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Fiscal Stimulus and Potential Inflationary Risks: An Empirical Assessment of Fiscal Deficit and Inflation Relationship in India

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Abstract

The fiscal response in India to deal with the contagion from the global crisis during 2008-10 was driven by the need to arrest a major slowdown in economic growth. However, there could be medium-term risks to the future inflation path, in the absence of timely fiscal consolidation. As highlighted in the paper, fiscal deficit could be seen to influence the inflation process through either growth of base money or higher aggregate demand. Empirical estimates over the sample period 1953-2009 suggest that one percentage point increase in the level of the fiscal deficit could cause about a quarter of a percentage point increase in the Wholesale Price Index (WPI). The paper emphasises that the importance of fiscal space in the India specific context needs to be seen in terms of not only the usual output stabilisation role of fiscal policy but also the need for use of fiscal measures to contain inflationary pressures that often arise from temporary but large supply shocks.

- **JEL Classification:** E31, H62, H63
- **Keywords:** Fiscal Deficit, ARDL, Price Level

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I. Introduction

Fiscal stimulus emerged as the key universal instrument of hope in almost every country around the world, when the financial crisis in the advanced economies snowballed into a synchronised global recession. Borrowing as much at as low a cost as possible to stimulate the sinking economies necessitated unprecedented coordination between the fiscal and monetary authorities. It is the fiscal stance that had to be accommodated without any resistance by the monetary authorities so as to minimise the adverse effects of the crisis on output and employment, while also saving the financial system from a complete breakdown. Given the deflation concerns in most countries -rather than the fear of inflation - monetary authorities had no reasons to resist. The universal resort to fiscal stimulus, however, has now led to significant increase in deficit and debt levels of countries, which may operate as a permanent drag for some time, affecting the overall macroeconomic outlook, including inflation. OECD projections indicate that OECD level fiscal deficit may reach 60 year high of about 8% of GDP in 2010, and public debt may exceed 100% of GDP in 2011, which will be 30 percentage points higher than the comparable pre-crisis levels in 2007.

In India, the fiscal response to the global crisis was swift and significant, even though India clearly avoided a financial crisis at home and also continued to be one of the fastest growing economies in the world in a phase of deep global recession. Despite the absence of any need to bailout the financial system, it is the necessity to partly offset the impact of deceleration in private consumption and investment demand on economic growth, which warranted adoption of an expansionary fiscal stance. One important consequence of this, though, was the significant deviation from the fiscal consolidation path, and the resultant increase in the fiscal deficit levels over two consecutive years (2008-10).

The immediate impact of the higher levels of fiscal deficit on inflation may be almost negligible, since: (a) the expansionary fiscal stance was only a partial offset for the deceleration in private consumption and investment demand, as the output-gap largely remained negative, indicating no risk to inflation in the near-term, and (b) despite large increase in the borrowing programme of the Government to finance the deficit, there was no corresponding large expansion in money growth, since demand for credit from the private sector remained depressed. Thus, neither aggregate demand nor monetary expansion associated with larger fiscal deficits posed any immediate concern on the inflation front. The usual rigidity of deficit to

correct from high levels to more sustainable levels in the near-term, however, entails potential risks for the future inflation path of India, which may become visible when the demand for credit from the private sector reverts to normal levels and if the revival in capital flows turns into a surge again over a sustained period. The major risk to future inflation would arise from how the extra debt servicing could be financed while returning to sustainable levels through planned consolidation. Revenue buoyancy associated with the recovery in economic activities to a durable high growth path would only contribute one part; the major important part, however, has to come either from a combination of higher taxes, withdrawal of tax concessions and moderation in public expenditure, which could weaken growth impulses and the pace of recovery, or from higher inflation tax, suggesting higher money growth and associated pressure on future inflation.

Conceptually, the risk to inflation from high fiscal deficit arises when fiscal stimulus is used to prop up consumption demand, rather than to create income yielding assets through appropriate investment, which could have serviced the repayment obligations arising from larger debt. As highlighted by Cochrane (2009) in the context of the US, "...If the debt corresponds to good quality assets, that's easy...If the new debt was spent or given away, we're in more trouble. If the debt will be paid off by higher future tax rates, the economy can be set up for a decade or more of high-tax and low-growth stagnation. If the Fed's kitty and the Treasury's taxing power or spending-reduction ability are gone, then we are set up for inflation." It may be worth recognising that all over the world, at some stage, the risk of active anti-inflationary policy conflicting with inflexible fiscal exit cannot be ruled out. As highlighted by Davig and Leeper (2009) in this context for the US, "...as inflation rises due to the fiscal stimulus, the Federal Reserve combats inflation by switching to an active stance, but fiscal policy continues to be active....In this scenario, output, consumption and inflation are chronically higher, while debt explodes and real interest rates decline dramatically and persistently".

The future risk to inflation in India, from fiscal stimulus, thus could arise from the downward inflexibility of the deficit levels, and with revival in demand for credit from the private sector and stronger recovery taking economic growth closer to the potential, high fiscal deficits could be manifested in the form of pressures on both aggregate demand and money supply. Surges in capital flows could complicate the situation further. This paper recognises the possible policy challenge arising from higher money growth on account of persistent large fiscal deficits, revival in private credit demand and surges in capital flows, on the one hand, and higher

policy interest rate chasing higher inflation on the other. Possible crowding-out effects associated with the fiscal imbalances may also lead to a situation where high inflation and high nominal interest rates co-exist. Since much of these possibilities could be empirically validated over time depending on what outcome actually may materialise in the future, this paper only recognises the potential risk to future inflation path, and accordingly aims at studying the relationship between fiscal deficit and inflation in India over the sample period 1953 to 2009.

Macroeconomic variables are generally interrelated in a complex manner. Therefore, a deeper understanding of inflation dynamics would involve analysing its relationship with macroeconomic variables such as deficit, money supply, public debt, external balance, exchange rate, GDP and interest rates. In the literature, particularly in the developing country context, simple models are, however, often used to analyse the inflationary impact of fiscal deficit. This largely reflects the role of fiscal dominance, which has often been a phenomenon in many developing countries. Thus, fiscal-based theories of inflation are more common in the literature of developing countries (for example, Aghevli and Khan (1978), Alesina and Drazen (1978) and Calvo and Vegh (1999)). On the other hand, for developed countries, fiscal policy is often considered to be unimportant for inflation determination, at least on theoretical grounds, as the desire to obtain seigniorage revenue plays no obvious role in the choice of monetary policy (Woodford, 2001).

In the Indian context also, there are several studies analysing the nexus between government deficits, money supply and inflation. The findings of these studies generally point to a self perpetuating process of deficit-induced inflation and inflation-induced deficit, besides the overall indication that government deficits represent an important determinant of inflation (For example, Sarma (1982), Jhadav (1994) and Rangarajan and Mohanty (1998)). The above results have been on the expected lines given that till the complete phasing out of the *ad hoc* treasury bills in 1996-97, a sizable portion of the government deficit which could not be financed through market subscription was monetised. However, extending the period of analysis further beyond the automatic monetisation phase, Ashra *et al.* (2004) found no-long relationship between fiscal deficit and net RBI credit to the Government and the latter with broad money supply. Thus, they concluded that there is no more any rationale in targeting fiscal deficit as a tool for stabilisation. On the other hand, Khundrakpam and Goyal (2009), including more recent data and adopting ARDL approach to cointegration analysis, found that government deficit continues to be a key factor causing incremental reserve money creation and overall expansion in

money supply, which leads to inflation.

In this paper, we use a simple model to study the inflationary potential of fiscal policy in India by estimating the long-run relationship and the short-run dynamics between fiscal deficit, seigniorage and inflation. The motivation is that fiscal deficit can lead to inflation either directly by raising the aggregate demand (demand pull inflation), or indirectly through money creation, or a combination of both. Against this background, Section II presents briefly the analytical framework employed in the paper. In section III, the estimation procedures are explained. The data and empirical results are analysed in section IV. Section V contains the concluding observations.

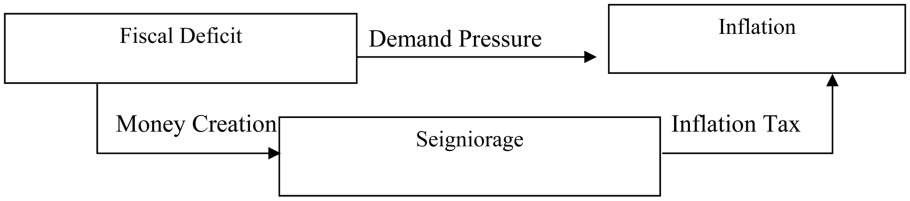
II. The Analytical Framework

Inflation, according to monetarists, is always and everywhere a monetary phenomenon. Following the seminal contribution by Sargent and Wallace (1981), however, it is viewed that fiscally dominant governments running persistent deficits would sooner or later finance those deficits through creation of money, which will have inflationary consequences. Fischer and Easterly (1990), thus, argue that rapid monetary growth may often be driven by underlying fiscal imbalances, implying that rapid inflation is almost always a fiscal phenomenon. Historical evidences have shown that governments' often resorted to seigniorage (or inflation tax) during times of fiscal stress, which has inflationary consequences. Thus, contemporary macroeconomic literature, while trying to explain inflationary phenomenon has also focussed on the fiscal behaviour, particularly in the developing country context. This is because fiscally dominant regimes are often seen as a developing country phenomenon, due to less efficient tax systems and political instability, which leads to short-term crisis management at the cost of medium to long-term sustainability. As noted by Cochrane (2009), "...Fiscal stimulus can be great politics, at least in the short-run." Furthermore, more limited access to external borrowing tends to lower the relative cost of seigniorage in these countries, increasing their dependence on the inflation tax while delaying macroeconomic stabilisation (Alesina and Drazen, (1991) and Calvo and Vegh (1999)).

The relationship between government deficit and inflation, however, is more often analysed from a long-term perspective. This is because borrowing allows governments to allocate seigniorage inter-temporally, implying that fiscal deficits and resort to inflation tax need not necessarily be contemporaneously correlated. The short-run dynamics between inflation and deficit is also complicated by the

possible feedback effect of inflation on the fiscal balance (Catao and Terrones, 2001). In the short-run, the government might also switch to alternative sources of financing in relation to seigniorage, weakening thereby the correlation between inflation, deficit and seigniorage.

A popular method of analysing the inflationary potential of fiscal deficit in India is through its direct impact on reserve money, which *via* the money multiplier leads to increase in money supply, that in turn leads to inflation (Khundrakpam and Goyal, 2009). In this paper, we analyse the inflationary potential of fiscal deficit by hypothesising that either: (i) there can be a direct impact on inflation through increase in aggregate demand; or (ii) through money creation or seigniorage; or (iii) a combination of both. The causality is described in the following flow chart. In essence, though, one has to recognise that the increase in demand financed by fiscal deficit would automatically lead to higher money supply through higher demand for money. In a Liquidity Adjustment Facility (LAF) framework, increase in money demand associated with higher government demand has to be accommodated, in order to keep the short-term interest rates in the system, in particular the overnight call rate, within the LAF (repo - reverse repo) corridor of interest rates. In a LAF based operating procedure of monetary policy, thus, money supply is demand driven, and hence endogenous. To the extent that fiscal deficit leads to expansion in money supply, associated inflation risk must be seen as a fiscal, rather than monetary, phenomenon.



In this paper, fiscal deficit (D) is defined as the net borrowing requirement of the Central Government. Thus, it is derived as total expenditure (revenue plus capital) of the central government less the revenue receipts (tax and non-tax, including grants) less non-debt capital receipts (such as disinvestment proceeds). In the literature, primary deficit, which is fiscal deficit less interest payments, is also often considered for analysing the inflationary impact of government deficit, in order to remove any possible endogeneity bias resulting from reverse impact of inflation on nominal interest rate. However, given the interest rate regime in India, we do not expect any such significant endogeneity.

Seigniorage or inflation tax is equated with the additional real reserve money creation or change in real reserve money. Thus, seigniorage 'S' is defined as the change in nominal reserve money deflated by the GDP deflator or,

$$S = \{RM - RM_{(-1)}\}/Def$$

Where, RM is the nominal reserve money or base money and Def is the index of GDP deflator.

So, we essentially would empirically test the following:

i) $P = f(D)$
ii) $P = f(S)$
iii) $S = f(D)$
iv) $P = f(D,S)$

It is important to note here that ΔRM could be driven by increase in net foreign assets (NFA) of the RBI as well as net RBI credit to the Government. Under fiscal dominance, much of the increase in RM could be because of increase in net RBI credit to the Government. Under an exchange rate policy that aims at avoiding excessive volatility, surges in capital flows and the associated increase in NFA of the RBI could drive the growth in RM from the sources side. As a result, inflation may still exhibit a stronger relationship with money growth, but the underlying driving factors behind money growth could be either the fiscal stance or the exchange rate policy or both.

III. The Empirical Framework

We employ bounds test to examine the stated empirical hypotheses above, for the following reasons. First, this approach can be applied to variables integrated of different order. Second, unlike residual based cointegration analysis, the unrestricted error correction model (UECM) employed in bounds test does not push the short-run dynamics into the residual terms. Third, the bounds test can be applied to small sample size. Fourth, it identifies the exact variable to be normalised in the long-run relationship. A limitation of bounds test, however, is that it is not appropriate in situations where there may be more than one long-run relationship among the variables. In other words, the test is appropriate only when one variable is explained by the remaining variables and not the *vice versa*.

This test involves investigating the existence of a long-run relationship among

the variables using an unrestricted error-correction model (UECM). In the case of two variables, the UECM would take the following form:

$$\Delta X_t = a_x + \sum_{i=1}^{n} b_{ix}\Delta X_{t-i} + \sum_{i=0}^{n} c_{ix}\Delta Y_{t-i} + \beta_x X_{t-1} + \gamma_x Y_{t-1} + \varepsilon_t \quad (1)$$

$$\Delta Y_t = a_y + \sum_{i=1}^{n} b_{iy}\Delta Y_{t-i} + \sum_{i=0}^{n} c_{iy}\Delta X_{t-i} + \beta_y Y_{t-1} + \gamma_y X_{t-1} + \varepsilon_t \quad (2)$$

Δ is the first difference operator. The bounds test for the presence of long-run relationship can be conducted using *F*-test. The *F*-test statistic tests the null hypothesis that the coefficients of the lagged levels of the variables are jointly equal to zero, against the alternative that they are jointly different from zero. In (1), where 'X' is the dependent variable, *F*-test for the null hypothesis for cointegration between the two variables with 'Y' as the long-run forcing variable is (H_0: $\beta_x = \gamma_x = 0$) against the alternative hypothesis (H_1 : $\beta_x \neq \gamma_x \neq 0$), denoted by F_x(X/Y). Where 'Y' is the dependent variable in (2), the null hypothesis is (H_0: $\beta_y = \gamma_y = 0$) against the alternative hypothesis (H_1: $\beta_y \neq \gamma_y \neq 0$), denoted by F_y(Y/X).

In the case of three variables, UECM would take the following form:

$$\Delta X_t = a_x + \sum_{i=1}^{n} b_{ix}\Delta X_{t-i} + \sum_{i=0}^{n} c_{ix}\Delta Y_{t-i} + \sum_{i=0}^{n} d_{ix}\Delta Z_{t-i} + \alpha_x X_{t-1} + \beta_x Y_{t-1} + \gamma_x Z_{t-1} + \varepsilon_t \quad (3)$$

$$\Delta Y_t = a_y + \sum_{i=1}^{n} b_{iy}\Delta Y_{t-i} + \sum_{i=0}^{n} c_{iy}\Delta X_{t-i} + \sum_{i=0}^{n} d_{iy}\Delta Z_{t-i} + \alpha_y Y_{t-1} + \beta_y X_{t-1} + \gamma_y Z_{t-1} + \varepsilon_t \quad (4)$$

$$\Delta Z_t = a_z + \sum_{i=1}^{n} b_{iz}\Delta X_{t-i} + \sum_{i=0}^{n} c_{iz}\Delta Y_{t-i} + \sum_{i=0}^{n} d_{iz}\Delta Z_{t-i} + \alpha_z Z_{t-1} + \beta_z X_{t-1} + \gamma_z Y_{t-1} + \varepsilon_t \quad (5)$$

When 'X' is the dependent variable, *F*-test for the null hypothesis for cointegration amongst the three variables, with 'Y' and 'Z' as the long-run forcing variable, is (H_0 : $\alpha_x = \beta_x = \gamma_x = 0$) against the alternative hypothesis (H_1 : $\alpha_x \neq \beta_x \neq \gamma_x \neq 0$), denoted by F_x(X/Y,Z). Where 'Y' is the dependent variable, the similar null hypothesis, with the 'X' and 'Z' as the long-run forcing variable, is (H_0 : $\alpha_y = \beta_y = \gamma_y = 0$) against the alternative hypothesis (H_1 : $\alpha_y \neq \beta_y \neq \gamma_y \neq 0$), denoted by F_Y (Y/X,Z). With 'Z' as the dependent variable, the similar hypothesis is the null of (H_0 : $\alpha_z = \beta_z = \gamma_z = 0$) against ($H_1$: $\alpha_z \neq \beta_z \neq \gamma_z \neq 0$), denoted by F_Z(Z/X,Y). However, as mentioned above, for this approach to be valid, there must be only one unique cointegrating relationship among the variables *i.e.*, only one of the variables

should be explained by the remaining variables without any reverse relationships.

The *F*-test has a non-standard distribution which depends upon: (i) whether variables included in the ARDL model are I(1) or I(0); (ii) whether the ARDL model contains an intercept and/or a trend. There are critical bound values of both the statistics set by the properties of the regressors into purely I(1) or I(0), which are provided in Pesaran, Shin and Smith (2001) for large sample size. The critical bound values for *F*-test in the case of small sample size are estimated in Narayan (2005). If the absolute value of the estimated *F*-statistics: (i) lie in between the critical bounds set by I(1) and I(0), cointegration between the variables is inconclusive; (ii) in absolute value lower than set by I(0), cointegration is rejected; and iii) in absolute value higher than set by I(1), cointegration is accepted.

For the equation which shows cointegrating relationship, the conditional long-run relationship is estimated by the reduced form solution of the following ARDL equations. If 'X' is the explained variable the specification takes the form:

$$X_t = a_0 + \sum_{i=1}^{n} b_1 X_{t-i} + \sum_{i=0}^{n} b_2 Y_{t-i} + \sum_{i=0}^{n} b_3 Z_{t-i} + \varepsilon_t \tag{6}$$

The short dynamics is obtained from the following ARDL specifications

$$\Delta X_t = a_0 + \sum_{i=1}^{n} b_1 \Delta X_{t-i} + \sum_{i=0}^{n} b_2 \Delta Y_{t-i} + \sum_{i=0}^{n} b_3 \Delta Z_{t-i} + ECT_{t-1} + \varepsilon_t \tag{7}$$

The *ECT* term in (7) is the error obtaining from the long-run relationship in (6).

The error correction model described by (7) can be used to generate dynamic forecast of the explained variable based on the past and current values of the independent variables. The accurateness of the dynamic forecast could indicate the robustness of the estimated model.

IV. Data and Empirical Results

We cover the time period 1953 to 2009 as consistent relevant data on wholesale price index (WPI) and reserve money are available from 1952-53 onwards in the Handbook of Monetary Statistics for India, RBI (2006). Data on Central Government fiscal deficit from 1971 onwards are obtained from Handbook of Statistics on Indian Economy (HSIE), RBI (2009), while that for the earlier period was obtained from Pattnaik *et al.* (1999). The data on GDP deflator is also obtained from HSIE, RBI. Two time periods were considered, mainly with the purpose of

generating dynamic forecast and checking the robustness of the model. The first time period is from 1953 to 2005, which excludes the post-FRBM period when direct lending to the Government by the RBI was discontinued under the FRBM Act.

A. Unit Root Tests

To gauge the appropriateness of the ARDL cointegration analysis, two unit root tests *viz.*, ADF test and PP test were conducted for the two sample periods. It was found that there are contradictions in the unit root properties based on the alternative tests for the price variable and between the two sample periods on government deficit. On the other hand, seigniorage is indicated to be a stationary series by both the tests and in both the sample periods. The overall picture that emerged was that the three variables are not necessarily integrated of the same order (Table 1). In view of this inconclusive stationary property of the series, we used bounds tests to check for cointegration between them.

B. Bounds Tests

Bounds tests results are extremely sensitive to the presence of serial correlation and the lag length selected. In order to remove the possible presence of serial correlations, dummies were included to remove outliers, which satisfied heteroscedasticity and other diagnostics tests. With price as the explained variable, the outliers were found in 1974 and 1975 coinciding with the after affects of oil price shock of 1973. Fiscal deficit outliers were found in 1955 and 2009, coinciding with the initiation of the Second Five Year Plan and the recent fiscal stimulus measures following economic slowdown due to global financial crisis,

Table 1. Unit Root Tests

Variable (X)	ADF		PP	
	X	*X*	*X*	*X*
1953 to 2005				
LogP	-3.21(t)	-5.20*	-4.94(t)*	-6.22*
LogS	-5.59(t)*	-9.00*	5.64(t)*	-24.3*
LogD	-3.10(t)	-6.96*	-3.16(t)	-6.98*
1953 to 2009				
LogP	-2.93(t)	-6.43*	-4.36(t)*	-6.44*
LogS	-5.50(t)*	-9.14*	5.58(t)*	-24.7*
LogD	-3.58(t)**	-6.82*	-3.63(t)**	-6.69*

Note: 't' in parentheses denote that the tests included a trend along with the constant, otherwise the tests are using only a constant. Inclusion of trend was determined by its statistical significance in the estimate.

respectively. The outliers with respect to seigniorage were found during the years of 1975, 1976 and 1977, which were the years of extreme volatility in regard to price situation and monetary growth. Given the use of annual data, the maximum lag length was set at 2 and the appropriate lag length was selected based on SBC criterion.[1] This was considered appropriate since the sample size is small (in the statistical sense) and therefore including too many lags may lead to loss of explanatory power.

The bounds tests results among the variables during both the sample periods reported in Table-2 reveal the following:

(i) Between price and seigniorage, the *F*-statistics is above the 95% critical bound values (6.79 and 5.15 for the two sample periods) and significant at 99% critical level only when price is explained by seigniorage. The *F*-statistics for the reverse relationships (2.35 and 2.01) are statistically insignificant. In other words, there exists a long-run cointegrating relationship between price level in the economy and government resorting to seignorage to finance its deficit, but with the former only being caused by the latter;

(ii) Between price and government deficit, the *F*-statistics for the two sample periods are 6.89 and 8.18 and statistically significant only when price is explained by government deficit. In the case of the reverse relationship, the *F*-statistics are 3.34 and 2.20 and are lower the 95% critical bound values and hence not significant. Thus, in the long-run, government deficit has an impact on price level in the economy, but the reverse impact is insignificant;

(iii) Seigniorage is also explained by government deficit with *F*-statistics of 6.80 and 4.98 for the two sample periods, but the reverse relationships are not statistically significant given the *F*-statistics of 0.55 and 0.52. The implication is that government resorts to seigniorage to finance its deficit in the long-run, but there is no significant reverse impact;

(iv) When all the three variables are combined, only price is explained by seigniorage and government deficit together with F-statistics of 4.61 and 4.38 for the two sample periods. None of the reverse relationships are statistically significant. The respective F-statistics for the two sample periods are 2.57 and 1.88 with government deficit as the explained variable and 0.36 and 0.55 with seigniorage as the explained variable. In other words, *ceteris paribus*, price level in the economy in India, in the long-run, is significantly influenced either directly by deficit itself or

[1] It was, however, found that increasing the maximum lag length to 3 or 4 hardly affected the results.

through the creation of money via deficit financing, or a combination of both. In other words, inflation is indicated to be explained by government deficit either directly or through seigniorage indirectly or through a combination of both the factors. Further, the results that there is only one cointegrating relationship between the variables in all the alternative combinations clearly indicates that the ARDL approach to cointegration can be used for estimation of the long-run relationships and the short-run dynamics.

C. Long-run Coefficients

In estimating the long-run coefficients a trend component was included in the price equations as a proxy to capture the impact of other determinants of inflation, ranging from output-gap to supply shocks in the form of deficient monsoon rainfall or increase in international commodity prices, wealth effects asset price changes, pass-through effects of exchange rate changes to domestic prices, etc. Each of these determinants could be better analysed in a macro-model, which is outside the scope of this paper. The other alternative to account for the impact of these other determinants of inflation path could be to introduce a trend component explicitly in the estimated equation, which could help in testing the intended empirical hypothesis, without completely ignoring the other determinants of inflation. The

Table 2. Bounds test for Cointegration

Functional Relation-ship	1953-2005			1953-2009		
	F-Statistics	95% criti-cal Values	Dummy variables	F -Statistics	95% criti-cal Values	Dummy variables
Bivariates						
$F_p(P/S)$	6.79*	4.44	1974 & 1975	5.15*	4.393	1974 & 1975
$F_s(S/P)$	2.35	4.44		2.01	4.393	
$F_p(P/D)$	6.89*	4.44	1974 & 1975	8.18*	4.393	1974 & 1975
$F_d(D/P)$	3.34	4.44	1955	2.20	4.393	1955 & 2009
$F_s(S/D)$	6.80*	4.44	1975, 1976 1977&1997	4.98**	4.393	1975, 1976 1977&1997
$F_d(D/S)$	0.55	4.44		0.52	4.393	2009
Trivariates						
$F_p(P/S,D)$	4.61**	4.178	1974 & 1975	4.38**	4.10	1974 & 1975
$F_d(D/S,P)$	2.57	4.178		1.88	4.10	2009
$F_s(S/D,P)$	0.36	4.178	1959 & 1997	0.55	4.10	1959 & 1997

Note: * and ** denote statistical significance at 99% and 95% critical levels, respectively. The critical bound values for F-statistics are extracted from Narayan (2005).

results presented in Table 3 reveal some interesting features. While the signs of the coefficients are as expected *a priori* in all the equations, some of them are not significant statistically. Specifically, the coefficients of fiscal deficit in the price equations are insignificant in the shorter sample period (column 2 and 4), but turn significant in the full sample period (column 6 and 8). Conversely, the coefficients of seigniorage, which are significant in the shorter sample period (column 1 and 4) turn insignificant in the full sample period, particularly with the inclusion of fiscal deficit as the other explanatory variable (column 5 and 8). This could indicate that till the ban on direct government borrowing from the RBI in 2005, the inflationary impact of fiscal deficit worked primarily through money creation and overshadowed the direct impact, if any. However, in recent years, with limited scope for direct monetisation, the inflationary impact of fiscal deficit is generated more directly perhaps via the channel of increase in aggregate demand.

Individually, 1% increase in seigniorage leads to about one-third of a percentage point increase in the price level in both sample periods, though the level of statistical significance declines (column 1 and 5). With regard to fiscal deficit, 1% increase leads to about one-fifth to one-quarter of a percentage point increase in the price level, which though is statistically significant only for the full sample period (column 2 and 6).

The below estimated elasticities, however, ignore the interactions between the

Table 3. Long-run Coefficients

	1954-2005				1954-2009			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	LogP	*LogP*	*LogS*	*LogP*	*LogP*	*LogP*	*LogS*	*LogP*
Constant	1.95 (1.92)***	3.31 (5.38)*	4.83 (17.83)*	1.85 (2.1)**	1.97 (1.53)	3.03 (5.1)*	4.84 (11.2)*	1.47 (1.17)
LogS	0.33 (2.14)**			0.24 (1.93)***	0.33 (1.7)***			0.23 (1.45)
LogD		0.186 (1.53)	0.48 (16.76)*	0.13 (1.3)		0.25 (2.1)**	0.50 (11.13)*	0.25 (2.1)**
Trend	0.056 (5.99)*	0.053 (3.35)*		0.045 (3.27)*	0.52 (3.9)*	0.044 (2.92)*		0.03 (1.49)
DumP	0.70 (2.19)**	0.79 (2.58)**		0.66 (2.54)**		0.90 (2.64)**		0.93 (2.22)
DumS1			-0.98 (-2.74)*				-1.78 (-2.78)*	

Note: *, ** and *** denote statistical significance at 1%, 5% and 10% levels, respectively. Dummy as indicated in the bounds test.

seigniorage and government deficit. It is seen from column (3) and (7) that to finance 1% of fiscal deficit in the long-run, seigniorage would increase by about 0.48 to 0.50%, with other things remaining the same.

Combining both government deficit and seigniorage as explanatory variables, one percent increase in seigniorage was found to cause inflation by about one-fifth of a percentage point in both sample periods, but is not statistically significant for the full sample. With regard to one percent increase in government deficit, the impact which was small (0.13) and not statistically significant in the shorter sample period, increased in the full sample period to a statistically significant level of about a quarter of a percentage point increase in the price level. The overall interpretation could be that, in the more recent years, the direct long-run inflationary impact of seigniorage has declined while that of government deficit through aggregate demand channel has increased.

D. Short-run Dynamics

The short-run dynamics presented in Table 4 reveal that all the equations are stable i.e., they converge to the long-run equilibrium as indicated by the negative sign of the error correction term. The explanatory powers are reasonable and the problem of serial correlation is within the tolerable level in general. There, however, seems to be some decline in the explanatory power after the inclusion of more recent period.

The inflationary impact of seigniorage in the short-run is negligible, irrespective of whether it is considered alone or taken together with government deficit in the model in both sample periods (columns 1, 4, 5 and 8). The speed of convergence following a shock is also slow, ranging between 10 to 20%.

Government deficit, on the other hand, has a positive impact on inflation even in the short-run for the full sample period indicating that the direct inflationary impact of government deficit could have become more prominent in the more recent years.

With regard to impact of government deficit on seigniorage, a strong positive impact is seen even in the short-run. The impact was larger in the shorter sample period and the speed of convergence was also much higher, with 85% of the divergence from the long-run equilibrium following a shock being corrected in a single time period. Both the short-run impact and speed of convergence declined markedly in the full sample period, indicating that government may have increasingly switched over to alternative source of financing its deficit in the short-run, given the restriction on direct borrowing from the RBI since the beginning of

fiscal 2006.

As mentioned above, dynamic forecasts of inflation for the period 2006 to 2009 were generated from the models estimated for the period 1953 to 2005 and then compared with the actual values. The forecast results are presented in Table 5. It could be seen that the direction of actual inflation are correctly predicted irrespective of whether seigniorage and government deficit are combined or considered individually. However, the inflation rates in each of the four years are over-predicted. The root mean square errors of predictions for the forecast period are also marginally higher than for the estimation period, except when government deficit is considered as the only explanatory variable. However, root mean square errors are about or less than 5.0%, except when seigniorage alone is the explanatory variable. It, thus, suggests that the role of seigniorage in explaining inflation may have become insignificant during the post-FRBM period. The general over-prediction also suggests that the impact of fiscal deficit on inflation might have moderated somewhat in recent years, as use of empirical estimates relating to the

Table 4. Short-run Dynamics

	1954-2005				1954-2009			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ΔLogP	*ΔLogP*	*ΔLogS*	*ΔLogP*	*ΔLogP*	*ΔLogP*	*ΔLogS*	*ΔLogP*
Constant	0.34 (1.21)	0.62 (2.68)*	4.08 (5.81)*	0.38 (1.36)	0.14 (0.50)	0.52 (2.47)**	2.59 (4.52)*	0.23 (0.84)
ΔLogS	0.003 (0.20)		0.26 (2.14)**	0.00 (0.00)	-0.004 (-0.28)			-0.005 (-0.38)
ΔLogD		0.035 (1.54)	0.41 (5.11)*	0.027 (1.19)		0.43 (2.17)**	0.27 (3.96)*	0.039 (1.92)***
Trend	0.01 (2.02)**	0.01 (2.18)**		0.009 (1.89)***	0.005 (0.99)	0.008 (1.9)***		0.005 (1.01)
DumP	0.12 (4.60)*	0.15 (4.52)*		0.134 (4.70)*	0.13 (4.71)*	0.16 (4.97)*		0.15 (5.20)*
DumS1			-0.83 (-3.48)*				-0.95 (-3.76)*	
ECM(-1)	-0.17 (-2.80)*	-0.19 (3.36)*	-0.85 (-5.64)*	-0.20 (-3.06)*	-0.099 (-1.70)***	-0.17 (-3.27)*	-0.54 (4.46)*	-0.16 (2.44)**
R-bar Square	0.52	0.41	0.51	0.53	0.44	0.40	0.39	0.47
DW-Statistics	1.79	1.65	1.80	1.77	1.67	1.64	1.63	1.67

Note: *, ** and *** denote statistical significance at 1%, 5% and 10% levels, respectively. Dummy as indicated in the bounds test.

past data to generate forecasts for the more recent periods yield higher values than actual. Moreover, the over-prediction could also be on account of the inclusion of a trend in the estimated equation, which will inherently have an upward bias.

V. Concluding Observations

The fiscal response in India to the severe contagion from the global crisis was conditioned by the need to minimise the adverse impact on the domestic economy. In the process, however, India's fiscal deficit expanded again to the pre-FRBM level. Given India's past experience, in terms of fiscal consolidation resulting only over a number of years, downward inflexibility of the post-crisis high fiscal deficit level could emerge as a potential source of risk to India's future path of inflation.

During 2008-10, when the fiscal stimulus led to increase in the fiscal deficit level, India's inflation environment remained highly volatile, reaching a peak in 2008-09 under the influence of the global oil and commodity prices shock, and coming under pressure again in 2009-10 from another supply shock, but from within the country, in the form of significant increase in food prices after a deficient monsoon. In this inflation process over these two years, however, fiscal deficit did not have much of a contributing role, since: (a) the overall private demand remained depressed, and fiscal expansion only aimed at partially offsetting the impact of deceleration in the growth of private consumption and investment demand on economic growth, (b) large borrowing programme of the Government did not lead to high money growth, since the growth in demand for credit from the private sector exhibited significant deceleration, and (c) some of the fiscal measures that led to higher deficits actually helped in keeping the headline inflation supressed. Thus,

Table 5. Dynamic Forecasts for 2006 to 2009 (in per cent)

	Change in P due to change in S and D		Change in P due to change in S		Change in P due to change in D	
	Actual	Predicted	Actual	Predicted	Actual	Predicted
2006	4.28	8.85	4.28	10.2	4.28	8.13
2007	5.28	8.79	5.28	12.0	5.28	7.5
2008	4.65	9.49	4.65	13.7	4.65	6.7
2009	8.01	13.19	8.01	13.6	8.01	9.8
Root mean square	Estimation Period	Forecast period	Estimation Period	Forecast period	Estimation Period	Forecast period
	4.1	4.57	3.77	6.97	3.12	2.61

the usual two channels through which fiscal deficit could cause inflation - *i.e.* by exerting pressure on aggregate demand in relation to potential output and by leading to excessive expansion in money growth - were almost absent. As demand for credit from the private sector revives, and if capital inflows remain strong on a sustained basis, the drag from the fiscal stimulus and its implications for the future inflation path will start to emerge over time.

In this context, this paper examined the empirical relationship between fiscal deficit and inflation over the pre-FRBM period 1953-2005 as well as the full sample period of 1953-2009. The direct impact of fiscal deficit through primary expansion in reserve money was studied by using a concept of 'seigniorage', proxied by the annual change in reserve money deflated by GDP deflator.Net RBI credit to the Government and RBI's increase in net foreign assets are the two key determinants of growth in reserve money on the sources side, and hence, only part of the increase in reserve money could be ascribed to the fiscal stance at any point of time. The overall impact of the fiscal deficit on inflation, in turn, could operate through both increases in aggregate demand as well as associated growth in broad money. In both direct as well as overall analysis, thus, the role of money in inflation becomes obvious, but that process is largely conditioned by the fiscal deficit.

Bounds test results presented in the study suggest that: (a) there is a cointgrating relationship between the price level and seigniorage financing of deficit; (b) fiscal deficit and price level also exhibit a similar relationship, and in both cases the price level appears to be determined by seigniorage or fiscal deficit, not the other way round; (c) the role of seigniorage in the inflation process may be declining over time, particularly in recent years, even though the impact of fiscal deficit on inflation through aggregate demand might have increased; (d) one percentage point increase in the level of fiscal deficit is estimated to cause as much as 0.25 percentage point increase in WPI; and (e) as per the analysis of short term dynamics through which fiscal deficit may get transmitted to inflation, fiscal deficit appears to have a positive impact on inflation even in the short-run, though modest, and the speed of adjustment after a shock may also be slowing down over time. These empirical findings suggest that while the fiscal stance in India was appropriate in the context of the economic slowdown that followed in response to the global crisis, it is a medium-term potential source of risk inflation. This possibility, in turn, highlights the significance of return to fiscal consolidation path at the earliest, with an emphasis on the quality of fiscal adjustment, driven by rationalization of expenditure rather than depending on revenue buoyancy from stronger durable

recovery in growth.

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