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An Empirical Analysis of Monetary and Fiscal Policy Interaction in India

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AN EMPIRICAL ANALYSIS OF MONETARY AND FISCAL POLICY INTERACTION IN INDIA

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Abstract

This study analyses the behaviour of monetary and fiscal policies interaction in India using quarterly data for 2000Q2 to 2010Q1. It finds that, even after the elimination of automatic monetisation of fiscal deficit in 1997 and prohibiting RBI from buying government securities in the primary market under the FRBM Act from April 2006, fiscal policy continues to substantially influence the conduct of monetary policy. Specifically, the reaction of the two policies to shocks in inflation and output is mostly in the opposite direction. While monetary policy reacts in a counter-cyclical manner, fiscal policy reaction is primarily pro-cyclical in nature. The positive impact of expansionary fiscal policy on output is highly short-lived, while there is a significant negative impact in the medium to long- term.

Keywords: Fiscal Policy, Monetary Policy, Interaction, Prices

JEL Classification Codes: E61, E63

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Introduction

Monetary and fiscal policies in any country are two macroeconomic stabilisation tools. However, these two policies have often been pursued in different countries in different directions. Monetary policy is often pursued to achieve the objective of low inflation to stabilise the economy from output and price shocks. On the other hand, fiscal policy is often biased towards high growth and employment even at the cost of higher inflation (Alesina and Tabelini, 1990; Aurbach, 2004). For achieving an optimal mix of macroeconomic objectives of growth and price stability, it is necessary that the two policies complement each other. However, the form of complementarity will vary according to the stage of development of the country's financial markets and institutions.

With increasing independence of central bank in the conduct of monetary policy from fiscal dominance during the last few decades, there has been a renewed interest in the issue of monetary and fiscal policy coordination (Melitz, 1997; Von Hagen *et. al*, 2001). Another development, which led to spawning a number of studies on this issue, was the Stability and Growth Pact (SGP) and formation of European Monetary Union (EMU). Under this arrangement, individual countries pursue independent fiscal policies within the SGP, but have a common monetary policy. Thus, this arrangement has underscored the importance of monetary and fiscal policy coordination (Muscatelli *et. al*, 2002). Furthermore, the recent global financial crisis has once again demonstrated the importance of coordinated response of monetary and fiscal policies. Sovereign debt problem in many countries in the euro area, in

particular, has also underlined the need for monetary and fiscal policies coordination.

In the context of developing economies, it is often viewed that there is complete fiscal dominance and the central bank is subservient to the fiscal authority (Fischer and Easterly, 1990; Calvo and Vegh, 1999). Therefore, it is argued that the issue of coordination may not arise since the very concept of coordination arises only when the two institutions are independent. However, it is argued that actual execution of the two policies could significantly differ from what could be expected from the institutional arrangements (Arby and Hanif, 2010). Furthermore, irrespective of the dependence/independence of the two policies, there will be interaction between these two policies. The nature of the interaction, however, will be conditioned by the institutional framework. The institutional arrangements have been changing in many developing countries as they are moving towards making central banks more independent, implying time varying behaviour of the interaction between the two policies, which has important implications for the objectives of macroeconomic stabilisation. Thus, from the macroeconomic policy point of view, it is important to empirically verify the nature of the interaction.

In India also, several changes have taken place in the monetary and fiscal policy frameworks, particularly since the beginning of the 1990s. These include complete phasing out of automatic monetisation of fiscal deficit through creation of *ad hoc* treasury bills (also called *ad hocs*) in 1997 and prohibiting RBI from buying government securities in the primary market from April 2006 under the Fiscal Responsibility and Budget Management (FRBM) Act, 2003. These changes are quite significant and have altered the basic nature of the

interaction between monetary and fiscal policies. However, the central government continues to incur large fiscal deficits, which has implications for the demand management by the Reserve Bank. In this backdrop, the paper empirically examines the interaction between monetary and fiscal policies in India in the recent period. In particular, the focus is on examining the monetary and fiscal policy responses to shocks in output and inflation.

The rest of the paper is organised as follows. Section II briefly discusses the evolution of monetary and fiscal policies interface in India. Section III contains a brief review of the literature. In Section IV, the theoretical and empirical framework, based on the literature, is laid out. Section V presents the results. The final section sums up the main findings.

II. Evolution of Monetary and Fiscal Policy Interface in India

The framework for monetary and fiscal policy interface in India stems from the provisions of the Reserve Bank of India Act, 1934. In terms of the Act, the Reserve Bank manages the public debt of the Central and the State Governments and also acts as a banker to them. The interface between these two policies, however, has been continuously evolving. In the pre-Independence days, the Colonial Government adopted a stance of fiscal neutrality. However, requirements of the World War II necessitated primary accommodation to the Government from the Reserve Bank.

In the post-Independence period, the monetary-fiscal interface evolved in the context of the emerging role of the Reserve Bank. Given the low level of savings and investment in the economy, fiscal policy began to play a major role in the development process under successive Five-Year Plans

beginning 1950-51. Fiscal policy was increasingly used to gain adequate command over the resources of the economy, which the monetary policy accommodated. Beginning the Second Plan, the Government began to resort to deficit financing to bridge the resource gap to finance plan outlays. Thus, the conduct of monetary policy came to be influenced by the size and mode of financing the fiscal deficit. Consequently, advances to the Government under the RBI Act, 1934 for cash management purposes, which are repayable not later than three months from the date of advance, in practice, became a permanent source of financing the Government budget deficit. Whenever government's balances with the Reserve Bank fell below the minimum stipulation, they were replenished through automatic creation of *ad hoc* Treasury Bills. Though the *ad hocs* were meant to finance Government's temporary needs, the maturing bills were automatically replaced by fresh creation of *ad hoc* Treasury Bills. Thus, monetisation of deficit of the Government became a permanent feature, leading to loss of control over base money creation by the Reserve Bank.

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

by banks with it to enable control of credit boom in the private sector emanating from reserve money creation through deficit financing.

The Statutory Liquidity Ratio (SLR) under the Banking Regulation Act, 1949 was originally conceived as a prudential requirement to ensure availability of sufficient liquid resources in relation to the liabilities by banks for meeting sudden drain on their resources. However, through a gradual hike the SLR became essentially an instrument to secure an increasing captive investor base for government securities to finance the increasing expansion in the government's fiscal deficit, particularly after the nationalisation of banks in 1969.

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

In pursuance of the recommendations of the Chakravarty Committee (1985), the monetary policy strategy shifted from the credit planning approach to a monetary targeting approach from 1986-87. This entailed clear assessment of primary liquidity creation consistent to achieve broad money supply (M_3) - the

target under the monetary targeting framework. The exercise of setting monetary targets was taken up immediately after the presentation of the Union Budget, which provided the magnitude of budget deficit and the level of market borrowing programme.

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

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

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

Even though fiscal dominance through automatic monetisation of fiscal deficit has been done away with over the years in India, the influence of fiscal deficit on the outcome of monetary policy has continued to remain significant given its high level. High fiscal deficit, even if it is not monetised, can interfere with the monetary policy objective of price stability through its impact on aggregate demand and inflationary expectations.

III. A Brief Review of Literature

The literature on interaction between monetary and fiscal policies can be broadly categorised into four categories based on the focus of research (Semmler and Zhang, 2003). First, is the fiscal theory of the price level determination in which fiscal policy behavior is non-Ricardian. In this approach, the time paths of government debt, expenditure and taxes do not satisfy the inter-temporal solvency constraint that in equilibrium the price level has to adjust in order to ensure government solvency. This alters the stability conditions associated with the central bank's interest rate policy (example, Benhabib *et. al*, 2001). The second approach studies the interactions between

monetary and fiscal policies from a strategic perspective in a game theory framework (example, Van Aarle *et. al*, 2002). The third approach is on empirical research on monetary and fiscal policy interactions primarily using VAR models (example, Muscatelli *et. al,* 2002). In the fourth approach, the analysis of monetary and fiscal policy interactions is extended to open economies by focusing on fiscal and monetary interactions between two or more countries (example, Van Aarle *et. al,* 2002). In this paper, we follow the third approach in the Indian context.

The theoretical framework of these VAR models is derived from the objectives of monetary and fiscal policies. Both the objectives are a function of unemployment, inflation and potential output growth, but with different weights assigned by the two policies. Monetary authority assigns more weight to price stability over unemployment, while fiscal authority is biased towards reduction in unemployment than price stability. The policy instruments are interest rates with the monetary authority and fiscal balance with fiscal authority. Thus, the VAR models typically consist of four variables, *viz.*, two macroeconomic variables representing unemployment/output and inflation and the other two are policy variables reflecting the fiscal and monetary policy stance.

Some of the empirical findings in the literature are as follows. For the G-7 countries, the form of interdependence between monetary and fiscal policy instruments was asymmetric and differed across countries. While in the US and the UK, monetary policy was found to react to fiscal expansion, it was absent in Italy, Germany and France (Muscatelli *et. al*, 2002). In Italy, Germany and France, Semmler and Zhang (2003), however, found that fiscal policy is

affected by monetary policy and also observed some regime changes in the interactions between the two policies in France and Germany.

In the developing country context, Zoli (2005), studying a group of emerging market economies, found that there was fiscal dominance in the case of Brazil and Argentina. In the case of Pakistan, Agha and Khan (2006) found inflation to be a fiscal phenomenon by showing that fiscal policy significantly influences the conduct of monetary policy. However, Arby and Hanif (2010) for the period 1964-65 to 2008-09 found contradictory result that the two policies have been executed independently in Pakistan, but the co-ordination between them was weak. Nasir *et. al* (2010), using VAR model for the period 1975 to 2006 in Pakistan, also find weak co-ordination among the two policies. In the case of six South Asian countries, Hasan and Isgut (2009) during the period 1980 to 2008 found that fiscal policy responded to economic slowdown promptly, while the response of monetary policy was mixed.

IV. Theoretical and Empirical Framework

Drawing on the literature, the theoretical and empirical framework of this study is set out as in the following. It is assumed that monetary policy instrument is represented by interest rate 'r', while the fiscal instrument is the fiscal balance 'S'. Monetary and fiscal authorities have differential preferences over the objectives of unemployment, inflation and growth in potential output. In general, fiscal authority has a bias for lower employment even at the cost of higher inflation by running lower/higher fiscal surplus/deficit. Monetary authority's preferred objective, on the other hand, is low inflation at potential level of output. Monetary authority has no preference for any specific level of

fiscal deficit, while neither of the two policies has a specific preferred level of interest rate.

Using the above assumptions, the utilities of the two authorities are given by

$U^M = U^M (u,P,g)$ (1)

$U^F = U^F(u,P,g,S)$ (2)

Where U^k is the utility function of the authority $k \in$ (M, F), 'u' is the unemployment rate, 'P' is the inflation rate and 'g' is the potential output growth. The unemployment rate is the measure of the utilisation of resources in the economy and is represented by output gap which is a function of the two policies, viz., 'r' and 'S'.

$U = u(r,S\ldots)$ (3)

Inflation is assumed to be a function of output gap (or unemployment rate) and the expected rate of inflation as given below:

$P = P(u) + P^e$ (4)

Where P^e is the expected inflation which depends on a backward looking component and the actual rate of inflation in the economy given by

$P^e = \omega P + (1- \omega)P^B$ (5)

Combining (4) and (5)

$P = P(u)/(1- \omega) + P^B$ for $0 \leq \omega < 1$

When $\omega = 1$, inflation does not depend on backward looking price behaviour or anticipated monetary and fiscal policies and the unemployment rate is always at natural rate of unemployment that $P = P(U^N)$.

The potential output growth 'g' depends on investment ratio, which is equal to the sum of private plus government saving ratio. To simplify, it is

assumed that the private saving ratio is unaffected by monetary and fiscal policy and hence g = g(S) is a function of the government saving rate.

Combining (1) to (5), we get

$$U^M = U^M \{u=u(r,S\ldots), P(u)/(1- \omega) + P^B, g(S)\} \quad (6)$$

$$U^F = U^F\{u=u(r,S\ldots), P(u)/(1- \omega) + P^B, g(S), S\} \quad (7)$$

Equations (6) and (7) show that monetary and fiscal policies depend on unemployment rate 'u', inflation 'P', interest rate 'r' and fiscal surplus 'S'.

The empirical analysis of the interaction between monetary and fiscal policies is carried out using Vector Autoregression (VAR) models consisting of the above four variables. In our case, we consider a simple VAR of the four variables, which has the following structure:

$$u_t = \sum\{\alpha_{11\eta}u_{t-\eta} + \alpha_{12\eta}P_{t-\eta} + \alpha_{13\eta}S_{t-\eta} + \alpha_{14\eta}r_{t-\eta}\} + \varepsilon_{1t}$$

$$P_t = \sum\{\alpha_{21\eta}u_{t-\eta} + \alpha_{22\eta}P_{t-\eta} + \alpha_{23\eta}S_{t-\eta} + \alpha_{24\eta}r_{t-\eta}\} + \varepsilon_{2t}$$

$$S_t = \sum\{\alpha_{31\eta}u_{t-\eta} + \alpha_{32\eta}P_{t-\eta} + \alpha_{33\eta}S_{t-\eta} + \alpha_{34\eta}r_{t-\eta}\} + \varepsilon_{3t}$$

$$r_t = \sum\{\alpha_{41\eta}u_{t-\eta} + \alpha_{42\eta}P_{t-\eta} + \alpha_{43\eta}S_{t-\eta} + \alpha_{44\eta}r_{t-\eta}\} + \varepsilon_{1t}$$

The responses of different variables are analysed using Impulse Response Function (IRF) from the VAR model. As time series data on employment are not available, drawing on principle of Okun's Law, output gap has been considered as the proxy. Thus, the four variables used are: Output Gap (*O_GDP)* defined as deviation of actual output from the trend, inflation rate measured by WPI inflation (DLWPI), change in gross fiscal deficit (DLGFD) and policy rate (PRATE) with weighted average call rate as the proxy[1]. While the responses of one variable to the change in the other variables are obtained from the impulse response function, the contribution of different factors

[1]Weighted average call rate has been used as a proxy for the policy rate, as it has tended to hug the effective policy rate – repo rate or reverse repo rate – as the case may be depending upon the liquidity condition during the period under consideration.

explaining the fluctuations in a variable is analysed through the variance decomposition analysis.

V. Empirical Results

The time period considered for the study is from 2000Q2 to 2010Q1. This is the period when i) fiscal dominance over monetary policy eased substantially with the elimination of automatic monetisation of fiscal deficit and prohibition on direct government borrowing from the Reserve Bank; and ii) the operating procedure of monetary policy in India underwent a paradigm shift in the early 2000 with the introduction of liquidity adjustment facility and the interest rate channel becoming the main monetary policy signaling instrument.

Granger Causality Tests

Before conducting the vector autoregression (VAR) analysis, the four variables viz., Output Gap (*O_GDP)*, inflation rate (DLWPI), change in gross fiscal deficit (DLGFD) and policy rate (PRATE), were tested for their stationary properties. Except PRATE, all the remaining three variables were found to be stationary by Augmented Dicky-Fuller (ADF) and Phillip-Perron (PP) tests (Table-1). Ng-Perron tests, not reported to conserve space, however, show that all the series are stationary at least at 10 per cent level.

Table-1: Test for Unit Root

Variable (X)	ADF		PP	
	Log X	∆Log X	Log X	∆Log X
DLGFD	-8.9*	-8.3*	-10.5	-48.1*
O_GDP	-3.1**	-5.5*	-2.8***	-7.0*
DLWPI	-5.8*	-6.1*	-3.9*	-16.9*
PRATE	-2.4	-6.4*	-2.3	-7.1*

Notes: ***, ** and * denote significance at 10%, 5% and 1% level, respectively. The lag length in the ADF tests was chosen based on Schwarz Bayesian Criterion (SBC) with maximum lag set at 4, being quarterly data.

Vector Autoregression Analysis

The lag length of the VAR was selected as one, since four out of the five tests select optimal lag length to be one (Table 2).

Table 2: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	183.4903	NA	3.33e-09	-8.174517	-7.330077	-7.869194
1	265.5464	127.1869*	1.26e-10*	-11.47732	-9.957329*	-10.92774*
2	277.9687	16.77005	1.61e-10	-11.29843	-9.102890	-10.50459
3	293.7480	18.14621	1.85e-10	-11.28740	-8.416304	-10.24930
4	318.2887	23.31372	1.53e-10	-11.71444*	-8.167790	-10.43208

* indicates lag order selected by the criterion
LR = sequential modified LR test statistic (each test at 5% level); FPE = Final predicition error; AIC = Akaike information criterion; SC = Schwarz information criterion; HQ = Hannan-Quinn information criterion.

The ordering of the variables in the VAR was based on Granger causality tests given in Table 3. The variable least influenced by other variables was ordered first while the variable most influenced by other variables was placed at the last. Thus, the ordering of the VAR was DLGFD, O_GDP, DLWPI and PRATE.

Table 3: VAR Granger Causality Tests

Null Hypothesis	**Lag**	**Chi-Square**	**Probability**
O_GDP does not Granger Cause DLGFD	1	0.05	0.83
DLGFD does not Granger Cause O_GDP	1	2.32	0.13
DLWPI does not Granger Cause DLGFD	1	1.02	0.31
DLGFD does not Granger Cause DLWPI	1	1.05	0.31
CALL does not Granger Cause DLGFD	1	0.17	0.67
DLGFD does not Granger Cause PRATE	1	5.76*	0.02
DLWPI does not Granger Cause O_GDP	1	0.10	0.75
O_GDP does not Granger Cause DLWPI	1	4.60*	0.03
PRATE does not Granger Cause O_GDP	1	0.01	0.94
O_GDP does not Granger Cause PRATE	1	2.57	0.11
PRATE does not Granger Cause DLWPI	1	9.29*	0.00
DLWPI does not Granger Cause PRATE	1	13.17*	0.00

* denotes significance at 5% level.

An important point which emerges from the above Granger causality results is the unidirectional causality running from fiscal deficit to policy rate. This implies that, even after the elimination of automatic monetisation of fiscal deficit and prohibition on direct borrowing of government from the Reserve Bank, fiscal policy continues to impinge on the outcome of monetary policy.

Impulse Response Functions

The responses of different variables through impulse response functions (IRF) obtained from a shock of one standard deviation and the variance decomposition are as follows[2].

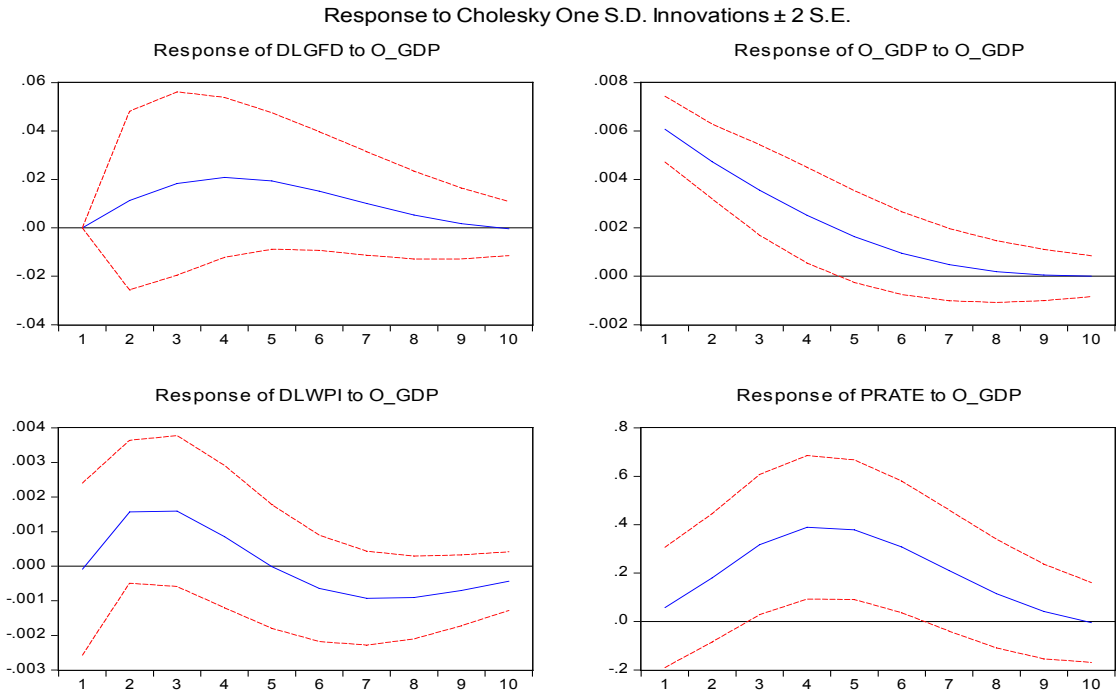
Effects of Output Shock

Chart 1 shows the time path of the responses in different variables to shock in output gap. It is seen that any positive shock to output gap converges back to its long run path in about two years. The positive shock to output gap leads to rise in inflation. Monetary policy reacts strongly in a counter-cyclical manner by raising the policy rate. Fiscal policy response, on the other hand, remains largely pro-cyclical, *i.e.,* fiscal deficit increases, before converging back in about two years. This pro-cyclical behaviour could follow as increase in revenue buoyancy of the government during the upswing of a business cycle makes government in developing countries to spend even more and remain downward inflexible during downswing of the business cycle (Alesina and Tabellini, 2005; Ilzetzki and Vegh, 2008). There follows a strong counter-cyclical monetary policy, as reflected in the policy rate rising to a peak level by the fourth quarter after the shock. As a result of this monetary policy action,

[2] In the VAR estimate, four dummy variables, 'D1', 'D2', D3 and D4, were used to control for outliers in each of the four variables. D1 (fiscal deficit outliers) = 1 for 2007:Q3 and -1 for 2008:Q4 and zero otherwise; D2 (output gap outlier) = 1 for 2002:Q4 and 2004:Q1 and zero otherwise; D3 = (Inflation outlier) = 1 for 2000:4 and 2008:4 and zero otherwise and D4 = (Call rate outlier) = for 2007:1 and -1 for 2007:2 and zero otherwise.

decline in inflation overshoots by the fifth quarter before converging subsequently. Overall, responses of monetary and fiscal policies to output shocks are opposite to each other.

Chart 1: Response to Output Shock



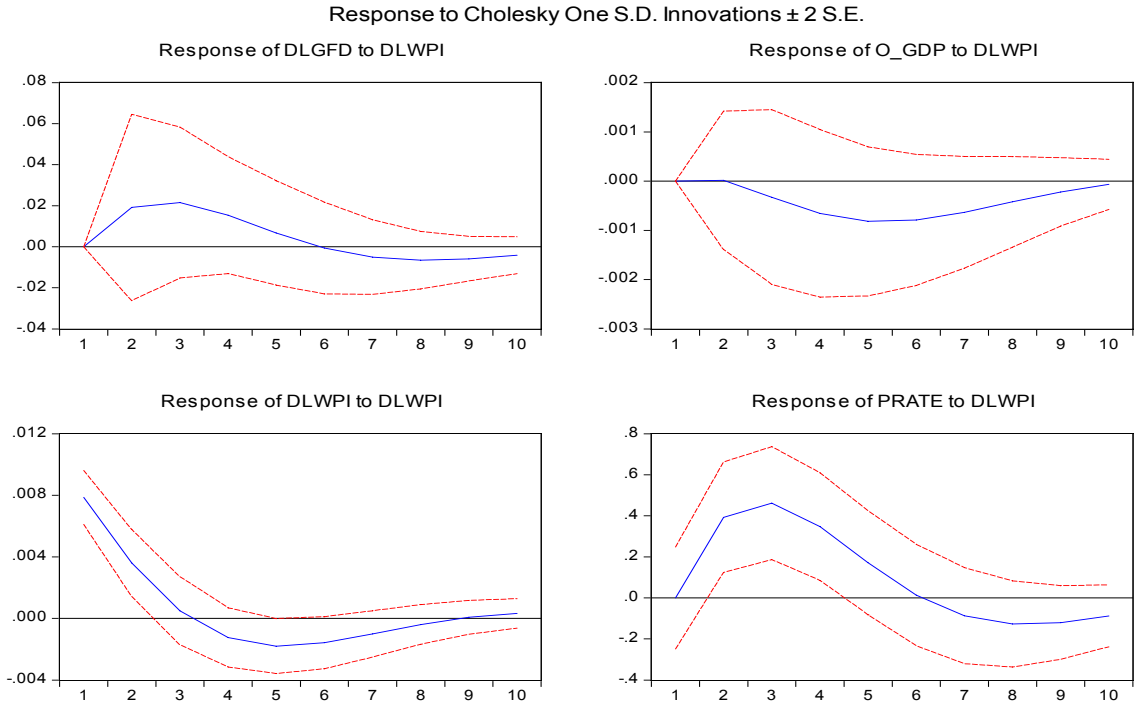
The variance decomposition shows that shock to output gap accounts for about 25 per cent of the total changes in the policy rate, while it accounts for about 6.5 per cent of the total changes in inflation. Output gap accounts for about 4.0 per cent of the total variation in gross fiscal deficit (Annex Tables 1 to 4).

Effects of Inflation Shock

The negative impact of inflation shock on output growth appears to last several quarters, though the statistical significance is weak initially. The response of inflation to its own shock is to converge back to its equilibrium level fairly rapidly in about three quarters. Interestingly, the correction in inflation

overshoots by the third quarter before converging back around the eighth quarter. This could be attributed to strong counter-cyclical monetary policy reaction of the authority to raise the policy rate to a peak by the third quarter before gradually converging back. The response of fiscal policy is again pro-cyclical as it increases by the second quarter before converging back by the fifth quarter (Chart 2). This increase in fiscal deficit due to inflation could follow from price rise leading to increase in government expenditure more than that of revenue receipts. A number of studies in the Indian context in the past have found that price elasticity of government expenditure is significantly higher than the price elasticity of government receipts (for example, Khundrakpam, 1998 and 1999).

Chart 2: Response to Inflation Shock



The variance decomposition analysis shows that other than its own impact shock to inflation accounts for highest percentage of the total variation in policy rate (26 per cent). This also suggests strong monetary policy responses

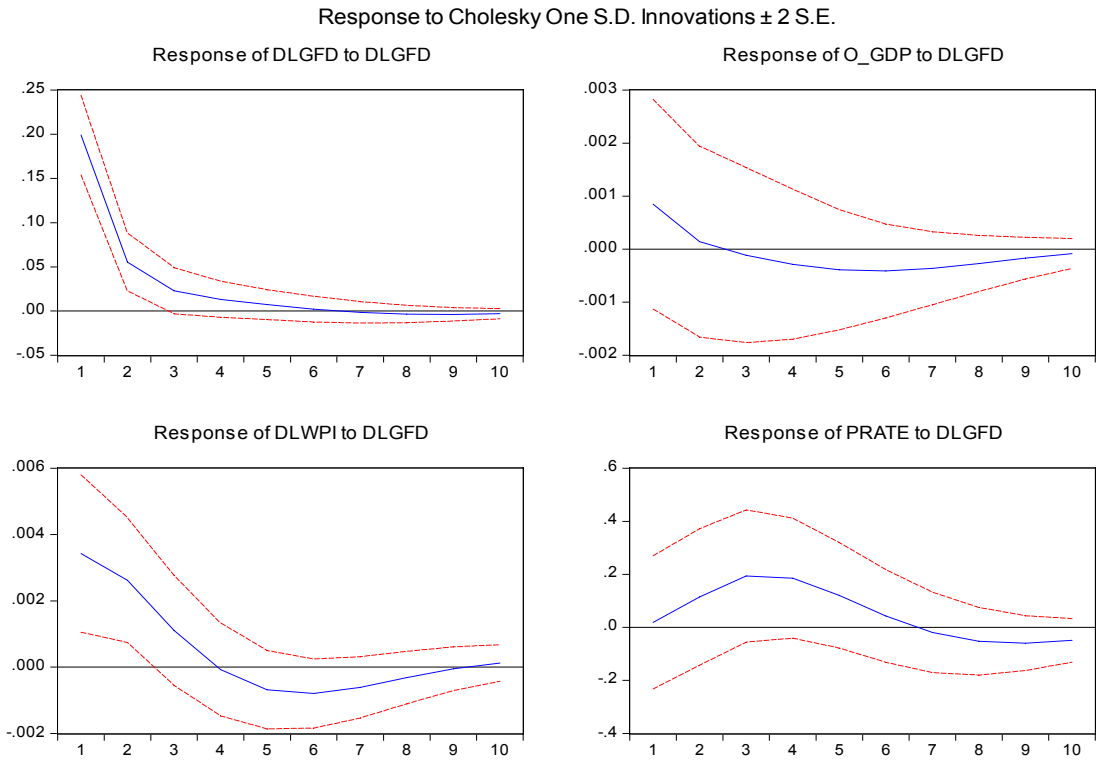
to rise in inflation. Shock to inflation explains only about 3 per cent total variation in output gap and fiscal deficit (Annex Tables 1 to 4).

Effects of fiscal Shock

A positive shock to fiscal deficit takes about five to six quarters to converge back to its long run equilibrium path. On other hand, increase in fiscal deficit leads to rise in the level of output above the potential in the very first quarter. However, the positive impact remains only till the second quarter, and by the third quarter the impact dies out completely and turns negative thereafter. In a supply constrained economy like India, this very short-term positive impact of fiscal expansion on output while having a negative impact in the medium to long-term could arise at least for the following two reasons. First, fiscal deficit, typically associated with government dis-savings may subsequently lower the overall savings, and therefore, investment in the economy, leading to lower level of output. Second, rising fiscal deficit could lead to hardening of the borrowing cost of more efficient private sector, and thus, crowd-out private sector investment and lower output growth (RBI, 2002 and 2010).

With the rise in output over the potential level following the shock in fiscal deficit, inflation rises from the first quarter and fall back to zero only by the fourth quarter. Monetary policy again reacts in a counter-cyclical manner but with a lag from the second quarter. Over the longer term, as fiscal expansion leads output to fall below the potential, both monetary policy and inflation is subsequently eased (Chart 3).

Chart 3: Response to Fiscal Shock



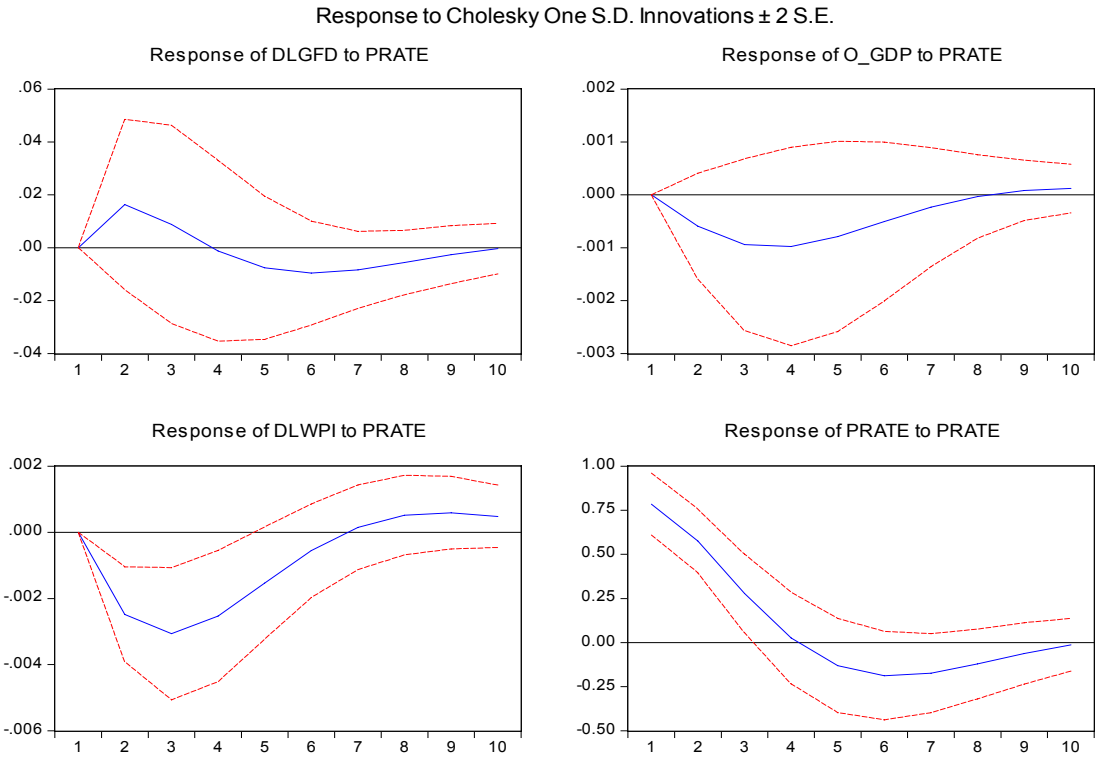
The variance decomposition analysis shows that shock to gross fiscal deficit explains about 3 per cent of the total variation in output gap and policy rate, while explaining around 12 per cent of the total variation in inflation (Annex Tables 1 to 4).

Effects of Policy Rate Shock

Chart 4 shows the responses of various variables to a shock in policy rate. Increase in policy rate leads to decline in output below its potential level, reflecting negative impact on aggregate demand, with the decline peaking by the third quarter. This decline in the level of output below potential leads to decline in inflation, which also peaks by the third quarter, before converging back along with the convergence of output to its potential level. Increase in policy rate or monetary tightening leads to some fiscal expansion initially, which

could follow from rise in borrowing cost of the Government and the fall in the level of output, before narrowing after the fourth quarter (Chart 4).

Chart 4: Response to Policy Rate Shock



The variance decomposition analysis shows that shock to policy rate accounts for about 20 per cent of the total variation in inflation by the fifth period, suggesting a significant impact of monetary policy on inflation. Policy rate accounts for around 4 per cent of the total variation in output gap (Annex Tables 3 to 6).

VI. Summary and Concluding Remarks

This study analysed the behaviour of interaction between fiscal and monetary policies in India using quarterly data for 2000Q2 to 2010Q1. The choice of period of the study was influenced by the operating procedure of monetary policy in India which underwent a paradigm shift in the early 2000 with the introduction of liquidity adjustment facility and the interest rate channel

becoming the main monetary policy signaling instrument. With the complete phasing out of automatic monetisation of fiscal deficit by April 1997, the fiscal dominance over monetary policy had also eased substantially. Furthermore, the FRBM Act, 2003 prohibited the Reserve Bank from buying government securities in the primary market from April 2006.

Granger causality tests indicate that fiscal policy continues to unilaterally influence monetary policy even after the elimination of automatic monetisation of fiscal deficit and prohibition of RBI from buying government securities from the primary market. The impulse response functions from VAR analysis showed that monetary policy is highly sensitive to shocks in inflation and it responds swiftly in a counter-cyclical manner. However, the response of fiscal policy shows a pro-cyclical tendency to both inflation and output shocks, which perhaps explains as to why monetary policy responds strongly than otherwise it would have.

The study also suggests that expansionary fiscal policy is effective in raising the level of output over the potential level only in the short run. In the medium to longer term, however, fiscal expansion leads to economic slowdown. It seems fiscal deficit leads to decline in savings and investment in the economy over the medium term, besides crowding-out more efficient private sector investment by government consumption.

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Annex Table 1. Variance Decomposition of O_GDP

Period	S.E.	DLGFD	O_GDP	DLWPI	PRATE
1	0.006165	2.851075	97.14893	0.000000	0.000000
2	0.007801	1.937371	97.49029	0.000368	0.571967
3	0.008632	1.584750	96.61450	0.142120	1.658633
4	0.009069	1.457768	95.22621	0.651561	2.664463
5	0.009288	1.464807	93.87822	1.395679	3.261290
6	0.009389	1.537509	92.90411	2.076695	3.481684
7	0.009430	1.615414	92.36099	2.510864	3.512730
8	0.009444	1.666528	92.12711	2.702986	3.503373
9	0.009448	1.688920	92.04823	2.754967	3.507885
10	0.009449	1.694695	92.02307	2.759372	3.522866

Annex Table 2.Variance Decomposition of DLWPI

Period	S.E.	DLGFD	O_GDP	DLWPI	PRATE
1	0.008258	9.370157	0.010492	90.61935	0.000000
2	0.009735	11.92507	2.614110	78.96325	6.497569
3	0.010398	11.50735	4.636791	69.45096	14.40490
4	0.010807	10.65959	4.911568	65.61008	18.81876
5	0.011072	10.33170	4.679076	65.14195	19.84727
6	0.011234	10.35020	4.872250	65.25569	19.52186
7	0.011331	10.39943	5.457541	64.93484	19.20819
8	0.011391	10.37516	6.035482	64.37599	19.21337
9	0.011428	10.31746	6.373458	63.95499	19.35409
10	0.011451	10.27728	6.490042	63.77924	19.45343

Annex Table 3. Variance Decomposition of DLGFD

Period	S.E.	DLGFD	O_GDP	DLWPI	PRATE
1	0.199205	100.0000	0.000000	0.000000	0.000000
2	0.208642	98.25408	0.290741	0.844503	0.610671
3	0.211758	96.35503	1.024813	1.855283	0.764873
4	0.213616	94.94710	1.957361	2.340672	0.754865
5	0.214812	93.96918	2.746532	2.412826	0.871463
6	0.215574	93.31688	3.223216	2.396609	1.063298
7	0.216030	92.92375	3.425379	2.441208	1.209662
8	0.216275	92.72106	3.477398	2.527021	1.274521
9	0.216390	92.63372	3.480209	2.597797	1.288279
10	0.216439	92.60080	3.478916	2.632339	1.287946

Annex Table 4. Variance Decomposition of PRATE

Period	S.E.	DLGFD	O_GDP	DLWPI	PRATE
1	0.787283	0.054336	0.540877	5.15E-05	99.40474
2	1.070447	0.648510	3.146352	13.47438	82.73076
3	1.249904	2.065157	8.775380	23.52527	65.63419
4	1.364225	3.138019	15.50165	26.23185	55.12848
5	1.436790	3.476023	20.92461	25.07111	50.52826
6	1.482419	3.393877	23.96962	23.56020	49.07631
7	1.509801	3.271903	25.04268	23.04758	48.63784
8	1.524772	3.257108	25.12147	23.29340	48.32802
9	1.532017	3.315870	24.95698	23.69041	48.03673
10	1.535156	3.377362	24.85586	23.91906	47.84772