Cost and Benefit of Disinflation Policy in India

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The Reserve Bank of India's monetary policy stance is based on assertions that there is no trade-off between inflation and growth and that disinflation will result in more growth. This note examines recent empirical evidence on the direction of causality for growth and inflation, and the short-run costs and long-run benefits of a deliberate policy of disinflation. There is no support for the first assertion because a regular trade-off does exist in India, imposing substantial short-run costs for deliberate disinflation. There is strong evidence for causality from growth to inflation, but the reverse cannot be ruled out. Under such conditions, the RBI should hold nominal growth of money supply and allow supply-side policies by the government to bring down inflation.

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The governor of the Reserve Bank of India (RBI) made some categorical statements in an interview published on 31 January 2014 (*Mint*). He emphatically said that there was hardly any trade-off between growth and inflation in India now and that by bringing down inflation, we could achieve more growth. Both these assertions are the basis for the current monetary policy stance. The first one denies the existence of a theoretically expected positive relationship between inflation and growth of real gross domestic product (GDP) in the short run in India, while the second one postulates a unidirectional inverse causal relationship from inflation to growth. We need to examine their validity in the light of the available empirical evidence.

In the Indian context, the first serious effort at estimating the inflation-unemployment trade-off in the industrial sector was by Rangarajan (1983), who came to the conclusion that there was no trade-off between inflation and unemployment. Applying the extended Phillips curve framework for the whole economy, Dholakia (1990) also found horizontal short-run aggregate supply in India. These studies were based largely on the period of administered prices, before market-oriented reforms. More recent studies by Paul (2009) and Dholakia and Sapre (2012), however, find a theoretically expected regular (positive) short-run trade-off between inflation and growth in India. Paul (2009) found a short-run Phillips curve for the industrial sector when he adjusted for external shocks such as droughts and oil prices. Dholakia and Sapre (2012) found an upward sloping short-run aggregate supply curve for the whole economy when they incorporated the speed of adjustment by considering an extended Phillips curve.

Several studies from the RBI estimate the Sacrifice Ratio for the Indian economy to be around +2, implying that a 1 percentage point deliberate reduction in the inflation rate on a permanent basis would require a sacrifice of about 2% of potential output (RBI 2002; Kapur and Patra 2003; Mitra et al 2014). Thus, more recent studies on India clearly provide empirical evidence in favour of a regular trade-off between inflation and growth of output. However, as the RBI *Annual Report of 2010-11* suggests, it has subscribed to the idea of a threshold inflation rate, implying a backward-bending dynamic aggregate supply curve. Several research studies, largely from the RBI, addressing this issue (Mohanty et al 2011; Singh 2010; Samantaraya and Prasad 2001; Kannan and Joshi 1998; Vasudevan et al 1998) have provided the basis for the RBI governor's assertions that form the basis for the current monetary policy stance.

Since the issue of the trade-off between inflation and growth is of critical importance for policy, we examine it empirically from various angles to gain a better understanding of it. In the next section, we critically examine arguments about the threshold inflation rate and consider the issue of the direction of causality between growth and inflation. The following section presents estimates of the Sacrifice Ratio in the Indian economy with up-to-date data. The next section deals with estimates of the benefits of disinflation in terms of output growth in India in the recent past. The final section concludes with some policy implications.

1 Direction of Causality

The traditional macroeconomic model of aggregate demand and aggregate supply has the general price level and output as basic endogenous variables. They are determined simultaneously in the equilibrium within the system. On the aggregate demand side, the price level affects the output through net exports and real balances, given the nominal money supply. On the aggregate supply side, however, the output gap derived

from the employment gap affects the price level. In the dynamic form, the dynamic aggregate demand (DAD) and the dynamic aggregate supply (DAS) functions provide the short-run equilibrium rate of the inflation and output gap. All the above mentioned studies on the threshold inflation rate and backward-bending DAS curve suffer from the limitation of assuming a unidirectional causality from inflation to growth without recognising their simultaneous determination under equilibrium.

Moreover, the micro-foundation of a backward-bending DAS requires a large number of commodities with substantial self-consumption satisfying very stringent conditions in terms of substitution, income, and supply elasticities (Kothari 1998; Dholakia 1999). Further, as a basic course in economics tells us, the existence of any backward-bending supply curve has to be justified by establishing that the slope of the corresponding demand curve is numerically less than the supply curve for stable equilibrium. Otherwise, it may lead to a perverse implication of a tight money policy resulting in higher inflation and lower growth even with a downward-sloping DAS curve. None of the studies on threshold inflation attempts to establish this basic stability condition. Therefore, such studies on threshold inflation represent a statistical exercise without any rigorous theoretical basis.

Since we cannot conclusively establish the direction of causality between observed inflation and growth on a priori grounds, we investigate the direction of causality as loosely established by the precedence test. Popularly used alternative methods of testing precedence or causality are the Granger causality test and the error correction model (ECM). We apply both these methods using annual growth rates of GDP at 2004-05 prices and inflation rates. Ideally, inflation should be measured by the GDP deflator, but since the RBI uses the wholesale price index (WPI) and pleads for using the consumer price index (CPI), we may use all the three alternative measures for the inflation rate. For these methods to work, we need at least 35 to 40 observations, and we therefore take the period from 1970-71 to 2012-13 for

estimation. The data are obtained from the RBI (2013).

The Granger causality test requires testing two null hypotheses such that (i) Ho: inflation (π) does not Granger cause growth (G) with the alternative hypothesis H_A: inflation Granger causes growth; and (ii) Ho: growth (G) does not Granger cause inflation (π) with the alternative hypothesis H_A: growth Granger causes inflation. This test is carried out for three alternative measures of inflation – πd for deflator-based inflation; πw for WPI-based inflation; and πc for CPI-based inflation. The results are presented in

Table 1: Results of Granger Causality Test on Growth and Alternative Measures of Inflation

	F-Statistic	p-value
$\Pi d \rightarrow G$	2.65	0.065
$G \rightarrow \Pi d$	0.99	0.409
$\Pi w \rightarrow G$	2.89	0.051
$G \rightarrow \Pi w$	1.36	0.273
$\Pi c \rightarrow G$	2.29	0.097
$G \rightarrow \Pi c$	1.76	0.175

None of the values are significant at 5% level.

Table 1. It can be seen that in each of the three sets of pairs, the null hypothesis cannot be rejected. Thus, according to the Granger causality test, neither does inflation cause growth nor growth cause inflation in India.

The second method of the ECM is more recent and takes care of concerns about unit root and cointegration of the two

series and estimates the model in the first difference with lags of both variables. Again we consider both the alternative directions of causation, considering the three alternative measures of inflation. The results are in Table 2.

It can be seen that the overall fit is very good in all the six cases being significant at the 1% level. Moreover, the coefficient of the lagged estimated error term ($\hat{E}_{t-1}$) fulfils the constraints of being negative and less than unity in all the six models. However, it is not significant at the 1% level in all the three models with change in growth as a dependent variable, whereas it is significant at the 1% level in all the three models with change in inflation rate as a dependent variable. A detailed look at the statistical significance of lagged inflation and growth in the respective models also corroborates this. Thus, the empirical evidence suggests that, on margin, it is the growth of real GDP that affects (or causes) inflation and not vice versa, although if we accept less stringent criteria at the 5% level of significance, the causality appears to be bidirectional. The assumption behind all threshold inflation studies of inflation unidirectionally causing growth does not get empirical support in our findings.

The ECM method also gives us estimates of the short-run and long-run

Table 2: Results of Error Correction Models on Annual Growth and Inflation

Dependent Variable:	Change in Growth of Real GDP (ΔG)			Change in Inflation Rate ($\Delta\pi$)		
Measures of Inflation:	GDP Deflator	WPI	CPI	GDP Deflator	WPI	CPI
Constant	-0.136	-0.815	-0.689	2.002	2.332	0.204
$\Delta\pi_t$	-0.405*	-0.251**	-0.129	–	–	–
$\Delta\pi_{t-1}$	–	–	–	0.090	0.226	0.135
$\Delta\pi_{t-2}$	–	–	–	0.045	0.031	0.015
ΔG	–	–	–	-0.804*	-0.764**	-0.351
ΔG_{t-1}	-0.230	-0.304	-0.349	–	–	–
ΔG_{t-2}	-0.224	-0.240	-0.219	–	–	–
π_{t-1}	0.211	0.208	0.168	–	–	--
π_{t-2}	-0.224	-0.201	-0.178	–	–	–
π_{t-3}	0.064	0.127	0.131	–	–	–
G_{t-1}	–	–	–	-0.593**	-0.644	-0.799**
G_{t-2}	–	–	–	0.142	0.079	0.307
G_{t-3}	–	–	–	0.141	0.148	0.471
$\hat{E}_{t-1}$	-0.530**	-0.539**	-0.593**	-0.639*	-0.844*	-0.713*
Adj R^2	0.688*	0.646*	0.543*	0.514*	0.508*	0.454*
p-value for F-statistic	0.000	0.000	0.000	0.000	0.000	0.000
Derbin's test p-value	0.190	0.132	0.208	0.399	0.001	0.025
Breusch-Godfray LM test p-value	0.147	0.098	0.161	0.343	0.001	0.018
Short-run effects	+0.051	+0.134	+0.120	-0.311	-0.418	-0.020
Long-run effects	+0.035	+0.087	+0.077	-0.359	-0.562	-0.024

* significant at 1%; ** significant at 5%; G = growth of real GDP; π = inflation rate; E = error term; Last two rows provide p-values of alternative tests for H$_0$ = no serial correlation.

effects of the independent variable on the dependent variable. It is interesting to see that both the methods differ in the direction of the effect of the independent variable on the dependent variable and that the magnitude of the effect differs as per the measure of inflation selected. If we take inflation as the cause and output growth as the effect, our estimates suggest that a 1 percentage point reduction in inflation would cause a reduction in output growth by 0.05 to 0.13 percentage points in the short run and 0.04 to 0.09 percentage points in the long run. Although these estimates are not very reliable and significant statistically, we mention them to show that a reduction in inflation per se may be associated with a decrease in growth rather than an increase in growth, both in the short run and the long run, which is contrary to what the RBI governor asserted.[1]

On the other hand, if we consider output growth as the cause and inflation as the effect, our estimates suggest that a 1 percentage point increase in growth would lead to a reduction in inflation by 0.31 to 0.42 percentage points in the short run and 0.36 to 0.56 percentage points in the long run. It is, however, not likely to affect CPI inflation by more than 0.02 percentage points.

Our results are quite consistent with the widespread feeling among academics and business analysts that deflator or WPI-based inflation in India is because of supply-side problems and not demand-side problems. If output increases and demand remains the same, inflation would immediately fall and the fall would be sharper in the long run. On the contrary, if supply remains the same and demand is made to fall, say by a tight money policy, both prices and output would fall in the short run, leading to avoidable costs on the economy. We now turn to the short run costs of deliberate disinflation through monetary policy on the economy.

2 Cost of Disinflation

Providing a booster dose in terms of aggregate demand policies to emerge out of an external adverse supply shock is by now a well-recognised remedy. While this would lead to speedy recovery of output growth, it would raise the inflation rate beyond the initial level reached through the supply shock. This would create a problem of high inflation over the long period in developed industrialised countries because their potential output growth is low in the range of 2% to 3% annually. It may not create the problem to the same extent in a rapidly growing developing economy where the potential output grows at 8% to 9% annually, as argued by Dholakia (2014). However, if the central bank enthusiastically pursues a tight money policy to bring down the inflation rate, it cannot be painless. Such a disinflation policy will involve short-run costs in terms of foregone output and employment. The magnitude of such costs will depend on the slope of the aggregate supply curve. The flatter the aggregate supply curve, the higher the short-run cost of disinflation. In this context, we should note the findings by Azad and Das (2013) that several southeast Asian developing economies, including India, have a flat Phillips curve.

Such short-run costs of disinflation policy are crystallised in the concept of the Sacrifice Ratio. Very few studies are available on India estimating the Sacrifice Ratio. RBI (2002) and Kapur and Patra (2003) were efforts made more than a decade ago. Dholakia (2014) and Mitra et al (2014) are the most recent efforts in this direction. The first two studies consider the whole time series containing all different episodes of inflation and disinflation together to provide a single average estimate of the Sacrifice Ratio, largely based on a regression approach. While RBI (2002) estimates +2 for the Sacrifice Ratio, Kapur and Patra (2003) provide a range of single estimates for it depending on the measure of inflation, time period, and specification of aggregate supply function. The range of estimates given by them is quite large, from +0.3 to +4.7, with the average considered around +2. Estimates by Dholakia (2014) based on the direct identification of disinflation episodes from 1980-81 to 1983-84 and from 1998-99 to 2003-04 are +2.11 and +1.84, respectively. Similarly, Mitra et al (2014) find the average Sacrifice Ratio to be 2.8 during the expansionary phase and 2.3 for the contractionary phase of monetary policy. However, it is important to recognise that all these estimates are based on total effects, with several other relevant factors not being held constant. As a result, they do not present strict estimates of the short-run costs of the RBI's disinflation policy.

Dholakia (2014) has attempted to overcome this limitation by considering the simultaneous equation framework of the basic macro-dynamic model. His estimate of the Sacrifice Ratio attributed to monetary policy alone is about +1.2 in the short run and +0.9 in the long run. These estimates imply that when the RBI tightens monetary growth to reduce the inflation rate by 1 percentage point, the economy sacrifices potential output of about 1.2% in the short run and 0.9% in the long run. Thus, there is sufficient empirical evidence to show that there is a non-trivial trade-off between inflation and growth in India, which is specifically attributable to the RBI's policy actions. If so, the RBI's policy to disinflate can be justified only if the benefits of disinflation outweigh the costs.

3 Benefits of Disinflation

Society benefits from disinflation on several counts. Price stability in the sense of low inflation would reduce risks in various contracts, investment decisions, business planning, and exchange rate

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movements. However, all this would ultimately result in increased output and growth in the economy in the long run. This has to be the logic on which people argue for and prefer less inflation to higher inflation, though the benefits of disinflation necessarily accrue in the long run whereas the costs of potential output loss and slowdown start almost immediately and continue in the medium term. Thus, the RBI governor's statement has to be interpreted to mean that the current high inflation stands in the way of achieving high growth in the long run. Since he has ruled out any short-run trade-off in terms of sacrifice of output growth to achieve disinflation, the choice for the RBI seems to be clear. Unfortunately, one cannot rule out a short-run trade-off between inflation and growth based on recent evidence, as discussed above.

Regarding the benefits of disinflation, there is controversy among scholars. Fischer (1993) and Barro (1995) are of the opinion that moderate inflation of around 10% or less may not adversely impact the long-run growth of the economy. On the contrary, several studies such as Chopra (1988), Motley (1994), and Chaturvedi et al (2009) have found empirical evidence in favour of inflation affecting growth negatively. Since most of these studies are dated by now, we

Table 3: Annual Rates of Growth of Real GDP and Inflation in India (in %)

Years	Growth of Real GDP	Inflation Rate based on GDP Deflator	Inflation Rate based on WPI	Inflation Rate based on CPI-IW
1995-96	7.2882	9.1287	7.9929	10.2113
1996-97	7.9747	7.7827	4.6053	9.2652
1997-98	4.3016	6.6157	4.4025	7.0175
1998-99	6.6834	8.0536	5.9488	13.1148
1999-2000	8.0043	3.1013	3.2694	3.3816
2000-01	4.1482	3.3823	7.1576	3.7383
2001-02	5.3857	3.1664	3.5967	4.2793
2002-03	3.8778	3.7286	3.4098	4.1037
2003-04	7.9665	3.7632	5.4556	3.7344
2004-05	7.0509	5.7098	6.4810	4.0000
2005-06	9.4771	4.2246	4.4667	4.2308
2006-07	9.5691	6.4155	6.5890	6.8266
2007-08	9.3221	6.0226	4.7373	6.4000
2008-09	6.7248	8.4525	8.0529	9.0226
2009-10	8.5947	6.0686	3.8090	12.4138
2010-11	9.3200	8.8154	9.5617	10.4294
2011-12	6.2100	8.2307	8.9366	8.3333
2012-13	4.9938	7.8712	7.3548	16.4615

Source: RBI (2013).

need to examine more recent data to get better insights. Table 3 provides annual rates of inflation and growth of real GDP for the last 18 years, which may not be sufficient to carry out any rigorous statistical exercise, but good enough to get some broad trends.[2]

A close look at the table reveals an interesting lagged relationship between annual inflation rates and GDP growth rates in the recent past. It takes almost four to five years for persistent inflation rates to affect growth rates in the negative direction. A lag of four to five years in the effects of changes in long-run inflation to affect real output growth appears consistent in the light of the finding of Dholakia and Sapre (2012) that four years is the time considered effectively by people to form an inflationary expectation in India. Labour market imperfections, long-term wage contracts, underdeveloped and less-efficient institutions, and administered prices in important energy products and raw materials may contribute to such a sluggish adjustment.

We can see the broad lagged relationship by observing from Table 3 that from 1995-96 to 1998-99, inflation rates were high, averaging 7.9% for the GDP deflator, 5.7% for the WPI, and 9.9% for the CPI, resulting in low growth rates averaging 5.6% from 1998-99 to 2002-03. Subsequently when inflation rates fell sharply from 1999-2000 to 2003-04, averaging 3.4% for the GDP deflator, 3.9% for the WPI, and 3.8% for the CPI, the growth of real GDP increased sharply, averaging 8.7% from 2003-04 to 2007-08. Inflation began rising after 2006-07 and we have been experiencing a serious slowdown in GDP growth since 2011. Thus, inflation on the whole seems to affect GDP growth adversely in the long run in India. Disinflation, therefore, is expected to yield benefits in terms of higher growth after four to five years. The extent of benefits of 1 percentage point disinflation seems to be in the range of gaining 0.5 to 1.7 percentage points in GDP growth after four to five years. If we ignore WPI-based inflation, as the current thinking in the RBI seems to suggest, growth benefits would be at best 0.5 to 0.7 percentage points per 1 percentage point of disinflation.

It may, however, be noted that these are very loose estimates and represent the upper limit of the benefits of disinflation since no other relevant factors are held constant. We are considering them only because no other rigorously derived estimates exist for the Indian economy in recent years.

4 Concluding Remarks

It is clear from the discussion that the RBI governor's assertion of there being no serious trade-off between inflation and growth in the country does not get any support from recent empirical evidence. On the contrary, deliberate disinflation would impose a sizeable immediate cost of loss of output on the system. His second assertion on the direction of causality also does not have any clear supporting evidence, though casual observation of recent trends does indicate that disinflation may lead to some gain in GDP growth after four to five years.

Before pushing the agenda of cutting inflation by following a tight money policy, the RBI needs to carefully consider the costs and benefits of such deliberate disinflation in terms of output and growth. Very broad and conservative estimates of the costs and benefits suggest that 1 percentage point of deliberate disinflation may entail about 1% loss of potential output over the short to medium term, and a gain of about 0.5 percentage points in growth after four to five years. Without discounting, it would, therefore, take at least two more years to recover the loss, assuming normal times. If, however, during these six to seven years, the economy receives another shock, the recovery of the loss may be prolonged. It is important to note that the cost of 1% of potential output in India is related to about 0.2% of employment loss and an increase of about 0.6% in the proportion of poverty, as argued by Dholakia (2014).[3]

As discussed in Section II, inflation appears to be a supply-side problem in India and the causation is from growth to inflation with an inverse relationship. Under these conditions, the government should promptly address supply constraints, allow full utilisation of already created capacity, and push growth

wherever possible to create a positive business climate. The RBI will then see inflation falling sharply if it holds the nominal growth of money supply and creates an environment of policy certainty, rather than one of policy surprises and uncertainty.

NOTES

1 It may be pointed out that a relatively recent study by Chaturvedi et al (2009) taking selected countries from Asia, including India, came to the conclusion that the causality is from inflation to growth and not bidirectional. However, their study period was from 1989 to 2004 and the experience after 2004 in India is very different.

2 If a longer time duration is considered for rigorous analysis, Section II provides the results for the tests of direction of causality besides providing the quantitative estimates of short-run and long-run impacts of the causal variable on the dependent variable. Since these estimates are not statistically significant, and since they do not support the arguments for any long-run benefits of disinflation per se, we consider the less rigorous method of observing broad trends for the sake of conservatism.

3 It should be noted that poverty proportion would decline by 0.6%, that is, 0.006*31% and not by 0.6 percentage points. These figures are based on elasticities calculated from the two end-points of 1993-94 and 2011-12 in National Sample Surveys on the employment-unemployment situation and consumer expenditures.

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