

# Indian Experience of Inflation

## A Review of the Evolving Process

*An assessment of the inflation record of India reveals that inflation increased from the 1970s onwards before moderating in the mid-1990s. Supply shocks, both due to a setback in agricultural production and international oil prices, and monetary expansion due to automatic monetisation of the fiscal deficit were the major contributory factors to higher inflation. Reform initiatives since the early 1990s towards developing a broad-based financial market, particularly activation of the government securities and forex markets coupled with improved monetary-fiscal interface enabled better monetary management since the second half of the 1990s. Moreover, judicious supply management through buffer stocks of foodgrains and import of sensitive commodities containing the adverse impact of supply shocks also played an important role. It can also be noted that notwithstanding the unprecedented size of external capital flows, monetary management was effective in ensuring a reduction in inflation and lowering expectations.*

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High inflation is widely believed to impede economic growth and is inimical to social justice, thereby lending credence to emergence of low and stable inflation as a key objective of economic policy. A noteworthy development in recent years is the reduction in inflation across a number of countries, irrespective of their stages of development. Like other economies, India too witnessed a rise in inflation during the 1970s and 1980s reflecting a mix of expansionary fiscal policy, accommodative monetary policy and supply shocks. In the aftermath of the balance of payments difficulties, inflation rose further during the first half of the 1990s. An improved monetary-fiscal interface and other reforms imparted greater flexibility to the Reserve Bank of India (RBI) in its monetary management since the mid-1990s, even though it had to contend with large capital flows. Equipped with abundant food stocks and foreign exchange reserves, the RBI has been able to contain inflation. Significant success in reining in inflation has helped to lower inflation expectations in the recent period.

Against the above backdrop, the organisation of this paper is as follows. Section I briefly presents the concept and measurement of inflation in India and stylised facts about inflation in India in the past five and a half decades are provided in Section II. Key issues related to inflation in India are highlighted in Section III and finally, Section IV concludes.

### I Concept and Measurement

Inflation is the rate of change of general price level, which is computed as the weighted average of prices of individual goods and services. Assignment of weights for constructing the general price index normally reflects the relative importance of the goods and services included. Thus, the general price index captures the overall magnitude of prices of the goods and services. In India, there are mainly three types of measures of general price level namely, (i) wholesale price index (WPI), (ii) consumer price index (CPI) and (iii) implicit GDP deflator. The WPI is available

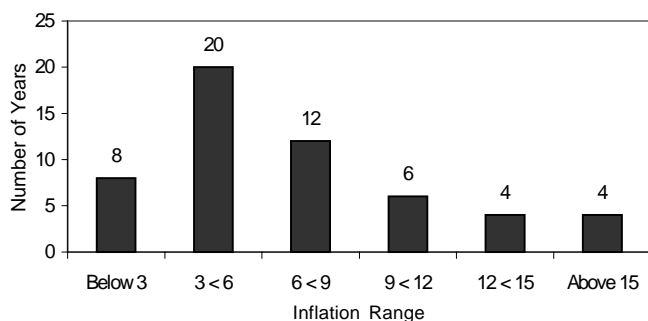
for all tradable goods including for various groups, subgroups and individual commodities. CPI reflects the cost of living conditions of a homogeneous group of consumers for which it is constructed and based on retail prices of commodities generally consumed by the group. Currently, four categories of CPI are available in India. They are CPI for industrial workers (CPI-IW), CPI for agricultural labours (CPI-AL), CPI for rural labours (CPI-RL) and CPI for urban non-manual employees (CPI-UE). Among the four, CPI-IW is very popular with better coverage whereas CPI-AL and CPI-UE are designed to measure the impact of inflation on rural and urban poverty, respectively [Reddy 1999]. The third measure of inflation, GDP deflator is derived from the national accounts as a ratio of GDP at current prices to GDP at constant prices.

It can be observed from Table 1 that, during the period 1970 to 2004, the average inflation depicted by either of the indices viz, WPI, CPI or the GDP deflator was close to 8 per cent. The correlation coefficient between WPI and GDP deflator at around 0.9 implies a close association between the two. However, the association between CPI and WPI has been weaker in the 1980s and 1990s.

It is important to note that each of the price indices has certain advantages and disadvantages to guide the policy responses as part of the price stabilisation exercise [Reddy 1999]. In policy and academic discussions in India, the selection of the price index is heavily tilted in favour of the WPI. Factors such as a wide coverage of commodities, high frequency (weekly basis), data availability with a lag of just two weeks contributed towards emergence of WPI as the most suitable general price index. Nevertheless, it suffers from excluding services and non-tradeable commodities. The discussions on inflation in the following sections will be largely in terms of "headline inflation" based on the WPI.

For the recent period, group-wise levels of inflation based on WPI along with their respective weights are presented in Table 2. Manufactured commodities with a weight of 63.75 per cent by and large dominate the movement of overall WPI.

**Graph 1: Frequency Distribution of WPI Inflation**



## II

### A Brief Sojourn into Inflation History

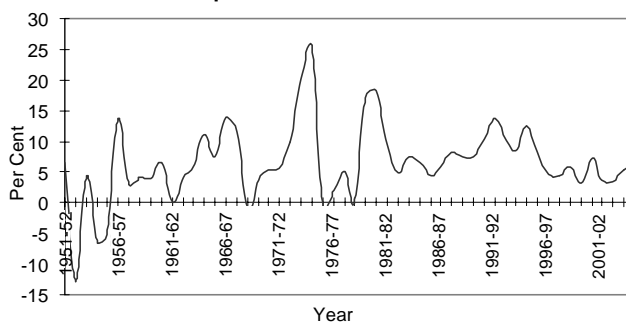
India has been traditionally a low inflation country. Barring a few years of high inflation driven by supply shocks, inflation has remained benign throughout the period since independence. During the period 1951-52 to 2004-05, in 28 years inflation was below 6 per cent and in 40 years it was below 9 per cent. There are only four years in the entire period, when inflation was above 15 per cent. These years of high inflation basically reflect the impact of supply shocks, primarily due to setbacks in domestic agricultural production and external oil price hikes. The average inflation during 1951-2005 is estimated to be 6.5 per cent. Graph 1 depicts the frequency distribution of inflation in India across different ranges during the period 1951-52 to 2004-05. The modal range of inflation in the entire period consists of 3 per cent to 6 per cent. Furthermore, out of 54 years, 32 years are placed in the range of 3 per cent to 9 per cent of inflation.

Looking at the trend of inflation in India from a historical perspective, Graph 2 depicts the inflation rates and Table 3 provides the average inflation trend on a five-yearly basis since 1951-52. The discussion is carried out by dividing the entire period into two phases, viz, (i) the pre-reform period, and (ii) the post-reform period. The pre-reform period extends up to 1991-92, the year witnessing severe economic crisis and the post-reform period covers the years from 1992-93 to the recent period.

#### Pre-reform Period (1951-52 to 1991-92)

In the pre-reform period, inflation had accelerated during the 1960s partly induced by the two wars in 1962 and 1965 and the crop failure of 1965-66 when agricultural production fell by more than 16 per cent. It became a matter of serious concern when it breached 20 per cent in the early 1970s led by a setback in agricultural production and an unprecedented hike in international oil prices. Prior to that, the 1950s witnessed average inflation of less than 2 per cent, but with considerable variation in yearly inflation. The percentage change in prices varied from a negative value of 12.8 per cent in 1952-53 to the highest inflation of 13.8 per cent in 1956-57. The deflation of 1952-53 is mainly attributed to the higher agricultural production in that year, whereas high inflation of 1956-57 was mainly due to demand pressures, particularly investment demand in the light of the thrust on industrialisation in the second five-year plan. During the 1950s, two more years viz, 1954-55 (-6.71 per cent) and 1955-56 (-5.23 per cent) also witnessed negative price changes. Thus, notwithstanding low average inflation during 1950s, there was considerable volatility in the price movement. However, inflation was

**Graph 2: WPI Inflation in India**



in the range of 3 to 7 per cent during the last four years of this decade (1957-58 to 1960-61).

In the following decade, average inflation increased to 6.2 per cent. Price changes were the lowest at a negative of 0.91 per cent in 1968-69 as a result of bumper agricultural production in the previous year. It was highest at 13.95 per cent in 1966-67, followed by inflation of 11.56 per cent in the following year. High inflation during these two years can largely be attributed to impact of the Pakistan war in 1965 and the famine experienced

**Table 1: Alternative Indicators of Inflation in India**  
(Per cent)

Period	WPI	CPI	GDPD
1	2	3	4
<i>Average Inflation Rate</i>			
1970-2004	8.0	8.2	7.8
<i>Sub-periods</i>			
1970-80	9.0	7.7	7.7
1980-90	8.0	9.0	8.7
1990-2000	8.1	9.5	8.7
<i>Standard Deviation</i>			
1970-2004	5.6	5.6	4.2
<i>Sub-periods</i>			
1970-80	9.0	9.5	6.8
1980-90	3.9	2.4	1.4
1990-2000	3.6	3.0	2.6
	Correlation between WPI and CPI	Correlation between WPI and GDP	Correlation between CPI and GDP
1970-2004	0.83	0.88	0.81
<i>Sub-periods</i>			
1970-80	0.93	0.93	0.81
1980-90	0.59	0.84	0.64
1990-2000	0.63	0.88	0.78

Notes: WPI: Wholesale price inflation. CPI: Consumer price inflation for industrial workers. GDPD: GDP deflator inflation.

Source: Report on Currency and Finance, 2003-04, RBI.

**Table 2: WPI Inflation (Annual Average) since 1991-92**  
(Per cent)

Period	All Commodities Weight: 100	Primary Weight: 22.03	Fuel Weight: 14.23	Manufactured Weight: 63.75
1991-92 to 1995-96	10.6	11.3	11.3	10.1
1996-97 to 2000-01	5.1	5.4	13.0	3.1
2001-02 to 2004-05	4.7	3.8	7.8	4.1
2004-05 (April 1 to July 3, 2004)	7.1	3.9	10.3	7.2
2005-06 (April 1 to July 2, 2005)	4.1	0.1	10.5	3.3

Sources: (1) Economic Survey, 2004-05, Government of India, New Delhi.

(2) Macroeconomic and Monetary Developments: First Quarterly Review 2005-06, Reserve Bank of India, Mumbai.

during 1965-66. During this decade, average inflation was higher vis-à-vis the previous decade, but the variation subsided.

The decade of the 1970s stands out as the most tumultuous period in India in terms of inflationary uncertainty, witnessing very high inflation mainly driven by the supply shocks emanating from agricultural and oil prices. For the first time since independence, inflation overshot the level of 20 per cent in 1973-74 (20.2 per cent) and 1974-75 (25.2 per cent). Reflecting the first oil shock of 1973, the import price deflator (measured as year-on-year changes in the unit value index of imports) surged by 43.0 per cent and 72.8 per cent during 1973-74 and 1974-75, respectively. In line with the sharp increase in average international crude oil prices by over 250 per cent in 1974, domestic fuel prices increased sharply from an annual average of about 4.7 per cent during the three years preceding the first oil crisis to about 26.5 per cent on average during the three years beginning 1973-74. Referring to the severity in inflation, particularly that of agricultural commodities in 1972-73 and 1973-74, the *RBI Annual Report 1974-75* observed that “even the seasonal decline in prices, particularly agricultural commodity prices, to which the Indian economy is traditionally accustomed, did not take place during the last two years”. A hike in oil prices and poor agricultural production led to reappearance of high inflation in 1979-80 (17.1 per cent) and 1980-81 (18.2 per cent).

Making a comparison of the two events of high inflation in the 1970s, the *RBI Annual Report, 1979-80* observed that, “Agricultural supplies were affected in both years; but while 1973-74 had been preceded by successive poor harvests and sizeable food imports became necessary, in 1979 substantial and readily available food stocks served to mitigate the scarcity. Hence, the influence on the price level of primary commodities in general and of food articles in particular was lower in 1979-80. Although the impact of the external influence of oil price hikes was experienced even during 1973-74, it was of far greater significance in the price rise in 1979-80.” Thus, higher fuel prices and agricultural commodity prices got reflected in overall inflation and the average inflation during the 1970s is estimated to be 10.3 per cent. It can also be noted that demand factors in terms of a sharp increases in money supply vis-à-vis output growth also aggravated the inflationary problem in 1970s. While the average output growth of GDP during this period stood at 3.2 per cent, the average growth of broad money (M3) at 17.7 per cent added to demand pressures.

Demand pressures emanating from an expansionary fiscal policy and its monetisation, coupled with intermittent supply shocks, continued inflationary pressure during the 1980s but its severity was lower than the previous decade. Inflation averaged 7.2 per cent per annum during the 1980s with a noteworthy reduction in inflation variability. Inflation varied between 4.4 per cent in 1985-86 and 10.1 per cent in 1990-91. The fiscal deficit of the centre widened from 3.8 per cent of GDP during the 1970s to 6.8 per cent during the 1980s. Close to one-third of this burden was borne by the RBI during the 1980s (close to a quarter during the 1970s). Rapid expansion of RBI credit to the government led to an acceleration in reserve money growth. However, broad money growth was contained at 16.9 per cent with increases in cash reserve requirements.

The experience of the 1980s has a noteworthy contribution in highlighting the inflation-fiscal-monetary nexus. Empirical evidence confirmed the adverse effects of excessive monetary expansion, emanating from the monetisation of the fiscal deficit,

on inflation [Rangarajan and Arif 1990; Jadhav and Singh 1990]. Because of higher elasticity of government expenditure with respect to inflation relative to that of government receipts, higher inflation meant an enlarged fiscal deficit which, in turn, necessitated increased monetisation. This led to a further increase in inflation, starting a vicious circle of high inflation, high deficits and high monetisation.

### *Post-Reform Period (since 1992-93)*

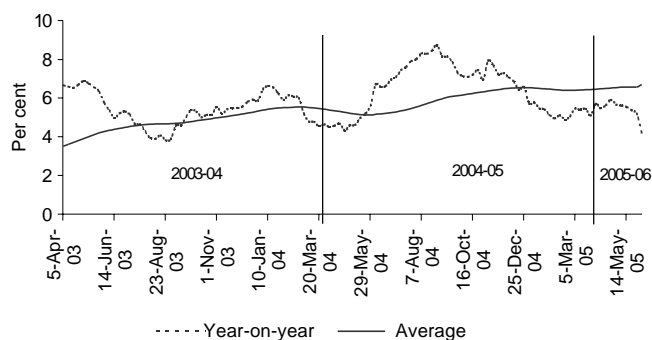
The Indian economy underwent a severe economic crisis in 1991 mainly triggered by a balance of payment problem and manifestation of underlying imbalances emanating from an adverse impact of high fiscal and current account deficits of the 1980s. The year 1991-92 witnessed low economic growth of 1.3 per cent and foreign currency assets at around US \$ 1 billion were barely sufficient to finance two weeks of imports in July 1991. During the crisis year of 1991-92, inflation was 13.7 per cent. As a response to this crisis, an entire gamut of reforms covering external, industrial and financial sectors were introduced and the reform initiatives significantly contributed to a moderation of inflation. In terms of inflationary behaviour, the post-reform period can be distinguished into two sub-periods. The average inflation was around 9.8 per cent during the period 1992-96, which came down by half (4.9 per cent) during the period 1996-2005.

As part of the macroeconomic stabilisation programme and structural reforms undertaken in the aftermath of the crisis, the exchange rate depreciated substantially. Between end-March 1991 and end-March 1992, the Indian rupee depreciated by nearly 37 per cent with respect to the US dollar. Notwithstanding the limited openness of the Indian economy, this order of depreciation added to inflationary pressures during the first half of the 1990s [RBI 2004]. Hikes in procurement prices as well as supply-demand imbalances in essential commodities like pulses, oilseeds and edibles oils further added to inflation. Lower foreign exchange reserves in the early 1990s constrained the import option for meeting the demand gaps. The sustained rise in fuel prices at a double-digit rate (of about 13 per cent) in the first half of the 1990s had its impact on inflation, not only directly but also through the second round effects. Furthermore, a phased opening up of the Indian economy also added to inflationary pressures. This emanated from large capital inflows between 1993-94 and 1994-95. Despite a number of steps to sterilise capital flows, monetary expansion remained well-above the desired trajectory. Due to the combined effect of all these factors, a sharp increase in inflation was witnessed during the period 1992-96.

**Table 3: WPI Inflation in India: Periodic Averages**  
(Per cent)

Period 1	Average Inflation 2	Range 3
1951-56	-2.75	-12.78 to 6.51
1956-61	6.28	3.03 to 13.79
1961-66	5.71	0.0 to 11.1
1966-71	6.73	-0.91 to 13.95
1971-76	11.98	-1.1 to 25.2
1976-81	8.52	0.0 to 18.2
1981-86	6.52	4.4 to 9.3
1986-91	7.84	5.8 to 10.3
1991-96	10.55	8.1 to 13.7
1996-2001	5.07	3.3 to 7.2
2001-05	4.70	3.4 to 6.4

**Graph 3: Annual Wholesale Price Inflation in Recent Period**



Source: RBI Annual Report, 2004-05, RBI.

Despite substantial capital inflows and high fiscal deficits in the period since 1996-97, inflation could be controlled. Average inflation came down to 4.9 per cent during the period 1996-2005. The range of inflation varied from a low of 3.3 per cent in 1999-2000 to a high of 7.2 per cent in 2000-01. During this period, inflation has had a distinct decelerating trend. In fact, even in 2002-03 when the country faced a severe drought, inflation remained moderate at 3.4 per cent. Moreover, a 2002-03 was also marked by the simultaneous impact of several other adverse developments such as border tensions and high international crude oil prices. As the *RBI Annual Report, 2002-03* observed, "in the past, the occurrence of anyone of the shocks experienced in 2002-03 in isolation had produced a sharp loss of growth, higher inflation, balance of payments difficulties, and even financial instability in the economy. Seen in this context, the performance of the economy during 2002-03 demonstrates the developing resilience of the Indian economy. This suggests that perseverance with structural reforms, despite the drag of slower growth in the second half of the 1990s, has helped to relatively shock-proof the economy and sustain a stable macroeconomic environment".

A number of factors explain the lowering of inflation and inflation expectations since mid-1990s as discussed in detail in RBI (2004). First, the RBI could largely contain money supply to levels consistent with its indicative inflation projections. This was despite a large order of capital inflows from abroad and the consequent build-up of reserves. Improved monetary-fiscal interface and reforms in the government securities market enabled a lower degree of monetisation of fiscal deficits. In particular, market-determined yields encouraged banks to willingly invest in government securities and reduced the pressure on the RBI to finance the government. The expansionary effect of large forex purchases was sterilised effectively by resorting to a number of steps, especially open market operations and a judicious use of the Liquidity Adjustment Facility (LAF). Furthermore, there is a view attributing the regime of lower inflation to liberalisation of both internal and external trade and continual reduction and rationalisation of taxes leading to greater competition and cost efficiency [Government of India 2005].

In the recent period, supply-side pressures mainly dominated the inflation outcome of 2004-05. A hardening of international oil prices as well as domestic food prices responding to a deficient monsoon in the previous year fuelled a spurt in inflation in India during the first half of 2004-05 (Graph 3 and Table 4). Inflation began to ease in the second half of 2004-05 under the impact of a combination of fiscal and monetary measures and waning of the impact of south-west monsoon [RBI 2005].

Monetary tightening measures included increasing CRR twice by 25 basis points each (to 4.75 per cent in September 18, 2005 and then to 5.0 per cent in October 2, 2004) and raising the reverse repo rate by 25 basis points (to 4.75 per cent in October 2004). The fiscal measures cushioning the pass-through of an increase in international oil prices to domestic inflation included a reduction in excise and customs duties in June and August 2004. In 2005-06 (as of October 1, 2005), year-on-year WPI inflation eased to 4.2 per cent as compared to 6.2 per cent a year earlier.

### III Key Issues

#### *Inflation – Definition and Measurement*

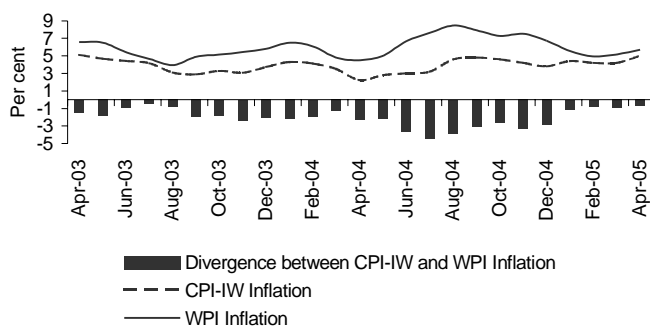
As noted by Reddy (1999), measurement issues related to price indices remain an area of concern in India. Even the most suitable

**Table 4: Wholesale Price Inflation in India in Recent Period (Year-on-Year) (Per cent)**

Commodity	Weight	2004-05 Inflation	2004-05 (October 2) Inflation	2005-06 P (October 1) Inflation
All commodities	100.0	5.1	7.1	4.2
1 Primary articles	22.03	1.3	4.3	1.8
Food articles	15.40	3.0	1.8	4.1
i Rice	2.45	2.9	-1.4	4.1
ii Wheat	1.38	-1.1	3.9	1.6
iii Pulses	0.60	-2.6	1.8	5.1
iv Vegetables	1.46	11.9	1.4	3.5
v Fruits	1.46	11.5	-0.8	5.5
vi Milk	4.37	-1.7	4.0	0.4
vii Eggs, fish and meat	2.21	7.3	0.9	14.7
Non-food articles	6.14	-6.9	4.1	-4.3
i Raw cotton	1.36	-23.8	-5.4	-15.5
ii Oil seeds	2.67	-6.5	8.8	-6.2
iii Sugar cane	1.30	-0.7	5.1	0.6
Minerals	0.48	68.0	131.5	4.4
i Iron ore	0.21	119.1	290.6	4.1
2 Fuel, power, light and lubricants	14.23	10.5	10.8	12.0
i Mineral oils	6.99	16.0	16.9	17.7
ii Electricity	5.48	0.8	0.8	6.2
iii Coal mining	1.75	17.1	16.3	0.7
3 Manufactured products	63.75	4.6	7.0	2.3
i Food products	11.54	0.4	5.2	0.1
Of which: Sugar	3.62	19.7	15.6	10.0
Edible oils	2.76	-8.4	2.3	-7.8
Oil cakes	1.42	-17.4	-4.6	-12.9
ii Cotton textiles	4.22	-12.7	6.8	-13.4
iii Man-made fibre	4.41	0.6	6.0	-6.9
iv Chemicals and chemical products	11.93	3.9	3.2	3.0
Of which: Fertilisers	3.69	3.3	0.4	3.1
v Basic metals, alloys and metal products	8.34	17.1	19.9	8.5
Of which: Iron and steel	3.64	21.3	26.5	9.1
vi Non-metallic mineral products	2.52	11.4	7.9	7.7
Of which: Cement	1.73	10.2	6.0	9.3
vii Machinery and machine tools	8.36	7.1	6.3	4.1
viii Transport equipment and parts	4.29	6.2	6.4	2.6
Food items (composite)	26.9	1.9	3.1	2.4
WPI excluding food	73.1	6.3	8.7	4.9
WPI excluding fuel	85.8	3.7	6.2	2.1

Source: *Macroeconomic and Monetary Developments: Mid-Term Review 2005-06*, RBI.

**Graph 4: WPI and CPI Inflation**



Source: RBI Annual Report, 2004-05.

index, i e, WPI suffers on various accounts. It does not include services and asset prices. Given the growing importance of services in overall GDP, now constituting close to half of it, ignoring services is a serious drawback. With growing financial deepening in the post-reform period, the role of asset prices has assumed considerable importance. On the other hand, CPI suffers from a very narrow coverage and low frequency (monthly). A divergence between inflation rates based on WPI and CPI, as evident from Graph 4, has raised several statistical issues. Explaining the divergence, RBI (2002) noted that, "The wedge between the two inflation indicators largely reflects the larger weight of the food group in the CPI and a differential movement in the inflation rates of various subgroups... In addition, the divergence between the CPI and WPI could also reflect the movements in the prices of services, which are included in the CPI."

Another major drawback of price indices in India is that the base year is not revised frequently failing to represent the importance of the goods and services in recent times. For example, the current base years for CPI-IW, CPI-UE and CPI-AL are 1982, 1984-85 and 1986-87, respectively. The current base year for WPI is 1993-94. Because of these limitations, the existing indices fail to be a reliable gauge of inflation [Reddy 1999]. There is an urgent need to revise the compilation of WPI and CPI to make them truly representative by expanding the coverage and making CPI available with a maximum lag of two weeks with weekly frequency as WPI.

### Headline versus Core Inflation

An issue closely related to definitional aspect of inflation is concerned with use of "headline" versus "core" inflation. While "headline inflation" covers the entire set of goods and services included in the general index, "core inflation" otherwise known as "underlying inflation" ignores the volatile items in the general index. Headline inflation reflects not only the effect of demand pressures but also supply shocks which impart transitory noise and bias to the index. Thus, a supply shock arising from crop failures or the international oil price hike will have the effect of raising the headline inflation. On the other hand, a positive supply shock such as a good harvest may reduce the headline inflation for some time even if underlying inflationary pressures are building up. In the event of such supply disturbances, policy actions to counter the impact on the aggregate price level will tend to accentuate the output effects of the disturbances, generating a short-run conflict between the central bank's inflation

and output objectives. Thus, the volatility of "headline" inflation without any discernible change in the associated fundamentals but due to supply shocks constrains its usefulness.

The concept of "core" inflation became popular with the adoption of the "inflation targeting" framework by several central banks. The main rationale for defining price stability in terms of "core" inflation lies in its permanency character and removal of transient components. A number of approaches are used to compute core inflation. Two alternatives, exclusion-based and limited influence estimators (trimmed mean), have been examined for India [Samanta 1999; Mohanty, Rath and Ramaiah 2000]. However, the loss of information content in the construction of core inflation and the relatively greater public acceptability of the headline inflation make the core measures useful only as indicators of the underlying inflationary process rather than as policy targets [RBI 2004]. Furthermore, in a developing country like India, a measure of core inflation excluding food items, which carries significant weight in the price index, may not be very meaningful [Jalan 2002]. Official data on "core" inflation are still not available and most academic and policy discussions are based on "headline" WPI inflation. However, in view of rising international fuel prices in the recent period, in addition to discussion on the behaviour of "headline" inflation, references to inflation excluding volatile components like fuel and administered prices also find a place in the policy documents.

### Growth-Inflation Trade-off and Threshold Inflation

In the literature, the Philips curve phenomenon implied the trade-off between economic growth and price stability. This phenomenon, originating from the seminal paper by A W Phillips (1958), suggested an estimated inverse relationship between the growth rate of money wages and the rate of unemployment. On the basis of relating prices to money wages, Samuelson and Solow (1960) extended the above analysis and estimated the positive association between rate of employment and inflation. The Phillips curve philosophy had produced numerous research works during 1960s and 1970s. During the early 1970s, a series of events like the breakdown of the Bretton Woods fixed exchange rate system, oil shocks and post-Vietnam war scenario resulted in both high inflation and high unemployment rates in the US. The prevalence of a combination of high inflation and unemployment rates with stagnating output known as stagflation empirically repudiated Phillips curve philosophy. At the theoretical level, Friedman (1968) and Phelps (1967) had already challenged theoretical underpinnings of the Philips curve. Subsequent research and the phenomenon of "stagflation" implied that beyond the short-run, any trade-off between inflation and growth is illusory.

The debate on the nature of relationship between inflation and growth is still quite open, but there is a convergence of views on the adverse impact of high inflation on economic growth. In this backdrop, Fischer (1993) and Barro (1995) established the non-linearity in the association of inflation and growth which subsequently led to emergence of the concept of "threshold inflation." In the Indian context, Rangarajan (1998), introduced the concept of "threshold inflation" to identify the level of inflation from which the adverse consequences begin to set in. Below and around this threshold level, there is greater manoeuvrability for the policy-makers to take into account other considerations including economic growth. This threshold level varies across the countries depending on country specific considerations.

Contrary to the lower level of 1 to 3 per cent in case of industrial countries, in developing countries, the threshold level of inflation is found to be higher at around 11 to 12 per cent [Khan and Senhadji 2000].

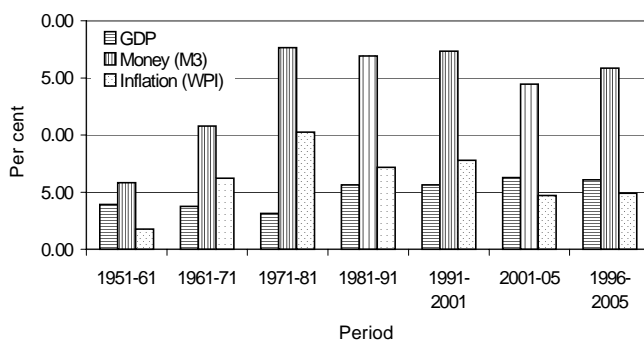
The Chakravarty committee [RBI 1985] first made a reference to 4 per cent level of inflation, which is regarded as the first influential fix on the threshold level of inflation in India. Rangarajan (1998) regarded 6 per cent level of inflation to be the outer tolerance limit. Subsequently, many attempts were made in India to formally estimate the appropriate level of threshold inflation [Vasudevan, Bhoi and Dhal 1998; Kannan and Joshi 1998; Samantaraya and Prasad 2001; RBI 2002] following Sarel (1996). The threshold level of inflation for India is found to be in the range of 4 to 7 per cent. The appropriate measure of threshold inflation gives greater flexibility to the central bank in pursuing the objectives of growth and price stability, simultaneously. If expected inflation is below the threshold level, the growth objective can take precedence over the price stability. On the other hand, if expected inflation is above the threshold, price stability should be given greater relative importance [Samantaraya and Prasad 2001]. It can be noted that in a developing country context, the adverse impact of inflation on social justice has to be incorporated in any analysis of inflation. However, with structural changes in the economy and credible anchoring of inflationary expectations at a lower level, the threshold inflation could also move downwards.

### Money, Output and Prices

The interrelationship between money, output and prices is one area in macroeconomics subject to very intense and wide research. The behaviour of money, output and prices in India since independence is presented in Graph 5. In the literature, the quantity theory of money provided the basic framework to facilitate the theoretical and empirical research of this complex relationship. In the determination of real money demand, output serves as an important argument and supply of money above the amount determined from the money demand function fuels inflationary pressure. Thus, the inverted money demand function represented by a single equation with price as the dependent variable and money and output as important explanatory variables served as the framework to study the interaction of money, output and prices. According to such a formulation, an increase in real output depresses the price level and monetary expansion raises the price level.

Sarma (1991) and Rangarajan (1994) estimated an inverted money demand function in a partial adjustment framework for India covering the periods of 1970s and 1980s. The results broadly inferred that the behaviour of prices are well explained by the changes in output (GDP in real terms) and broad money (M3). The distributed lag effects of a change in M3 on prices were found to be significant for about three years following the change and petering out progressively in the subsequent years. Emphasising the role of monetary control for price stability, Rangarajan (1997) noted that "it is true that developing countries like India are subject to greater supply shocks than developed countries. Fluctuations in agricultural output have an important bearing on the price situation. Nevertheless, a continuous increase in prices, which is what inflation is all about, cannot occur unless it is sustained by a continuing increase in money supply. Control of money supply has thus to play an important role in any scheme aimed at controlling inflation."

Graph 5: Average Growth of Money, Output and Prices



There were another set of studies [Singh 1989 and Jadhav 1994] attempting to examine the interaction between money, output and prices in India with the aid of formal tests of causality such as Granger's test and Sim's test. Both the studies established the causation from money to prices. While Singh (1989) found the reverse causation from prices to money to be strong, the results from Jadhav (1994) were otherwise. Moreover, the latter study found evidence of weak causality from money to output.

The major criticism against single equation method or causality tests is that they ignore simultaneity in the relationship between money, output and prices. Not only is output an important argument in the money demand function, monetary expansion also supports output growth through credit expansion. The net impact of monetary expansion on prices will actually depend on output elasticity of credit (money) and elasticity of prices with respect to money and output. Thus, a system of simultaneous equations incorporating all the related variables is better equipped to capture the determinants of prices as compared to a single equation. In India, several attempts have been made to analyse the association amongst money, output and prices through macroeconomic models using simultaneous equations and Vector Auto-Regression (VAR). Macroeconomic models developed by Jadhav and Singh (1990) and Rangarajan and Arif (1990) analysed the interrelationships among budget deficit, money stock, inflation and economic growth and broadly inferred that the price effects of an increase in money supply are stronger than the output effects. Using the VAR approach, RBI (1998), Srimany and Samanta (1998) and Samantaraya (2003) found that an expansionary monetary policy reduces interest rate, raises inflation and tends to improve output. However, the later set of studies suffers from inadequate data points.

### Fiscal and Monetary Coordination

Fiscal dominance on monetary policy in India through deficit financing is widely documented in terms of the impact of RBI credit to the government on reserve money and money supply. This monetary expansion, ceteris paribus, exerts upward pressure on prices. In turn, with an increase in prices government expenditure increases more rapidly than the revenues and hence widening government deficit. This deficit-money-inflation-deficit spiral became popular in developing countries' perspective. In the Indian context, Jadhav and Singh (1990) and Rangarajan and Arif (1990) are noteworthy contributions to this literature. These studies highlighted that while a substantial increase in government capital expenditure increases output, its impact on output

and prices also depends on the extent of resource gap met by borrowing from the RBI. As the proportion of the resource gap financed by the RBI increases, the trade-off between output and prices worsens sharply. By early 1990s high fiscal dominance on monetary policy became a matter of serious concern.

Monetary policy reforms during the 1990s hinged on easing the fiscal constraint. The first important step was introduction of an auction system for the central government's market borrowings in June 1992 and switching to financing of the fiscal deficit by market borrowings. This enabled RBI to scale down the statutory liquidity ratio (SLR) to the statutory minimum of 25.0 per cent by October 1997. The second major step was the historic accord between the government and RBI in September 1994 for phasing out the issue of ad hoc treasury bills having implications for eliminating automatic monetisation. A system of ways and means advances (WMA) to the central government was put in place to meet temporary mismatches providing greater flexibility to RBI in monetary management. Increasing monetary-fiscal coordination in recent years facilitated better monetary management as well as smooth progression of market borrowings. It is important to note that the stipulation of the RBI's withdrawal from the primary government securities market from April 2006 under FRBM Act, reinforces greater fiscal-monetary coordination.

### *Inflation Targeting*


In the pursuit of the objective of price stability, there had been widespread use of either monetary or exchange rate targets as nominal anchors in the conduct of monetary policy. Since the mid-1980s, developments in financial markets and ongoing financial innovations have rendered monetary targeting less effective. Exchange rate pegging aimed at controlling inflation by importing credibility from abroad (from a large successful low inflation anchor country) also turned out to be increasingly fragile, as countries opened their economies to external flows. The weaknesses with these frameworks led to shifting to "inflation targeting" by a number of countries in 1990s following the successful example set by the New Zealand. Under this approach, central banks directly target inflation itself and involves bridging the gap between the inflation forecast and the mandated inflation target in a forward-looking manner.

The experience of inflation targeting both in emerging as well as industrial countries has been satisfactory. But the decade of the 1990s has also been one of a generalised fall in inflation worldwide and even countries that have not adopted inflation targeting been able to maintain low inflation. There is a growing sense that by the time the current phase of the global business cycle has run itself out, inflation targeting may not be seen to have stood the test of time [Mohan 2003]. The relevance of a single inflation target for a developing country like India is also debated [Jalan 2002].

## IV Conclusion

An assessment of the inflation record of India reveals that inflation increased from the 1970s onwards before moderating in the mid-1990s. Supply shocks both due to a setback in agricultural production and international oil prices, and monetary expansion due to automatic monetisation of the fiscal deficit were the major contributory factors to higher inflation. Reform initiatives since the early 1990s towards developing a broad-based financial

market, particularly activation of the government securities and forex markets coupled with improved monetary-fiscal interface enabled better monetary management since the second half of the 1990s. Moreover, judicious supply management through buffer stocks of foodgrains and import of sensitive commodities containing the adverse impact of supply shocks also played an important role. It can also be noted that notwithstanding the unprecedented order of external capital flows, monetary management was effective in ensuring a reduction in inflation and lowering inflation expectations. The expansionary effect emanating from massive capital flows to India since 1993-94 has been effectively sterilised through a variety of instruments including open market operations and repo operations under LAF.

The success of price stability in India since mid-1990s has led to a reduction in inflationary expectations and consequently, inflation tolerance has also come down. It is important to note that inflationary expectations are also dependent upon fiscal prudence. The enactment of the Fiscal Responsibility and Budget Management Act in 2003 by the central government and similar legislations by a majority of the state governments envisaged a reduction in key deficit indicators and this is expected to enhance the autonomy of the monetary authority. However, adherence to the fiscal rules as per the legislation will be important for stabilising inflationary expectations in the country. 

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