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## RESERVE BANK OF INDIA

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# *OCCASIONAL PAPERS*

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**Special Notes**



**Book Reviews**

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# *Is the Government Deficit in India Still Relevant for Stabilisation?*

**Jeevan K. Khundrakpam and Rajan Goyal***

This paper employing bounds test to cointegration analysis (Pesaran *et al,* 2001) revisited the linkages between real output, price and money and studied the impact of government deficit on money in India for the period 1951-52 to 2006-07. It finds that money and real output cause price both in the short as well as in the long run while money is neutral to output. Further, evidence shows that government deficit leads to incremental reserve money creation even though the Reserve Bank financing of Government deficit almost ceased to exist during most part of the current decade. It argues that Government deficit by influencing the level of sterilisation impacts the accretion of net foreign assets to RBI balance sheet and, therefore, continues to be a key factor causing incremental reserve money creation and overall expansion in money supply. Given the finding that money leads to inflation, government deficit, therefore, remains relevant for stabilisation.

**JEL Classification** : E41, E52

**Keywords** : Deficit, Money, Real Output, Price, ARDL

## Introduction

Impact of Government deficit on money supply and the effect of the latter on real output and prices has been extensively investigated in India (for a survey of literature see Jadhav, 1994). There have been a number of reasons for this subject being revisited several times. First, until very recently, there was automatic monetisation of government deficit through the creation of *ad hoc* treasury bills, which led to expansion of reserve money and the overall money supply *via* the multiplier effect. Secondly, given the competing but contradictory theoretical postulates on the interaction between money, real output and prices, the precise nature of the relationship among these variables has been an empirical issue. Thirdly, the relationships might have undergone changes with the developments in the economy, particularly in the financial sector. Finally,

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there has been development in the estimation techniques and methodology to have more robust estimates and better insights into the relationships among these variables.

We revisited the relationship between deficit, money, price and real output for the following reasons. First, growing globalisation of Indian economy and developments in the financial market has altered the financing pattern of government deficit leading to a change in the asset profile of Reserve Bank balance sheet in the recent years. In view of these changes in the recent times, Ashra *et al* (2004) revisited the issues and observed that the relationship between fiscal deficit and net RBI credit to government and the latter with broad money supply ($M_3$) do not exist and, therefore, concluded that fiscal deficit is no longer relevant for stabilisation. Secondly, despite the plethora of empirical works in this area, including the recent ones, a number of methodological issues, however, still need to be addressed. In particular, many of the earlier works have either neglected the stationary properties of the series or proper adjustments were not made to correct for non-stationarity.[1] Though studies in the later period have applied cointegration techniques on non-stationary series, the unit root tests employed in these studies have suffered from low explanatory powers, as they have not taken into account of structural breaks in the true data generating process (Zivot and Andrews, 1992).[2] Third, most of the existing studies have not attempted a distinction between the short-run and long-run causality.[3] Fourth, most of the studies in the Indian context have employed bivariate models which could give rise to omitted variables problem.

The contribution of the paper is the following. First, we consider the deficit of the entire government sector derived from the national accounting framework and analyse its impact on money supply through the reserve money expansion. This approach is different from the earlier works where the impact of deficit on money supply is analysed through the creation of net RBI credit to the government. Second, we cover an extended time period from 1951-52 to 2006-07. Third, and importantly, we employ autoregressive distributed lag (ARDL) approach to cointegration analysis developed by Pesaran and Pesaran (1997), Pesaran

and Shin (1999) and Pesaran, Shin and Smith (2001). This approach allows test for the presence of cointegrating relationship among variables characterised by different order of integration, and therefore, obviates the need to ascertain the unit root property of variables. Given the inconclusive unit root properties of relevant variables in India as shown in Appendix 1, this method appears to be more appropriate than other approaches. Fourth, for the cointegrated variables, an error correction framework is used for the causality tests in order to differentiate between short-run and long-run causality. Fifth, the relationships between money, real output and prices are analysed in a trivariate framework.

The rest of the article is presented in four sections. Section I provides a brief review of the select literature on India. In section II, the analytical and the empirical framework are discussed. The data and empirical results are analysed in section III. Section IV concludes.

## Section I

## A Brief Review of Select Literature on India

A summary of the time period, procedure and technique adopted along with the reported causality in some of the select earlier studies on India is presented in table 1. Among these, the earliest contribution was by Ramachandra (1983, 1986) for the period 1951-1971 and 1951-1980 who concluded that money causes both real income and price, price causes real income and nominal income causes money. Gupta (1984) for the period 1954-55 to 1982-83 also concludes that both nominal and real income have unidirectional cause on money supply. On the other hand, Nachane and Nadkarni (1985) using the quarterly data over the period 1960-61 to 1981-82 find that money supply has a unidirectional causality to price and is a major determinant of nominal income, but the relationship between money and real output is inconclusive. Both Singh (1989), based on quarterly averages of monthly data for the period 1970-71 to 1986-87, and Biswas and Saunders (1990), on quarterly data for two sub-periods of 1962-1980 and 1957-1986, find bi-directional causality between money and prices. Jadhav (1994) for the period 1955-56 to 1987-88 finds that money causes both prices and output. Thus, the conclusions derived by these earlier studies have been quite divergent.

More recently, Moosa (1997) using a seasonal cointegration framework shows long-run neutrality of money on output in India. On other hand, RBI (1998) for the period 1970-71 to 1996-97 finds that money is non-neutral to output. In nominal terms, there is bi-directional causality between money and output, while in real terms the causality is unidirectional running from money to output. Ashra *et al.,* (2004) during the period 1950-51 to 2000-01 also find that narrow money ($M_1$), but not broad money ($M_3$), is non-neutral to output. They also find that broad money ($M_3$) and prices have a bi-directional causality. However, RBI (1998) and Ashra *et al.,* (2004), unlike Moosa (1997), do not make distinctions between short-run and long-run neutrality of money on output.

**Table 1: Time period, technique and causality reported in select earlier studies**

| Authors | Time period | Stationarity of data | Technique adopted | Causality reported |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
| Ramachandra (1983, 1986) | Annual data: 1951-1971 and 1951 to 1980 | Not checked | Sims' test | a) Money causes real income and price<br>b) Price causes real income<br>c) Nominal income causes money |
| Gupta (1984) | Annual data: 1954-55 to 1982-83 | Not checked | Granger and Sims' test | Both nominal and real income cause money |
| Nachane & Nadkarni (1985) | Constructed Quarterly data: 1960-61 to 1981-82 | Stepwise autoregression | Sims' test | a) Money causes price and nominal income<br>b) No conclusion between money and real income |
| Singh (1989) | Monthly data: 1970-71 to 1986-87 | Successive differencing till time trend is insignificant | Granger and Sims' tests | Bi-directional causality between money and prices |
| Biswas and Saunders (1990) | Quarterly data: 1962 to 1980 and 1957 to 1986 | First difference of logarithms | Hsiao's FPE test | Bi-directional causality between money and prices |
| Jadhav (1994) | Annual data: 1955-56 to 1987-88 | In percentage change form | Granger and Modified Sims' test | Money causes price and output |

There are also fairly a large number of studies in India on the nexus between government deficit, money supply and inflation. Sarma (1982), replicating Aghevli-Khan (1978), finds a self-perpetuating process of deficit-induced inflation and inflation-induced deficits in India. Jadhav (1994) in a macro-econometric framework for the period 1970-71 to 1986-87 also finds a self-perpetuating process of government deficit and inflation. Extending to later period of the 1990s, Rangarajan and Mohanty (1998) support the hypothesis that government deficits have been an important cause for inflation in India. In contrast, Ashra *et al.,* (2004) find no long-run relationship between fiscal deficit and net RBI credit to government, and the latter with $M_3$. Therefore, they question the rationale for targeting fiscal deficit as a tool for stabilisation.

## Section II

## Analytical and Empirical Framework

### Analytical Framework

*Money, Real Output and Prices*

In the literature, there are different theoretical postulates on the interrelationship between money, prices and real output. Classical economists argue that money in the long-run leads to only a corresponding rise in price leaving the real output unaltered. Monetarists, however, acknowledged that under adaptive expectations, money supply can impact real output in the short-run. Rational expectation theory denies any impact of money on output even in the short-run. On other hand, Keynesians argue that money supply by influencing interest rates can affect investment and in turn real output *i.e.,* advocates non-neutrality of money on real output.[4]

Structural economists, on their part, argue that in less developed countries, in addition to money, structural factors such as supply and demand conditions also play an equally important role in determining price in the economy. Financing public investment through money expansion increases productive capacity and real output, while real output, at the same time, would increase the demand for money. Further, the

concern of the Government to maintain a desired level of real public expenditure leads to increase in nominal expenditure of the Government leading to rise in prices.

These competing theoretical constructs suggest that relationships between money, real output and prices could exist through different channels. Further, country specific conditions could have an impact on the relationship. Thus, the relationship between money, real output and price in India is considered to be an empirical issue.

*Fiscal Deficit, Reserve Money and Money Supply in India*

Though the growth of reserve money would normally be induced by the demand emanating from movements in output and price levels, in India, government deficit supplements these factors in determining the rate of reserve money expansion. Sources of reserve money have been observed to be intimately linked with the process of financing fiscal deficit. Till the early 1990s, a sizeable portion of government deficit which could not be financed through market subscription to Government securities issued at sub-market rates was automatically monetised with the creation of *ad hoc* treasury bills with the Reserve Bank. From 1992, coupon on Government securities was made market related (introduction of auction system) and beginning from 1994 the system of *ad hoc* treasury bills creation was phased out by 1996-97. However, monetisation of government deficit persisted to the extent that Reserve Bank continued to subscribe to these securities either due to inability of the market to absorb the entire floatation or its unwillingness to subscribe at the prevailing interest rates.[5] This has been the fallout of the Reserve Bank being the debt manager of the government and the large and persistent government deficit. It has also been found that fiscal deficit by enhancing Government debt offerings tend to raise the real interest rates unless contained by the injection of reserve money by the central bank (Goyal, 2004). Thus, government deficit had led to reserve money creation through increased holding of Government securities by the Reserve Bank.

In the recent years, increasing globalisation causing large capital inflows has added a new dimension in the dynamics of reserve money expansion and has also altered the channel of monetisation by varying

the asset profile/composition of RBI balance sheet. With a view to maintaining stability of the system, RBI has been acquiring surplus capital inflows and subsequently sterilising[6] them through selling of Government securities from its portfolio[7] to contain corresponding reserve money expansion. Therefore, the Reserve Bank could guide the rate of reserve money expansion by sterilising only a required proportion of the liquidity created earlier through its acquisition of foreign assets. Moreover, being a debt manager, the Reserve Bank could be expected to take up sterilisation in a manner that the subscription to Government securities does not get affected due to liquidity constraints. Therefore, the level of fiscal deficit and consequent government borrowings could be a key factor in determining the accretion of net foreign assets net of sterilisation to RBI balance sheet or the reserve money expansion.

Theoretically, money supply grows by a multiple of reserve money expansion. Almost all the studies conducted till date in the Indian context have observed that there is a significant relationship between money supply (both broad as well as narrow money) and reserve money and that the value of money multiplier has generally been stable. Although, progressive development of the financial sector with introduction of new instruments and financial innovations might have impacted the stability of money multiplier, the growth in money supply continues to be driven primarily by the movements in the reserve money stock.

Thus, to analyse the macroeconomic impact of fiscal deficit, we investigate whether fiscal deficit leads to increase in reserve money with consequent increase in the money supply and how the latter interacts with price and real output.

## The Empirical Framework

As unit properties presented in appendices are inconclusive for Indian data, the bounds test (ARDL) approach to cointegration analysis, which allows tests for cointegrating relationships among variables characterised by different order of integration, was adopted. This approach not only checks for the presence of long-run relationships but also determines the precise direction of that relationships *i.e.*, which variable is the dependent variable and which are the explanatory variables. It

involves estimating an unrestricted error-correction model (UECM), which for tri-variate models adopted here takes the following form

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

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

$$\Delta Z_t = a_z + \sum_{i=1}^{n} b_{iz}\Delta X_{t-i} + \sum_{i=0}^{n} c_{iz}\Delta Y_{t-i} + \sum_{i=0}^{n} d_{iz}\Delta Z_{t-i} + \alpha_z Z_{t-1} + \beta_z X_{t-1} + \gamma_z Y_{t-1} + \varepsilon_t \quad (3)$$

Here $\Delta$ is the first difference operator, and 'X', 'Y' and 'Z' are the three variables. The bounds test for the presence of long-run relationship involves using two separate statistics. The first is the F-test on the joint null hypothesis that the coefficients of the lag levels of the variables are jointly equal to zero, against the alternative that they are jointly different from zero. The second is a t-test on the lag level of the dependent variable that it is individually different from zero. When a long-run relationship exists between the variables, both F-test and t-test indicate which variables should be normalised.

In (1), where '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 explanatory 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 $F_x(X/Y,Z)$. The t-test is $\alpha_x \neq 0$. In (2), where 'Y' is the dependent variable, the similar null hypothesis, with the 'X' and 'Z' as the long-run explanatory 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 $F_Y(Y/X,Z)$. The t-test is $a_y \neq 0$. In (3), with 'Z' as the dependent variable, the similar hypotheses are 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 $F_Z(Z/X,Y)$, and the t-test is $a_z \neq 0$. However, for this approach to be valid, there must be only one unique cointegrating relationship among the three variables i.e., only one of the three variables should be explained by the other two without any reverse relationships.

Both the F-test and t-test have 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 and t-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 is lower than set by I(0), cointegration is rejected; and iii) in absolute value is 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

$$X_t = a_0 + \sum_{i=1}^{n} b_1 X_{t-i} + \sum_{i=0}^{p} b_2 Y_{t-i} + \sum_{i=0}^{m} b_3 Z_{t-i} + \varepsilon_t \qquad (4)$$

The short dynamics is obtained from the following ARDL specifications

$$\Delta X_t = a_0 + \sum_{i=1}^{n} b_1 \Delta X_{t-i} + \sum_{i=0}^{p} b_2 \Delta Y_{t-i} + \sum_{i=0}^{m} b_3 \Delta Z_{t-i} + ECT_{t-1} + \varepsilon_t \qquad (5)$$

The ECT term in (5) is the error obtaining from the long-run relationship in (4).

Using (5) we perform the Granger-causality tests, as Engle and Granger (1987) had cautioned that if the series are cointegrated, VAR estimation only in first differences will be misleading. By including the lag ECT terms we determine not only the direction of causality but also differentiate between the short-run and long-run causality. For specifications where long-run relationships are rejected by the cointegration tests, the causality tests are only in difference form with the ECT term omitted. For the short-run, the causality tests are conducted through Wald test for significance of the joint coefficients of the individual lag independent variables in the ARDL specifications. Long-run causality is confirmed by the sign and the statistical significance of the lag ECT terms in the ARDL.

## Section III

## Data and Empirical Results

### Data

The relevant variables are culled from various publications for the period 1951-52 to 2006-07. Real output (Y) measured by GDP at factor cost at (1999-2000 prices), money supply ($M_3$) and reserve money (RM) are obtained from Handbook of Statistics on Indian Economy 2007-08, RBI.[8] Price measured by wholesale price index (P)[9] are obtained from Monetary Statistics and various issues of Report on Currency and Finance, RBI. We use a broader concept of government deficit (GD), defined as the difference between investment and savings of the Government in the National Account Statistics from Economic Survey 2007-08. All the variables are considered in logarithm form.

### Empirical Results

Cointegration

Table 2 presents cointegration tests results.[10] We accepted the presence of cointegration between the variables if F-test rejects the null at least at 95% critical bound values. Where both F-test and t-test can not reject the null at this critical value it is taken as a clear cut evidence of no long-run relationship. Based on the above criteria, the existence of the following long-run relationships can be accepted.

*a) Money, real output and prices:*

Between money, prices and real output there is only one cointegrating relationship. When price (LP) is the dependent variable, the estimated F and t-statistics are found to be higher than the upper critical bound values (table 2: row 3). For the reverse cointegrating relationships, both the F and t-statistics are lower than 95% upper critical bound values (rows 1 and 2 in table 2). However, the evidence on money supply being influenced by output and prices is inconclusive by F-test, as it is significant at 10% level. In such inconclusive situation the error correction term is a useful way of establishing cointegration (Kremers *et al*., 1992 and Banerjee *et al*., 1998).[11]

*b) Government Deficit and Reserve Money:*

Both the F and t-statistics are higher than the upper critical bound value when change in reserve money is explained by the government deficit, while both the statistics are lower than the lower critical bound values for the reverse relationship. In other words, there is only one long-run relationship between change in reserve money and government deficit, with the former explained by the latter (table 2: row 4 and 5).

*c) Reserve Money and Money Supply:*

The bounds tests between reserve money and measure of money supply reveal that the F-statistics are higher than the upper critical bound values only when reserve money is the explaining variable (table 2: row 6 and 7). Thus, money supply share a long-run relationship with reserve money, with the latter as the explanatory variable.

## Long-run Coefficients

The estimated long-run relationships based on ARDL in (4) for those variables found to be cointegrated by the bounds test are presented in table-3. These estimates, which bring out the precise nature of the long-run relationship, reveal the following:

**Table 2. Bounds Test for Cointegration**

| Sl.No. | Variables | F-test | -test | Model | Cointegration |
|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 |
| **a)** | **Broad money, real output and price** | | | | |
| | 1 $F_Y(LY/LM_3, LP)$ | 1.13 | -1.76 | C&T | Rejected |
| | 2 $F_{M3}(LM_3/LY, LP)$ | 4.73*** | -2.26 | C&T | Rejected/Inconclusive |
| | 3 $F_P(LP/LM_3, LY)$ | 6.06** | -4.18** | C & T | Accepted |
| **b)** | **Government deficit and reserve money** | | | | |
| | 4 $F_{RM}(L\Delta RM/LGD)$ | 5.76** | -3.30** | C | Accepted |
| | 5 $F_{GD}(LGD/L\Delta RM)$ | 2.26 | -2.07 | C | Rejected |
| **c)** | **Reserve money and broad money** | | | | |
| | 6 $F_{M3}(LM_3/LRM)$ | 6.39** | -1.07 | C&T | Accepted |
| | 7 $F_{RM}(LRM/LM_3)$ | 0.95 | -1.24 | C&T | Rejected |

**Notes:** C and T denote for constant and trend component, respectively. The estimated F-statistics are compared with the critical bound values reported by Narayan (2005) for small sample size, while the estimated t-statistics are compared with the critical bound values reported in Pesaran, Shin and Smith (2001).
*, ** and *** denote significance at 99%, 95% and 90%, critical bound values, respectively.

*a) Price on Money and Real Output*

In the price equation, the coefficient of money supply ($LM_3$) has statistically significant positive sign, while that of real output (LY) is negative. In other words, while money leads to long-run inflation, real output lowers it. The negative impact of real output on long-run inflation in India is tenable, as supply factors is understood to play an important role in the determination of prices. Thus, improvement in supply position reflected in higher real output leads to fall in inflation, while increase in money supply causes inflation (table 3: column 2).

*b) Change in Reserve Money and Government Deficit*

It is seen from column 3 in table 3 that the coefficient of government deficit (LGD) on change in reserve money (LΔRM) is slightly above unity and statistically significant. In other words, one percent change in government deficit leads to about 1.06 percent expansion in the reserve money.

*c) Reserve Money and Money Supply*

The coefficient of reserve money (LRM) on money supply ($LM_3$) is positive and statistically significant (table 3: column 4).

**Table-3: Estimated Long-run Relationships**

| **Explanatory/Dependent** | **LP** | **LΔRM** | **$LM_3$** | **$LM_3$** |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
| Constant | 12.73 | -1.85 | 3.58 | -11.2 |
| | (6.8) * | (-5.5) * | (2.1) ** | (-3.5) * |
| Trend | 0.05 | | 0.08 | |
| | (6.2) * | | (2.4) ** | |
| $LM_3$ | 0.43 | | | |
| | (6.5) * | | | |
| LY | -0.94 | | | 1.03 |
| | (-5.6) * | | | (3.1) * |
| LP | | | | 1.43 |
| | | | | (6.5) * |
| LRM | | | 0.57 | |
| | | | (2.4) ** | |
| LGD | | 1.06 | | |
| | | (29.6) * | | |

* and ** denote significance at 1%, and 5%, respectively.

From the above results, it can be inferred that government deficit leads to additional reserve money creation, which leads to expansion in money supply that generates pressure on prices.

*d) Money on Price and Real Output*

Even though evidence on money supply being explained by price and real output was inconclusive from the bounds test, the long-run relationship was estimated in order obtain the error correction term. It is seen that both the real output (LY) and price (LP) have statistically significant positive coefficients on money supply (table 3: column 5). Thus, there is some evidence of money being caused by output and price, which would be confirmed later by the significance of the ECT term in the ECM framework *a la* Kremers *et al*., (1992) and Banerjee *et al*., (1998).

**Short-Run Dynamics and Causality**

The dynamics of the cointegrated variables were estimated using the specification given in (5). Short-run causality was performed using Wald test on the joint significance of the lagged variables. Long-run causality was confirmed by the sign and the statistical significance of the lagged ECT terms. Where long-run relationships were rejected by the bounds tests, the error correction term was excluded in the ARDL specification and a similar Wald test was conducted for short-run causality. Being annual data, the maximum lag length was set at two and the appropriate lag lengths were determined based on SBC criterion.

*a) Price is caused by Real Output and Money:*

The ECT terms in the price equations are negative and statistically significant, confirming the results obtained under bounds test, that price is caused by real output and money supply in the long-run (table 4: column 2). The one period speed of adjustment of price to its equilibrium relationship with real output and money following a shock is about 44 percent. In the short-run also, price is caused by both real output and money. Like in the long-run, real output has a negative impact on price, while money leads to increase in price. There is evidence of some inflation inertia in the short-run reflected in statistically significant positive coefficient (0.21) of lagged inflation (table 4: column 2).

*b) Money is caused by Real Output and Price:*

Though the evidence of cointegration of $M_3$ with real output and prices by bounds test was inconclusive, the lagged error-correction terms (ECT) in column 3 (table 4) is negative and statistically significant. This indicates that there appears to be a long-run relationship between $M_3$ on real output and prices. However, the coefficient is very small (-0.09), indicating very slow speed of adjustment to its equilibrium level following a shock. This low speed of adjustment could be a reflection of fiscal dominance, limiting the ability of the monetary authority to control money supply. In the short-run also, both real output and price positive cause money, but the coefficient is again very small in magnitude.

The higher speed of adjustment to its equilibrium level in inflation than in money supply may suggest that averseness to inflation in India is much more than that to off-target money supply. Further, the ability to adjust price faster to its equilibrium level even when money supply adjustment is slower may also indicate the importance of supply management in inflationary control in India.[12]

*c) Real Output is caused by Money and Price:*

As bounds test revealed no cointegrating relationship for real output on money and price, money and price are neutral to real output in the long-run, a result also obtained by Moosa (1997). In the short-run also, money has no effect on real output. Price, however, is non-neutral to real output in the short-run and has a negative impact (table 4: column 6).

*d) Government deficit causes Reserve Money*:

There is strong evidence of government deficit leading to incremental reserve money creation, both in the long-run and short-run (table 4: column 5). The ECT term of -0.66, which is statistically significant, indicate that the long-run relationship is strong and stable with about 2/3rd of the deviation from the long-run equilibrium following a shock being corrected in a single period. In the short-run, one percent increase in government deficit leads to 0.7 percent increase in incremental reserve money.

**Table-4: Causality Test Using Wald Test**

| **Explanatory/Dependent** | **ΔLP** | **ΔLM$_3$** | **ΔLM$_3$** | **ΔLΔRM** | **ΔLY** |
|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 |
| **ΔLP**(0) | | 0.13<br>[12.8]* | | | –0.14<br>[3.1]*** |
| **ΔLP**(–1) | 0.21<br>[5.5]** | | | | |
| **ΔLY**(0) | | 0.09<br>[3.8]*** | | | |
| **ΔLY**(0 to –1) | –0.73<br>[6.6]* | | | | |
| **ΔLY**(–1) | | | | | –0.38<br>[7.7]* |
| **ΔLY$_3$**(0) | 0.19<br>[15.2]* | | | | –0.11<br>[0.7] |
| **ΔLY$_3$**(–1) | | 0.47<br>[26.0]* | 0.44<br>[12.9]* | | |
| **ΔLRM**(0 to –1) | | | 0.20<br>[4.9]** | | |
| **ΔLGD** | | | | 0.70<br>[29.6]* | |
| **ECTt**–1 | –0.44<br>(–5.7)* | –0.09<br>(–3.1)* | –0.07<br>(–1.9)*** | –0.66<br>(–5.5)* | |

The reported figures in square brackets are Chi-square statistics from the Wald tests, while the figures in round brackets are t-statistics. *, **, and *** denote significance at 1%, 5% and 10% level, respectively.

*e) Reserve Money causes Money Supply*:

As the ECT term in column 4 in table 4 is negative and statistically significant, the long-run causality running from reserve money to bound money indicated by bounds test is confirmed. The speed of adjustment to equilibrium following a shock, however, is quite slow with coefficient of the ECT term of -0.07. In the short-run also increase in reserve money leads to expansion in money supply.

## Section IV

## Concluding Remarks

It has been asserted that with the liberalisation of the Indian economy and cessation of automatic monetisation of government deficit, there is

no linkage between government deficit and money supply and that government deficit is no more relevant for the purpose of price stabilisation (Ashra *et al*, 2004). This paper revisits causal relationships between government deficit and money, and the latter with real output and prices in India for an extended period 1951-52 to 2006-07 employing the ARDL approach to cointegration analysis. This approach to cointegration analysis, unlike in earlier studies, addressed the issues such as cognisance of inconclusive stationarity properties, variables with varying degree of integration and small sample size. Reflecting upon the higher degree of openness in the Indian economy, the paper argued that government deficit may now cause reserve money expansion through the incomplete sterilisation of Net Foreign Assets (NFA) accumulation intended to enable adequate market subscription to Government borrowings, replacing the erstwhile channel of 'net RBI credit to the Government'. It found a strong evidence of government deficit leading to reserve money creation with consequent increase in money supply. Further, there is no evidence of money causing changes in real output both in the long-run and short-run. However, money causes inflation both in the long-run and short-run, while real output dampens inflation. There is also some evidence of output and price leading to money creation i.e., bi-directional causality between money and prices rendering money targeting a complicated exercise. Thus, it is concluded that targeting fiscal deficit as tool for stabilization continues to remain valid.

## Notes

[1] Studies such as Ramachandra (1983, 1986) and Gupta (1984) have no considered the stationarity properties of the variables at all, while most of the later studies reported in table 1 have only considered first difference of the variables without formal test of the stationarity properties of the series.

[2] As shown in appendix 1, unit root property of a series is highly sensitive to the presence of structural breaks. In fact, many of the series show opposite unit root properties between tests conducted with and without structural breaks, rendering use of standard cointegration analysis inappropriate.

[3] As appendix 2 shows, the presence of cointegration is also sensitive to presence of structural break.

[4] The debate on this issue has settled down significantly and there is a broad agreement between the present day monetarists and neo-Keynesians that money can have substantial short-run effect on output and prices. However,

they still differ on its use for the purpose of stabilization known as the controversy on 'rules versus discretion'. Monetarists are non-interventionist and believe in rules while Keynesians are interventionist and believe in discretion.

[5] This liquidity constraint could arise on account of excess demand (including Government). RBI, as the debt manager ensures that government borrowing is successful and when the market is unwilling to absorb the entire floatation it subscribes to ease the liquidity constraints and pressure on interest rates.

[6] Sterilisation, however, involves cost to the RBI not only in terms of interest earning differentials between acquired foreign assets and the corresponding Governments securities sold, but also from the lower price these securities are being sold at.

[7] In 2004, Market Stabilisation Scheme was introduced wherein special bonds called Market Stabilisation Bonds are issued by the Government and are used by RBI to absorb excess liquidity in the system. The special feature of these bonds is that proceeds of the bonds are retained by the RBI and Government uses it only to redeem these bonds.

[8] $M_3$ and RM pertain to the fortnightly average in a year and not the March-end figures of the year.

[9] We consider WPI, as it is the headline measure of inflation in India.

[10] Being annual data, the maximum lag was fixed at two.

[11] These studies hold the view that a highly significant error correction term is further proof of the existence of a stable long-run relationship.

[12] In the wake of recent upsurge in oil prices, beside demand management measures by Reserve Bank, government also responded by cutting taxes on petroleum products to restrain price rise. Similarly, Government has resorted to imports of agricultural commodities in event of shortages.

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# Appendix 1: Unit Root Tests

## Dicky-Fuller and Phillips-Perron Tests

Augmented Dickey-Fuller and Phillips-Perron tests reported in table A1 show the following. Both the tests show that reserve money (LRM) is integrated of order one I(1), while government deficit (LGD) and change in reserve money (L**Δ**RM) are stationary I(0). With regard to broad money ($LM_3$), real output (LY) and price (LP), the two tests provide contradictory results.

**Table A1: Unit Root Tests**

| Variable (X) | ADF | | PP | |
|---|---|---|---|---|
| | Log X | ΔLog X | Log X | ΔLog X |
| 1 | 2 | 3 | 4 | 5 |
| $LM_3$ | -2.61(t) | -4.77 (t)* | -5.31(t)* | -4.78(t)* |
| LP | -3.02(t) | -6.31(nt)* | -4.51(t)* | -6.33(Nt)* |
| LY | 2.77(nt) | -9.27(t)* | 5.01(nt)* | -9.94(t)* |
| LGD | -4.00(t)** | -6.75(nt)* | -4.11(t)** | -6.76(nt)* |
| LRM | -2.09(t) | -4.98(t)* | -3.48(t) | -4.96(t)* |
| L**Δ**RM | -5.15(t)* | -9.36(nt)* | -5.24(t)* | -25.7(nt)* |

**Notes :** ** and * denote significance at 5% and 1% level, respectively. The lag length in the ADF tests is chosen based on Schwarz Bayesian Criterion (SBC). 't' and 'nt' in the parentheses indicate trend and no trend, respectively. Inclusion of trend is based on its statistical significance in the ADF equation.

## Zivot-Andrews Test

As both ADF and PP tests have low powers when the true data generating process is stationary about a broken linear trend, Zivot-Andrews (1992) tests were carried out. The tests are conducted on three models: Model A (structural break in the intercept of the trend function); Model B (structural break in the slope of the trend function); and model C (structural break in the intercept and slope of the trend function), which are reported in table A2. It reveals that only $LM_3$ LRM and L**Δ**RM are stationary with a structural break, while the rest of the series are non-stationary.

**Table A2: Zivot-Andrews (1992) test for Unit Root with Structural Break**

| Variables | Model A | Year | Model B | Year | Model C | Year |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| $LM_3$ | -5.53* | 1961 | -5.7* | 1969 | -5.63* | 1961 |
| LP | -3.90 | 1980 | -3.63 | 1999 | -3.68 | 1992 |
| LY | -2.48 | 1960 | -3.78 | 1986 | -3.90 | 1980 |
| LGD | -3.20 | 1982 | -3.06 | 2000 | -3.47 | 1999 |
| LRM | -4.84** | 1960 | -4.84** | 1960 | -4.84 | 1960 |
| LΔRM | -6.29* | 1978 | -5.53* | 1967 | -6.73* | 1977 |

* and ** denote significance at 5% and 1% level, respectively.

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# *Auctions of Government Securities in India – An Analysis*

**Ravi Shankar and Sanjoy Bose***

Auction methodology and its practical use have received tremendous importance in a market oriented mechanism from 1990s onwards. In this paper, we employ empirical methods to evaluate various performance parameters associated with auctions of Government of India dated securities. In this analysis we observed that Government securities auctions in India are fairly efficient as bidding dispersion is quite low with normality in pricing behaviour. The bidding behaviour analysis of Indian government securities auctions shows that bidders' pricing strategy is negatively influenced by bid size, bid cover ratio and tenor of the security. Indian bidders are reducing their bid amount for higher priced bids to minimise their 'winners-curse' in the auctions. The statistical analysis validates various standard auction features. It also establishes that the auctions help in determining most commonly perceived market-clearing borrowing rates out of well behaved bid-price distributions.

**JEL Classification** : D44, G10

**Keywords** : Government Securities Auction, Bidding Strategy.

## Introduction

The Government of India issues debt securities to finance the Public Debt. Reserve Bank of India conducts the auctions of the Government securities such as auctions of Treasury Bills and fixed coupon earning dated securities, floating rate bonds, capital index bonds by following a pre-announced half-yearly calendar. Dated securities are issued by either conducting yield-based auctions for issue of new securities wherein coupon rates emerge on the basis of competitive bidding, or price-based auctions for re-issue of existing securities. With the reform process initiated in the 1990s, auctioning government securities evolved out since the first auction of dated security was conducted on June 03, 1992.

Auction is a price building process driven by a competitive bidding process, wherein the seller receives a collective assessment of prospective

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value of the asset to be sold. Modern day auctions bear out detailed empirical data on bidders' behaviour when different units of goods get allocated at accepted bid prices. The importance of periodic empirical evaluation of bidding behaviour helps reset the assumptions that go behind designing auctions, specially the traditionally evolved out complex designs like those of Treasury security auctions. As underlying raw bid-price distributions govern *a priori* the bidder's demand and information about quantum and price, an empirical understanding of the bid data in the form of panel data analysis of locally differentiated form of a variety of the empirical frequency distributions, concentration analysis of bids as also evidences of localised mean reverting bell shaped (near-normal) pricing behaviour, provide valuable insights about overall performance of the auction design[1].

The major participants in these auctions in India are the banks, insurance companies, mutual funds and primary dealers. Banks and insurance companies participate actively in the auctions to meet their statutory requirements while primary dealers participate in the auction for market making and positioning the securities for further sale in the secondary market. Auction data reveal the competitive behaviour of various investor-groups in terms of success ratios, bid shading, total amount of bonds demanded, bid amount distribution as against respective bid prices, dispersion as well as concentration of bids around multi-modal bids that could be expected within a heterogeneous cluster of bidders. Panel empirical analyses for a similar set of auctions would elucidate the bidding pattern and help evaluate the overall efficiency of the auctioning process.

Much of the auction literature deals with the relation between auction mechanism and the seller's revenue and with equilibrium bidding strategies. However, many of the theoretical results are not robust to changing assumptions when verified by doing hard empirical analyses (Milgrom, 1989). Subtleties of competitive bidding were brought to the fore because of the puzzling conclusions on winner's curse[2] drawn from the modern auction theories, which has set the age-old debate about performance of auction designs for the case of sealed-bid Treasury bill auctions in which each buyer paying a price equal to the highest rejected

bid (uniform auction) would yield more revenue to the Treasury than the auctions in which winning bidder pays the seemingly higher amount equal to his own bid (multiple-price or discriminatory price auction). Majority of empirical modelling exercises of the subsequent period, however, could not settle this theoretical puzzle. It, therefore, made a case for experimental validation of auction theories in a particular context and empirical evaluations of the theoretical predictions for a particular auctioning environment. For example, Cammack (1991) studied the bidding strategies and the information content in the US Treasury bill auctions purely on an empirical basis and brought out firm evidences towards imperfect information in the Treasury bill market, downward bias in average auction bid (bid shading[3]) and the auction prices feeding on the secondary market price behaviour implying thereby that these two markets aggregate trader's private information differently.

Early work of Hendricks and Porter (1988) and others provide important guidance about bid distribution analyses for substantiating underlying assumptions behind an auction. Over a period of time, structural approach has emerged as a positive area of research in building up econometric models of auction data, which provide critical policy inputs regarding choice of an auction design and associated issues and assumptions related to auction format[4] (Paarsch et al, 2006). Till mid-1990s, only a few empirical studies have attempted to validate theoretical models using real auction data (Laffont *et al*, 1995). With the improved estimation and simulation techniques, several rigorous statistical analyses help estimate econometric models that are closely derived from auction theories. Examples include development of empirical models to discriminate between common values and private values models in the first-price auctions, to quantify the magnitude of the winner's curse in the pure common values model[5], or say comparing the performances of open and sealed bid auctions (Athey *et al*, 2006). For example, the working paper of Hortacsu (2002) undertook one of the oldest unresolved questions in the auction literature: whether to sell treasury bills by discriminatory or uniform auction, or his recent paper (Hortacsu, 2008) on testing for common values in Canadian Treasury Bill markets. In the Indian context also, no hard evidence could be found about superiority of the uniform auctions over a comparable set of multiple price auctions (RBI Annual Report, 2002-03).

In this paper one-year auction data for 2006-07 (April-March) in respect of Government of India dated securities, which follow by and large a comparable pattern and sizes, have been analysed to capture the bid price distribution pattern so as to gain insights into institutional bidding behaviour as also overall efficiency of the auction format, design and listed methods and rules for participating in the auction.

The present paper is divided into five sections. The first section briefly describes the commonly adopted auction designs in India and abroad. A theoretical framework focussing on bidding behaviour along with literature review is presented in Section II. Performance of government securities auction with certain stylised data analyses of bidding behaviour in the recent period is presented in Section III. Then an empirical evaluation of certain quoted pricing strategy model is presented in the Section IV and the concluding observations are summarised in Section V.

## Section I

## Design of Government Securities Auction in India[6]

The auction procedure followed by RBI is the commonly used *multiple-price sealed-bid* auction. The bidders electronically submit sealed competitive bids specifying the price they are willing to pay for a particular amount of debt security. For dated securities auctions, investors belonging to eligible categories may also submit non-competitive bids up to a ceiling of Rs.2 crore without specifying price. These bids are accepted at the average price of bids accepted in the auction. The total amount of non-competitive bids is subtracted from the total issue-size for allocation to competitive bids. An initial ceiling of 5 per cent of issue size is kept on the total non-competitive amount but the ceiling limit is rarely touched.

Once all the bids are received during the bidding time, RBI allocates the competitive bids starting from highest price bid and moving down until entire amount is allocated. In a multiple price-auction, each successful bidder pays the price stated in his bid. In case of 'uniform price' auctions, all successful bidders pay the same price that is cut-off

price at which the market clears the issue. The method of auction is announced well in advance in the issue announcement notification.

In India, the banks and insurance companies are required to invest in government securities as per statutory reserve requirements. Main auction bidding strategy of the banks and the insurance companies is to price their bids in such a way that it is beneficial to them than buying from secondary market to meet their growing reserve requirement. Their buying demand in secondary market may increase the price in secondary market. Therefore, these bidders being long-term investor have to price their bids based on their own values of the security in longer time horizon as against the bidding strategy of other bidders like the primary dealers who acquire securities in auction mainly to sale later in the secondary market and thus their bid pricing would have valuation of shorter-term. The intermediaries like the primary dealers would like to earn quick profit by acquiring securities in the primary auctions and selling in the secondary market.

On the other hand, primary dealers have the obligation of underwriting the auction issue and get the incentive in the form of underwriting commission. Thus, the primary dealers would have of different bid pricing strategy. Moreover, on account of size (capacity) constraint, the bidding strategy of the primary dealers would be different than the banks and insurance companies. The primary dealers are smaller entities as compared to banks and insurance companies, which have higher financial capacities.

India follows the by and large universally adopted auction method with most of the auctions being multi-price (or discriminatory price) auctions. Uniform price auctions were also undertaken in the past (RBI Annual Report, 2002-03). Countries that follow regularly similar auction designs include the UK, Italy, Canada, Germany and Sweden (Keloharju M *et al,* 2005).

Even though the traditional Treasury procedures have theoretical drawbacks, it is difficult to prescribe the best way to auction government securities. The Treasury is obliged to provide easy entry into the auctions, broadening, where possible, the ownership of the public debt; and it must adhere closely to a crowded schedule of borrowing. While the

Treasury may not always get the top revenue amounts for the issuances, the prevailing auction system help the conduct of monetary policy and ensure a deep and active secondary market in government obligations.

## Section II

## Theoretical Backdrop[7]

Modern day fascinating world of auction theory and its application has been termed as "auction engineering" and it thrives on multiple discourses of Game Theory, experimental economics of Design Mechanism, Operation Research and Empirical Sciences like statistics, simulation and computing science. To boot, auction is being increasingly cultivated as a very effective applied tool in pricing and allocating economic good so much so that related auction methods have created "the most single exciting province of applied economics during last dozen years" (Warsh, 2006).

To have a comprehensive summary on the auction literature is a daunting task as it 'continues to grow at a prodigious, even accelerating rate' even after three decades of intensive work that started in the late 1970s and early 1980s, just when the right game-theoretic methods for studying this subject namely games of incomplete information and perfect equilibrium was becoming widely known (Maskin, 2004).

Auctions help "increase" or "augment" ('*augere*') prices of exchange of ownership of different kinds of assets in uncertain context where the buyers and sellers do not have *a priori*, precise idea on pricing (Aryal *et al*, 2007). Auctions are used by the governments to set up new assets markets namely energy sources like offshore oil and gas lease, commodities like wool and forest timber, transport infrastructure and logistics, pollution permits and spectrum for mobile-phone services as also for privatisation of national firms (Klemperer, 2004). In such a zest for market-oriented instruments of experimental economics of the new millennium, a consensus has been reached among the practitioners that the most effective way to sell government securities is through auctions (Kastl, 2008). William Vickery's (1961) classic inquiry into auctions is

considered as the foundation of the theory of auctions. This had subsequently flourished into a growing discipline to embrace new environments and new theoretical as well as empirical developments. Many practical problems in the form of testable hypotheses came up and methodologies were developed to carry out laboratory experiments and inferential procedures to validate the field data on bidding behaviour (*op cit* Paarsch *et al*, 2006). Auction theories, modified suitably by strong empirical evidences when put to practical work in the 1990s led to highly successful designs on radio spectrum auctions in the mid-1990s. Along with came many more theoretical and synthetic developments on a variety of auction designs (Milgrom, 2004).

William Vickrey established the basic taxonomy of auctions by classifying them based on the order in which prices are quoted and the way in which bids are entered. First, securities can be awarded at prices that are progressively lowered until the entire issue is sold; alternatively, the auctioneer can arrange the bids in ascending order by their price and decide on a single price that places the total issue. By the second measure, the auction can be a private affair with sealed bids opened by the auctioneer (i.e. price is not known to other bidders), or it can be conducted in real time, with participants in a single room or connected by phone/ electronic bidding in public view (i.e price is known to other bidders). This two-by-two classification yields four different types of auctions namely (i) the first-price sealed-bid auction, (ii) the second-price sealed-bid auction, (iii) the descending-price open-outcry auction and (iv) the ascending-price open-outcry auction.

Treasury auctions wield a composite design known as multiunit sealed bid auctions. Such granular single price bids bestow strategic flexibilities to each bidder so that the stipulated amount of securities notified to be issued gets determined at a cut-off issuance price based on a well spread-out demand schedule, maintaining the competitive rigour as well as transparency in the whole process. Optimality of the best price determination is premised upon the assumption that all the bidders are rational and they put their bids efficiently. Compared to other auction designs, Treasury auctions are expected to yield the highest expected

revenue (utility) to the seller, while leaving sufficient space for strategic manoeuvrability of bidding for multiple quantities of bonds as price-quantity pair. However, it is currently being debated that new auction devises like ascending-price, open bid design is superior over somewhat inefficient versions of the traditional single price bid auctions namely pay-as-bid (or discriminatory) as well as uniform price (or, non-discriminatory) auctions. While the ongoing debate on possible switching to modern day auction designs like Ausubel types dynamic auctions is evolving, it is a well accepted fact that the established markets have a liking for the traditional auction structure wherein dominant market participants would like to derive comforts from consolidated use of the current processes (Ausubel, 2004). Anecdotal recording on the institutionalisation of Treasury securities auctions also suggests that the mere prospect of greater efficiency may not necessarily effect change that requires a large number of factors to alter familiar patterns of behaviour; change sometimes also depends on following a path that facilitates learning and implementation of new patterns (Garbade, 2004). As evidenced in the case of US securities market, the Treasury successfully configured the present efficient configuration of government bond auction[8] by combining familiarity, gradualism and a willingness to improve. Successful migration to a totally changed auction or even introduction of a new financial instrument by sovereign issuer requires lot of learning, creating motivation and learning among the participants as well as resolving many practical issues.

The general framework for analysing bidder behaviour in auctions used by economists is that of game theory. The auctions can be considered as strategic games and bidding behaviour determines the price for the security auctioned and thus the revenue raised for Government. Each bidder in the auctions submits price-quantity pairs. The valuation of each bidder depends on his or her information about the security. Bidders are assumed to behave competitively and not to collude making auctions as non-cooperative game. Successful bidding in the auction involves successful guesses about other bidders' information. Bidder X wins the auction if his bid exceeds the bids of other bidders and price paid is his bid price. The decision problem bidder X faces is to strategise a set of

bids that maximises his returns. It can be shown that the equilibrium strategy is a function of the bidders own valuation and the distribution of valuation of other bidders (Krishna, 2002).

It is often argued that sealed bid descending auction has a built-in bias in slapping winner's curse on successful bidders, which is quenched totally in case of open bid ascending auctions. The debate is still unsettled as would glean from the following competing arguments. First, it is argued theoretically that there is no systematic advantage of either sealed bid (Dutch) auction over the open bid ascending (English) auctions and vice-versa. This is premised upon a set of innovative results known as *Payoff Equivalence* theorems, which were first discovered by Vickery (1961) and extended by Myerson (1981), Riley and Samuelson (1981), Milgrom and Weber (1982). It began with Vickery's surprising finding that the average revenues and payoffs are same for every auction within a very broad class. Under certain idealised conditions, changing payment rules (e.g, uniform or multiple pricing, open or closed forms) cannot affect the participants' final payoff and thus the revenue finally realised. Such results are a kind of irrelevance conclusions, which are ingenuously used in analysing relative performances of different kinds of auctions. "Practical uses of the equivalence theorems are similar to the uses of Modigliani-Miller Theorem in financial economics, and the monetary neutrality theorems in macroeconomics" (Milgrom, 2004). It means that alternative designs are sought for in complex situations where key ideal assumptions are not tenable. Otherwise, simpler designs seem to be working fine. Its veracity, however, requires to be validated based on auction performance data from time to time, as environmental factors may undergo periods of remarkable changes, coercing thereby review of the assumed auction design. Second, it is argued in the contrary that irrelevance conclusion does not hold good in real life situations in the face of persistence of different behavioural factors in case of different forms. For example, proponents of ascending auctions often argue that no bidder is willing to bid close to fair value unless pushed to do so by the open competition of the auction design. Third, sealed bid auction is liked by the auctioneer over open bid forms because latter types never result in more being paid than is absolutely necessary to win the auction,

whereas sealed bids tenders are frequently evidenced to be leaving "lots of money being left on the table". Fourth, inherent rigour of sealed bid tenders relies heavily on the fact that available pricing information is equally and efficiently utilised by the bidders and to that extent preponderance of possible bid-shading balances possible chances of winner's curse, which could be at times demand driven aggressive bidding behaviour and there is no harm in collecting the "money left on the table" out of a pay-as-bid behaviour.

Similar arguments revolve around relative merits of two alternative forms for auctioning securities, namely *multiple price* versus *uniform price* auctions. Informal arguments like government getting more money from the first scheme, rationalising thereby that each bid paying its own price, or the counterpoint in favour of the uniform price auction that bidders who collectively know that they must pay their own bid *when they win* will bid less as guided by natural 'bid shading' behaviour reduce the market-clearing price leading to lower revenues, do not settle the issue. Irrelevance property inherent in the Payoff Equivalence property entails that till the designs do not affect the allocation principles among different groups of bidders, it does not affect the total revenue or the average prices obtained by the auctioneer. Data analysis of the bidding pattern revealed not much efficiency gains of uniform auction over multiple price design in the Indian context (RBI Annual Report, 2002-03).

The auction literature also distinguishes between independent private and common value auctions following Milgrom and Weber (1982). The value of the securities auctioned is not of private nature as there is secondary market where the securities traded and a bidder has the option to try to get the security in auction at his bid price or choose to buy it from secondary market at the prevailing price. For existence of secondary market, Government securities auctions are usually considered as common value auctions. Ausubel (2004) have observed that in a common value model the 'winner's curse' is more pronounced. The more amount of the security a bidder wins, the worse news is this for him as bidder has to pay higher price for the security. Ausubel refers to this phenomenon as 'champion's plague'. Rational bidders adjust for champion's plague

by reducing their demand for any given price. In auction parlance, this is known as bid shading. Nyborg *et al* (2002) argue that intra-bidder dispersion and quantity demanded would be impacted by bidder's capacity. Wilson (1979) described a multi-unit auction model and prescribed that risk neutral bidders would submit downward sloping demand schedules and the market clearing price will be at the point where bidders demand curve intersects his residual supply curve. Back and Zender (1993) shown that all bidders pay the same price and make no profit when bidders' marginal value is constant across the bidders and the value is perfectly known. Sometimes, auction participation could also dwell upon regulatory requirement. Hortacsu (2002, 2006) have argued that the banks participate in Turkish Treasury auction to fulfil their reserve requirement. It is of special importance that marked heterogeneity among the disparate regulated institutional entities may influence their values. Distinguishing features of private value and common value items could be understood from Milgrom's (1982) treatment of oil, gas and mineral rights. Empirical models are also being developed for testing private value component in otherwise dominating features of Treasury bills.

Repo auctions are used to inject central bank funds against collateral into the banking sector. Nyborg *et al* (2005) analysed the basic bid-data of the European Central Bank's (ECB) variable Repo rate auctions. The ECB uses standard discriminatory auctions and hundreds of banks participate. The amount auctioned over the monthly reserve maintenance period is in principle exactly what banks collectively need to fulfil reserve requirements. ECB's bidder-level data study finds: (i) Bidder behaviour is different from what is documented for treasury auctions. Private information and the winner's curse seem to be relatively unimportant. (ii) Under-pricing is positively related to the difference between the inter-bank rate and the auction minimum bid rate, with the latter appearing to be a binding constraint. (iii) Bidders are more aggressive when the imbalance of awards in the previous auction is larger. (iv) Large bidders do better than small bidders.

Literature on multi-unit auctions[9] does not provide any definitive recommendations whether the ultimate goal is that of revenue

maximisation or efficiency of the allocation. So far as country practices are concerned, there is a clear preference between the two most widely used mechanisms. As per the survey on auction practices adopted for Treasury securities in 42 industrialised undertaken by IMF staff members in the second half of the 1990s, it has been recorded that 39 countries conduct discriminatory auctions and only 3 countries use a uniform price auctions. Ausubel and Cramton (2002) argued that the comparison of the uniform and discriminatory auctions, both in terms of allocation efficiency and revenue maximisation, is an empirical question. Either form could be better under different circumstances, which may be evaluated based on empirical analysis. Standard data analysis in the form of mean variance analysis, assessing bid distribution pattern as also concentration analysis across the auctions during a year having certain homogeneity regarding the environment as well as auction rules and procedures would provide certain key evaluative information. Moreover, structural econometric modelling of the auction data would statistically validate certain common hypotheses relating to general performance of the auctions in quantitative terms.

## Section III

## Performance Analysis of Government Securities Auctions in India

### 1. Empirical background

The total amount of securities raised by Government of India during the year, 2006-07 was Rs.1,62,000 crore. Of this amount Rs.16,000 crore was raised under MSS (4 auctions) while the remaining amount of Rs.1,46,000 crore was for the market borrowings of the Govt of India. Of the 37 auctions held during the year, 3 new issues were placed through yield-based auctions while the remaining 34 were reissues of existing securities conducted through price-based auctions.

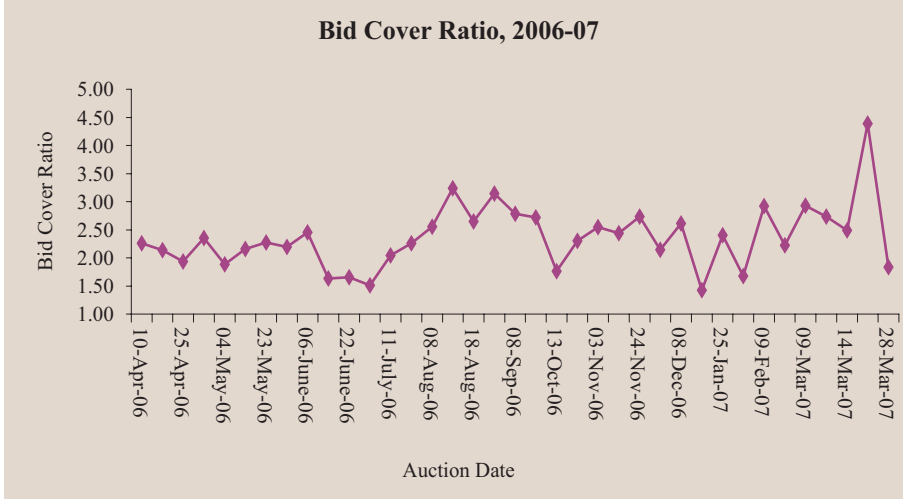
Auctions for the primary issuance were electronic sealed-bid auctions with multiple bids at different prices from market participants. An analysis of the bid-to-cover ratio and the distribution of bid price data reveal several important insights into the temporal behaviour of the overall market demand for the government securities as also pricing efficiency and concentration of bid price at the auctions conducted in 2006-07.

## 2. Behavioral pattern

**2.1 Market demand**: Demand for the government securities by the market can be measured in terms of bid-to-cover ratio (BCR) defined as total amount of bids received divided by the notified auction amount. The average BCR during 2006-07 was 2.36 as compared to 2.19 during 2005-06. Out of 37 auctions, BCR was above 3.0 in three auctions (two out of 29 auctions during 2005-06) showing higher demand compared to previous year. Maximum market demand was 4.39 times to notified amount for MSS auction of Rs.2000 held on March 22, 2007. In the overall average BCR is impacted predominantly by the liquidity scenario and the interest rate expectations. The data on BCR reveal a discernible pattern in the form of distinct quarterly cycles except a large swing witnessed in the concluding part of the study year due to a couple of market stabilization scheme (MSS) auctions.

Overall demand for government securities can be analysed in terms of (i) sectoral profile, (ii) demand-price relationship, (iii) effect of issue size, and (iv) effect of tenure of security.

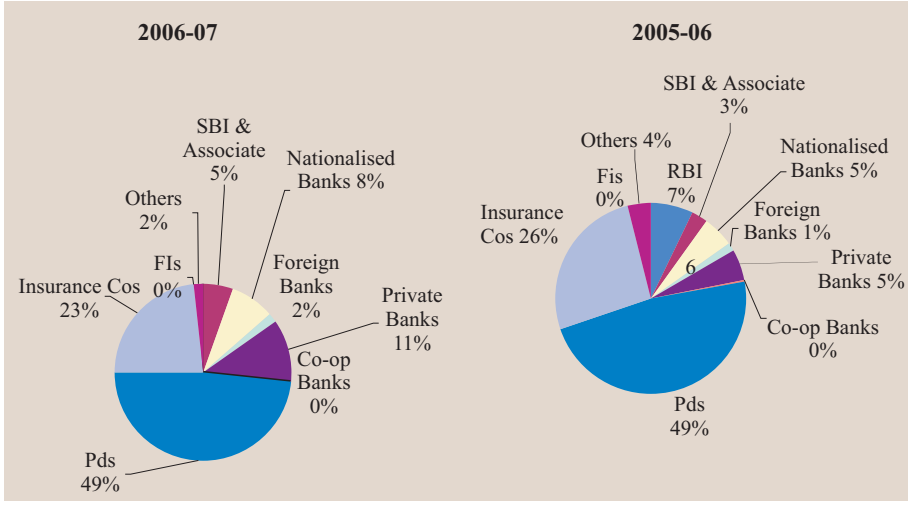
- **Sectoral profile:** The Primary Dealers have the obligation to underwrite the entire auction issue after introduction of the Fiscal Responsibility and Budget Management Act 2003 during 2006-

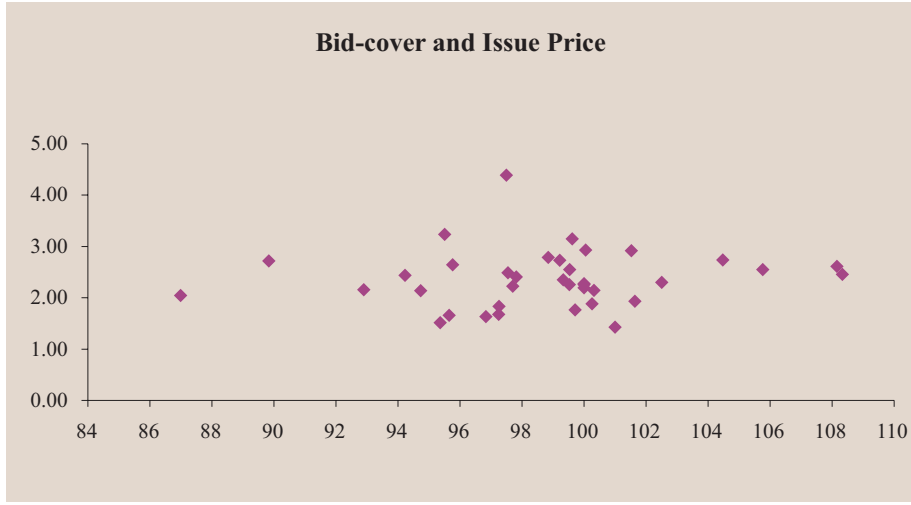


07. Hence, major portion of the issuance was subscribed by the PDs (including devolvement). The market segment-wise subscription is given below. Sectoral profile of the subscription to government securities remained by and large unchanged but for the private sector banks garnering an increased share of 11 per cent (5 per cent in 2005-06) of the overall amount of securities issued in 2006-07.

- **Demand – price relationship:** As stated above, there were 34 re-issuances of securities, thus, the price of securities being auctioned depend on the coupon of the security, higher the coupon means higher price and hence higher cash-outgo from the successful bidders. During 2006-07, the average cut-off price of the 37 auctions was Rs.98.72 compared to Rs.103.77 for the previous year. The correlation coefficient of auction demand (BCR) with cut-off price worked out to low (0.0993 for 2006-07 vis-à-vis –0.0706 for 2005-06) implying that market price and hence coupon is not a major factor for market demand. Since pricing in G Sec market in India is predominantly based on the yield-to-maturity (YTM) basis, the observation is in line with the market practice.

- **Demand versus Issue Size**: The average issue size of the auction was Rs.4,378 crore in 2006-07 as compared to Rs.4,233 crore in previous year. The auction size varied between Rs.2,000 crore to





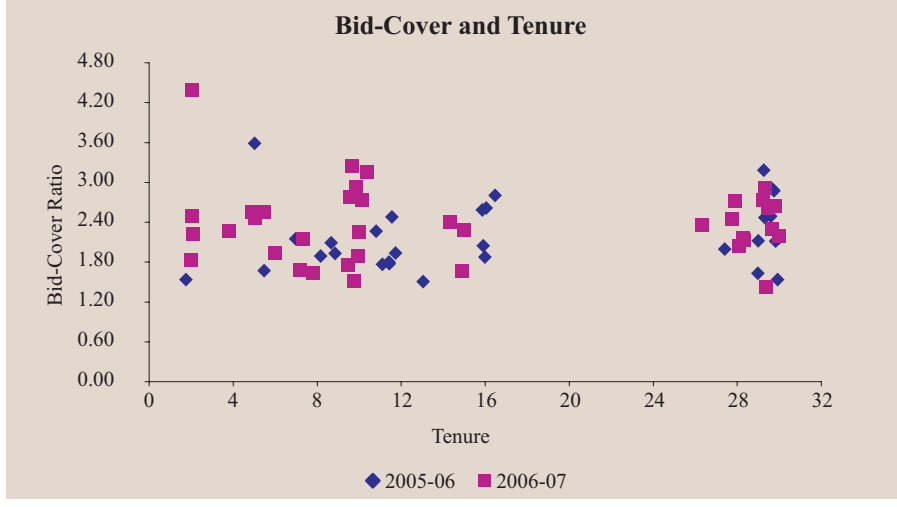

Rs.6,000 crore. The Bid-to-Cover ratio showed a statistically significant inverse relationship with issue-size (correlation coefficient of –0.3968 in 2006-07 as compared to –0.2218 in 2005-06) i.e. the market demand is lower for larger issues.

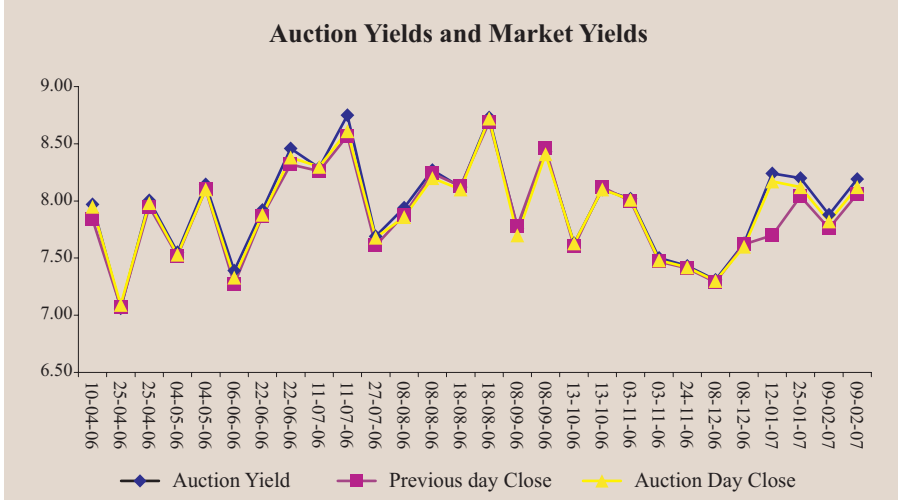
- **Demand versus Tenor**: The tenor of the securities issued during 2006-07 varied between 30 years to 2.02 years of residual maturity. The average maturity of the auction issues was 15.20 years in 2006-07 as compared to 17.63 years in 2005-06. Most of the issuance was in the range upto 16 years of residual maturity and then in the

range of 28-30 years of maturity. During this period, there was no issue in the range of 16-28 years of maturity. The pattern of market demand measured in terms of bid-to-cover ratio (BCR) and residual maturity of the security auctioned is shown in the graph below. It may be observed from the data that the market demand has no over all statistical relationship with security tenor. It may appear contrary to common understanding due to segmented Indian market and the fact that shorter tenor securities (up to 10 year) accounts for about 59 per cent of the total issued amount.

**2.2 Bid Pricing and Bidding Efficiency**: The market pricing of primary issuance was in line with the prevailing market prices indicating the market pricing based on the sovereign yield curve. The prevailing market prices in terms of the auction day closing yield and previous day closing yield along with auction yield is presented below which indicate complete alignment of primary issuance with secondary market yields.

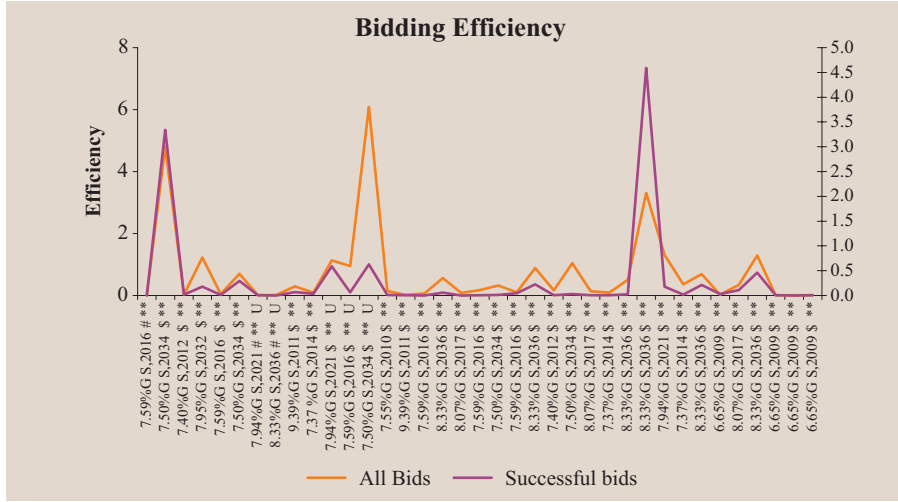
Bidding efficiency, when measured in terms of the dispersion of the bid prices around the cut-off price, requires to be weighted by the share of the amounts bid to minimise the effect of smaller size extreme bids. The lower the dispersion the more efficient is the bidding by the participants. Bidding was quite efficient (i.e. dispersion was low)






during most of the auctions except for the three longer tenure securities auction.

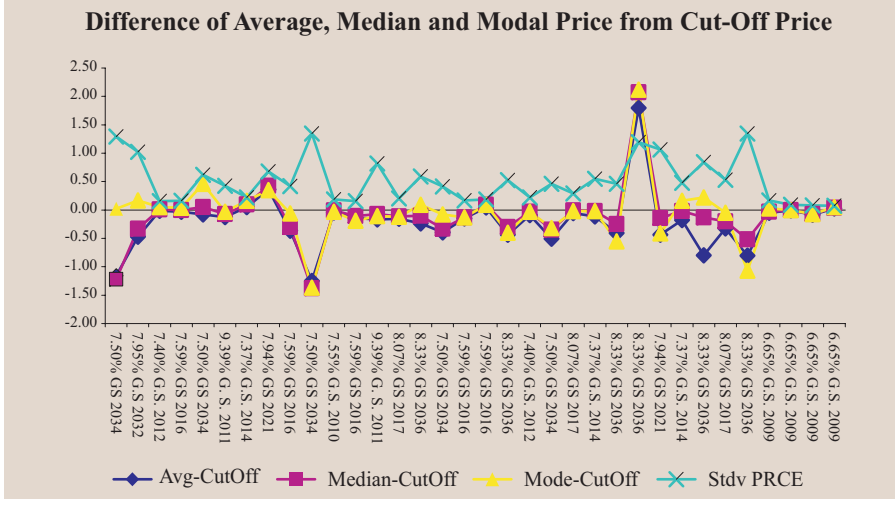
**2.3 Distribution of Bid Prices**: The various market price principles assume the normality in pricing behavior. The bid-prices in the primary auctions also follow the normal distribution around the centrality of the cut-off price. It may be observed that the primary auction mechanism is such that cut-off price emerges from the quantity demanded at the price and thus bid-amount determines the cut-off price among the bid-prices instead of the centrality of bid-prices.



Following chart presents the deviations of various measures of centrality of bid-prices like simple average, median and modal prices from the cut-off price. It may be observed from the chart that bid-price distribution is quite symmetrical with average, median and modal bid prices being close to each other in all the auctions. It may be noted here that average, median and modal bid-prices have been calculated without any weight to bid amount; all market participants' bid pricing is assumed to be equally likely.

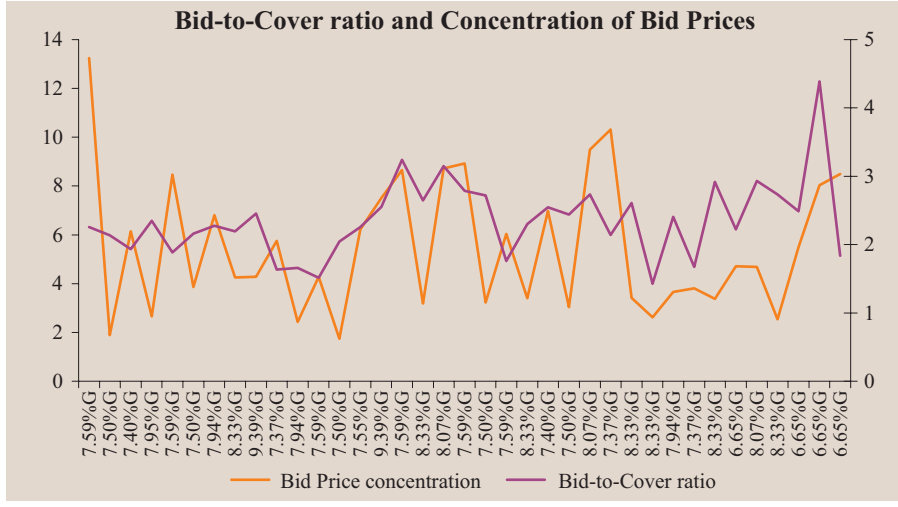
The closeness of cut-off price to the average bid-price shows the centrality of the market pricing in the auction process. This trend along with the closeness in secondary market prices reinforces the price-discovery mechanism of auction process. There were few deviations on account of devolvement (auction of 7.59%GS2016 & 7.50%GS2034) when cut-off price was higher than the central bid price. Similarly, auction of 8.33%GS2036 witnessed higher average bid price than the cut-off price as bid-cover ratio was lower at 1.43 for this issue for lower market demand and thus putting cut-off price lower than the average bid price. The skewness and kurtosis for each auction are also computed (Statement -1), which shows that the pricing behavior follows, by and large, a bell-shaped normal distribution.

**2.4 Concentration of Bid Price**: Concentration of bid price has



been measured by the Herfindahl index (*op cit* RBI Annual Report, 2002-03) of bid prices multiplied by the total number of bids. This is an indicator of the uniformity of market expectation. Higher the concentration of bid prices more is the uniformity of price/yield expectation of the bidders. Higher concentration around the expected cut-off price/yield is, therefore, more desirable. This measure has generally been high implying reasonable concentration of bid prices at auctions, which tallies with the observation of efficient bidding for most part of the year. Concentration of bid price has been found to be following the trend in BCR, indicating that when market demand is high market also has a reasonably uniform view on bond yields.

**2.5. Investor group-wise analysis**: The investors participating in the primary auctions may be categorised into 11 groups for studying the investor group-wise bidding behavior namely primary dealers, insurance companies, nationalised banks, State Bank of India and its Associates (SBI group), new private sector banks, other private sector banks, foreign banks, co-operative banks, mutual funds, other financial institutions and individuals. Of these, the last two categories of investors namely other financial institutions and individuals had participated in few auctions and thus the data analysis is confined to the major nine investor groups.

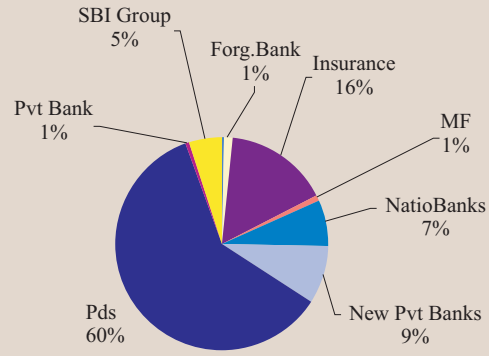


Among the Investor-Groups, the primary dealers (PDs) are required to underwrite the entire issuance (except for MSS issues), and to submit bids for the amount underwritten by each one of them. These stipulation perforce the predominance of PDs participation in the auction process. The banks and insurance companies are subject to statutory investment in G Sec. The investor-group-wise analysis has been presented on the various aspects of their participation in auctions in terms of number of bids and amount of bid submitted, and bid pricing.

(i) Auction participation: As expected, the primary dealers were ranked first with largest demand contributing to 60 per cent of the total bid amount. Banking sector contributed for 23 per cent comprising the new private sector banks (9 per cent), nationalised banks (7 per cent), SBI group (5 per cent), other private sector banks and foreign banks (1 per cent each) while the insurance companies had a share of 16 per cent of the total bid amount received in the auctions.

There is a wide variation in participation of investor-groups across the panel of the various auction issues. The insurance companies participate most aggressively in the longer tenure securities. PDs have submitted bids for larger amount in medium and short-term issues as compared with long-term issues. Banks also participated more in the medium and short-term issues. In terms of number of bids submitted in the auction, the ranking is – primary dealers (62%), banks (30%) followed

**Distribution of Bid Amount**



by mutual funds (4 per cent) and insurance companies (2 per cent). In all, 7,078 bids were received in the 37 auctions during the year of which 4,344 bids were submitted by primary dealers, 883 bids by nationalised banks, 597 by new private sector banks, 319 by SBI group, 267 bids by mutual funds, 153 bids by insurance companies.

(ii) Bid pricing: The bid pricing by investors is by and large guided by the yield curve; however, the individual pricing would also be influenced by the desire to get allotment in the auction. The bid pricing of investors like banks and insurance companies having statutory requirement on investment in government securities, with hold-to-maturity orientation, could be different from bid pricing of primary dealers who mainly acquires the stock in primary issues for later sale in the secondary market. In such a scenario, it is most likely that the primary dealers may be pricing their bids keeping near short-term movement of yield-curve whereas insurance companies would be pricing their bids in view of longer-term expectation of the yield-curve movement.

The investor-group-wise bid pricing behavior has been analysed for two aspects *viz.* within group variance in bid price indicating the uniformity of pricing, and difference between the cut-off price and the average bid-price in each of the auction. The investor-group-wise variance in bid prices presented in the annexed table shows the uniformity within the investors of a group giving similar considerations in bid pricing. For measuring the aggressiveness in auction biding, the average of difference from cut-off price (bid price – cut-off price) is analysed for each of the investor-group in each auction (Statement-2.). It shows clearly that the insurance companies are bidding aggressively in the longer-tenure securities' auctions having average bid price higher than the cut-off price. On the other hand, primary dealers are very competitive in their bid pricing for short and medium term securities auctions. The nationalised banks have the smallest overall difference in the auction bidding.

(iii) Success ratio**:** The aggressive bid pricing by an investor-group in the auction of security can be measured in terms of success ratio (amount allocated as percentage to bid amount). The auction-wise success ratio of various investor-groups is presented in the Statement-3.

It shows that the insurance companies have achieved a success ratio of hundred percent in nine auctions, - the highest among all the investor groups. Overall, the insurance companies have the highest success ratio indicating that their bid pricing is comparatively driven by desire to get allotment as compared with other investor groups. SBI group and the mutual funds have achieved the success ratio of hundred percent in four auctions. In terms of the overall success ratio, the ranking is: insurance companies (65 per cent), foreign banks and new private sector banks (54 per cent each), nationalised banks (50 per cent), SBI group (47 per cent), private sector banks (35 per cent), mutual funds (35 per cent), primary dealers (33per cent) and co-operative banks (23 per cent).

The primary dealers have quite lower success ratio of 33 per cent among the investor-groups because of the compulsion on bidding amount (they are required to underwrite the full amount and the bid amount can not be lower than the underwriting amount). As a result, bidding of the primary dealers in some of the auctions of longer tenure is quite negative. In twelve auctions, the primary dealers have success ratio of less than 20 per cent, of which, five auctions have success ratios even less than 10 per cent.

## Section IV

## Bid Pricing Strategy – Empirical Model

For understanding the bid pricing behavior of the participants in the auctions of government securities, it is important to focus on the variable 'distance of bid price from cut-off price' (i.e., bid price – cut-off price) to analyze the pricing strategy across various auctions. For this analysis, the price-based auctions have been considered.

The seminal studies of Nyborg *et al* (2002), and Hortacsu (2002, 2006) have observed the bid-shading in multiple-price auctions to minimise the 'winners-curse', i.e. bidders would like to reduce the bid size (bid amount) for prices which are more likely to get accepted. The bids above the cut-off price are accepted in the auction. Thus, bid size is one of the important variables to explain the bid pricing strategy. The next variable included in the model is market demand for the auction.

The market demand is measured in terms of bid-cover ratio for the auction. It is expected that higher market demand would induce aggressive bidding strategy of higher bid pricing. The securities auctioned are of varying maturities and it is expected that longer tenor securities would witness less aggressive pricing as longer duration securities have higher market-risk. Further, investor-group-wise behavior is also important to bid-pricing strategy as the primary dealers have the obligation of underwriting and also their role is mainly of intermediary to get securities in auction and later sale in secondary market. In order to measure the significance of market makers like primary dealers bid-pricing, a dummy variable is introduced in the model to capture the bid pricing strategy of the primary dealers. On the other hand, insurance companies have regulatory requirement for investment in the government securities for their long-term life-policies in view of India's 'population dividend'. As observed by Hortacsu (2002, 2006) in Turkish Treasury auctions, and the preliminary data analysis presented in the previous section also indicated a distinct bid-pricing strategy of ling-term investor like insurance companies in the auctions. Thus, a dummy variable is included in the model for insurance companies. Thus, the model is:

$$\text{DEVCUTOFF} = a_0 + a_1\ \text{BIDSIZE} + a_2\ \text{BIDCOVER} + a_3\ \text{TENOR}$$

$$+ a_4\ \text{DUMMYPD} + a_5\ \text{DUMMYINS}$$

where DEVCUTOFF = deviation from cut-off price (bid price – cut-off price) of the i-th bid in the j-th auction; BIDSIZE = amount bided at price in i-th bid; BIDCOVER = Bid-Cover ratio (i.e. total bid amount to the notified amount of the j-th auction; TENOR = tenure of security for which bid is placed in the j-th auction; DUMMYPD = 1 if bid belongs to a primary dealer, 0 otherwise; DUMMYINS = 1 if bid belongs to an insurance company, 0 otherwise.

The ordinary least square estimates of the regression equation is presented in Table 1 for four scenarios. The above results shows that most of the coefficients have the expected sign and are significant. The R-squared values are low but comparable for such large hetero-scedastic and multi-modal distributed discrete data. Estimates are similar to those obtained for other countries' studies (Nyborg *et al,* 2002).

As expected, the coefficient of bid size is of negative sign with statistically significant t-value. The aggressively priced bids are of lower bid size in the government securities auctions. Indian bidders are shading their bid amount for higher priced bids to minimise their winners-curse in the auctions. However, the coefficient for bid size is positive but insignificant for the auctions of very short tenor securities under MSS auctions. This observation can be interpreted as negligible 'winners-curse' due to less market risk for short-tenor securities. The short tenor securities' price would be less volatile in case of sovereign yield curve movement and thus it has opposite sign as compared to securities auctioned under normal market borrowing having larger tenor.

The bid-cover ratio representing market demand for the auctioned security is observed to have significantly negative coefficient in all types of the auctions. The bid pricing strategy of bidders in India is to have larger market demand with less aggressive pricing. The tenor of the security auctioned is also having statistically significant negative coefficient (except for the longer tenor auctions). As expected, the bidders pricing would become conservative (lower prices) with increase in the

**Table 1: Estimation Results**

| | **All Auctions** | **Auctions (excl. MSS auctions)** | **Longer Tenor Auctions (tenor>20 yrs)** | **MSS Auctions of Short-tenor (tenor<3yrs)** |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
| Constant | 0.477<br>(12.08)** | 0.659<br>(13.48)** | -3.149<br>(4.74)** | 2.043<br>(5.42)** |
| Bid Size | $-0.231 \times 10^{-3}$<br>(2.86)** | $-0.253 \times 10^{-3}$<br>(2.89)** | $-0.585 \times 10^{-3}$<br>(2.90)** | $0.039 \times 10^{-3}$<br>(0.69) |
| Bid cover | -0.176<br>(12.09)** | -0.257<br>(13.65)** | -1.060<br>(16.89)** | -0.039<br>(8.50)** |
| Tenor | -0.010<br>(11.90)** | -0.009<br>(9.07)** | 0.200<br>(8.58)** | -0.959<br>(5.26)** |
| DummyPD | -0.132<br>(7.62)** | -0.151<br>(7.89)** | -0.452<br>(8.52)** | -0.013<br>(1.38) |
| DummyIns | 0.247<br>(3.87)** | 0.244<br>(3.63)** | 0.405<br>(2.45)* | NA |
| No. of observations | 6613 | 5958 | 1791 | 655 |
| R-squared | 0.06 | 0.06 | 0.18 | 0.12 |
| F- Statistics | 78.78 | 77.56 | 78.99 | 21.36\ |

(Figures in parentheses are t-statistics - ** significant at 1 % level, * significant at 5% level)

tenor of security auctioned as the fall in the market prices increases with tenor for given rise in yield curve.

For analysing the investor-group's bidding behavior, two dummy variables have been included in the model for the two dominant investor-groups namely the primary dealers (DUMMYPD) and the insurance companies (DUMMYINS). The sign of the coefficient of ' DUMMYPD' observed to be negative indicating the low pricing in bidding strategy of the primary dealers. As expected, it is statistically significant in the government borrowing auctions because the primary dealers have the underwriting obligation and consequent bidding commitments. Primary dealers are necessarily required to submit bids for the amount underwritten by them and thus low bid pricing strategy along with downward sloping bid demand is adopted to minimise their 'winners curse'. The dummy becomes insignificant in the monetary stabilization scheme (MSS) auctions where the primary dealers have no underwriting and bidding commitments. This result has an important policy implication. There are some countries where primary dealers have exclusive bidding rights. If such exclusive right is provided in India, the bidding strategy of the primary dealers would result in increased borrowing cost to the government.

On the other hand, the investor group of the insurance companies views their investments in government securities with different perspective. Insurance companies are mostly held-to-maturity investors rather than active traders of the government securities and thus their pricing strategy have to be different than the primary dealers who are mainly active traders. Accordingly, the coefficient of the dummy variable (DUMMYINS) is significantly positive. Insurance Companies have not participated in the short tenor MSS auctions.

## Section V

## Empirical Findings and Results - Summary and Conclusion

The market response to the primary auctions was better in 2006-07 as compared with 2005-06. The market demand reveals a discernible pattern having quarterly cycles with deviation in the concluding part of

the financial year with couple of MSS issuances. The primary dealers with underwriting obligation for entire issuance has subscribed to the major portion of issuance. The coupon rate or price of the security being auctioned is found to be insignificant factor for market demand as the market is based on yield-to-maturity and not the price.

The market demand has statistically significant inverse relationship with issue size. The residual maturity or tenor of the security being auctioned does not show any statistical relationship with market demand. This aspect could be explained in terms of complimentary demand from banking and insurance sectors for short-medium and longer maturity securities, respectively. The primary dealers act mainly as intermediary for primary issuance and not the ultimate investors.

The auction yields are in alignment with secondary market yields. Bidding was quite efficient with low dispersion and high concentration of bids around the cut-off price reflecting a fair amount of transparent market.

Investor-group-wise variance in bid prices shows the intra-group uniformity giving similar considerations in bid pricing. There is wide variation in participation of investor-groups among various auction issues. The insurance companies participate more in longer tenor securities than the short-term securities. The primary dealers had submitted bids for larger amount in the medium and short-term issues as compared with the long-term issues. Banks also participated more in the medium and short-term issues.

The bid pricing of the investors like banks and insurance companies, who are held-to-maturity type of investors with statutory requirement, found to be different from bid pricing of the primary dealers who mainly acquires the stock in primary issues for later sale in secondary market. The insurance companies are found to be bidding aggressively in the longer-tenure securities' auctions with average bid price being higher than the cut-off price.

Different investor groups show their distinct levels of aggressiveness in bid pricing as reflected in their overall success ratios: insurance

companies with 65 per cent, foreign banks and new private sector banks with 54 per cent each, nationalised banks with 50 per cent, SBI group with 47 per cent, private sector banks and mutual funds with 35 per cent each, primary dealers with 33 per cent and co-operative banks with 23 per cent.

Analysis of the bidding behavior for the Indian government securities auctions shows that generally bidders pricing strategy is negatively influenced by the bid size, bid cover ratio and tenor of the security. Indian bidders are reducing their bid amount for higher priced bids to minimise their winners-curse in the auctions. However, for the auctions of very short tenor securities under the auctions of securities issued under MSS, the coefficient is positive but insignificant unlike the other auctions. In general, the conservative bid pricing strategy increases with the tenor of security and also with the market demand. The investor-group dummy variables for the primary dealers and the insurance companies were observed to be significant with opposite signs. Primary dealers have the obligations and bidding commitment and thus adopt a conservative pricing strategy to minimise their winners curse. On the other hand, insurance companies adopt a strategy of relatively more aggressive bidding as they like to hold the securities till maturity. Statistically significant difference in bid pricing strategies of the two investor-groups in auctions in India indicates the private-value case of GoI dated securities auction unlike the commonly perceived common-value case of government securities auctions.

To condude, the present study provides an insight to the bidding strategy in the auctions of government securities in India. The large financing of the Central Government deficit is being raised through the primary auctions without the recourse to monetisation. The market response to the primary auctions of government securities has been very good and the bidding has been observed to be quite efficient. The cut-off prices emerged in the auctions were in line with the centrality of market expectations and bid pricing observed to follow normal bell shaped distribution around the cut-off prices. The diversified investor base has ensured the spread of maturity profile of government securities. Various investor-groups participating in the primary auctions have not only

ensured good demand for auctioned securities of various tenors but also imparted a fair degree of competitiveness in the auctions. The bid pricing strategies in auctions in India also confirm the bid-shading behavior of bidders to minimize their 'winners-curse' as observed in other countries. The bid-pricing strategies adopted by 'market-maker' investors *viz.* primary dealers observed to differ significantly than the pricing of buy and hold investors, *e.g.* insurance companies. The observed difference in the two pricing approaches indicates that while former follows 'common-value' case having market price movement in mind and latter follow 'private-value' case with long term price in mind.

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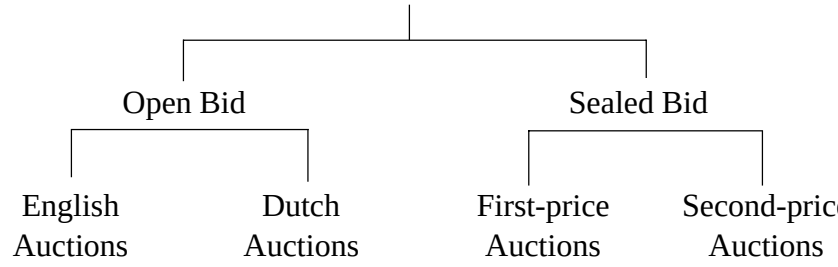
## Annex

**1. Auction designs and rules:** There are different ways to classify auctions. There are open auctions as well as sealed-bid auctions. Besides, bid prices could be put in ascending format (e.g., auctions under hammer in the English style) or the bids are allowed to drop downwards (e.g., Holland's flower market). Experts mostly agree on four major auction types of *one-sided auctions* (bids are as per one-sided sale design, not the "asks" as in the case of double-sided market design. These are commonly termed as English, Dutch, First-Price sealed-bid, and Vickrey (uniform second-price) auctions.

**Common Auction Designs**




Second-price auction format, which was invented by William Vickrey (1961), does not find much real-life application, but its forms and contents are of central theoretical importance. First price auctions are commonly used for selling mineral rights and Treasury securities. English auctions (open outcry or oral bid system) are mostly used for selling art, used cars etc. and Dutch auctions are used to sell flowers in Holland. One difficulty is the lack of commonality in naming conventions. What some people call a uniform second-price auction is known in financial communities as a Dutch auction, and no end of confusion results.

The Vickrey auction and other traditional formats like single round sealed bid auction started evolving out in the early nineties, when auction theory was put to work in various challenging areas using hybrid formats combining both the traditional and newly established design like ascending bid mechanism. Ascending bid auction (English variety) helps provide the bidders with more information achieving thereby gain in efficiency over single round sealed-bid auctions, which are generally used by the central governments like the US Federal Government

especially for the sale of high-value rights such as off-shore oil and gas leases.

Initial developments in the auction theories were on modelling the auctions of a *single indivisible object* to one of several *risk- neutral bidders* with *independent* private value properties. This is the classic case where the seller holds an auction because seller's information about the possible buyers with a varied value sense is imperfect and the seller likes to extract the best possible price for the object. And the above common formats were the alternative versions of conducting the actual auction.

The common auction rules are as under:

| Type | Rules |
|---|---|
| (i) English, or *ascending-price* | Seller announces reserve price or some low opening bid. Bidding increases progressively until demand falls. Winning bidder pays highest valuation. Bidder may re-assess evaluation during auction. |
| (ii) Dutch, or *descending-price* | Seller announces very high opening bid. Bid is lowered progressively until demand rises to match supply. |
| (iii) First-price, sealed bid. (Known as *discriminatory auction* in case of multiunit auctions). | Bids submitted in written form with no knowledge of bids of others. Winner pays the exact amount he bid. |
| (iv) Second-price, sealed bid or, *Vickrey auction*. (Known as c*ompetitive or stop-out price* auction in multi-unit auctions. | Bids submitted in written form with no knowledge of the bids of others. Winner pays the second-highest amount bid. |

**2. Winner's curse:** Widely recognised as being that phenomenon when a "lucky" winner pays more for an item than it is worth. Auction winners

are faced with the sudden realization that their valuation of an object is higher as other participants estimated a lower market value for the item. One may appear to have won but actually end up with losing money because profits decrease (akin to Pyrrhic victory with devastating cost to the victor). The winner is the bidder who made the largest positive error in his valuation. The losers lose the item, but not any money. Anyone winning a bid against experts should wonder why the experts bid less. In auctions in which no bidder is sure of the worth of the good being auctioned, the winner is the bidder who made the highest guess. If bidders have reasonable information about the worth of the item, then the average of all the guesses is likely to be correct. The winner, however, offered the bid furthest from the actual value.Since most auctions involve at least some amount of common value, and some degree of uncertainty about that common value, the winner's curse is an important phenomenon.

In the 1950s, when the term *winner's curse* was first coined, there was no accurate method to estimate the potential value of an offshore Mexican oil field. For example, an oil field had an actual intrinsic value of $10 million, oil companies might guess its value to be anywhere from $5 million to $20 million. The company who wrongly estimated at $20 million and placed a bid at that level would win the auction, and later find that it was not worth as much. Other commonly cited instances of auctions where the winner's curse is significant are:

a. Spectrum auctions in which companies bid on licenses to use portions of the electromagnetic spectrum. Here, the uncertainty would come from, for example, estimating the value of the cell phone market in New York City.

b. IPOs, in which bidders need to estimate what the market value of a company's stock will be.

c. Pay per click advertising online, in which advertisers gain higher ranking if they bid higher amounts per click from a search engine user.

**3. Winner's curse *vis-à-vis* bid shading**: The **winner's curse** is a probable phenomenon that could occur in common value auctions with

incomplete information whereby the winner will tend to overpay. However, an actual overpayment will generally occur only if the winner fails to account for the winner's curse when bidding. Despite its dire-sounding name, the winner's curse does not necessarily have ill effects. Bidders have only estimates of the value of the good. If, on average, bidders are estimating correctly, the *highest* bid will tend to have been placed by someone who overestimated the good's value. This is an example of adverse selection very similar to the classic "lemons" example of Akerlof. Rational bidders will anticipate the adverse selection so that even though their information will still turn out to have been overly optimistic when they win, they do not pay too much on average. Savvy bidders avoid the winner's curse by bid shading, or placing a bid that is below their ex-ante estimation of the value of the item for sale but equal to their ex-post belief about the value of the item, given that they win the auction. The key point is that winning the auction is *bad news* about the value of the item for the winner if he/she was the most optimistic and others are correct in their average ex-post estimations. Therefore savvy bidders revise ex-ante estimations downwards to take account of this effect in multi-unit auctions.

**4. Auction Format**: The core of any auction design is the art of building up best price discovery mechanism. It is intrinsically linked with structuring the process of bid submission known as auction format. The common auction formats are: (i) *Live-bid auction* is just the most commonly perceived format. It is typically a public event held where bidders and spectators assemble together. (ii) *Two-bid auction* includes a written pre-auction bid followed by a live auction. The auction is then restricted event including only those bidders that submitted a pre-auction written bid. Often the bidding is further restricted to include live bidding from only the top five or three pre-auction bidders. This two-bid auction system is used most often when selling items of special value such as exceptional residential building, significant asset like a turnkey business package or systemically valued financial assets. (iii) In *on-line bid auctions*, Auction Service providers in the US have invested thousands of dollars and experimented extensively with offering and selling real estate on-line. Internet has provided significant marketing

advantages. (iv) *Sealed/ Tender Bid auction* format is used when dealing with complicated commercial sell and purchases of multi-unit/ components items like composite housing estates, large tract mineral rights transactions or Treasury securities where specific terms for the purchase are not all pre-determined by the Seller. Buyers do have room to negotiate the terms of the purchase of the property, whereas the seller is provided an opportunity to potentially receive a higher price. (v) *Open bid* format is the new avatar of live bid or the classical outcry system of price discovery mechanism. (v) *Fax bid* auction process, developed in 1997, is most often utilised in the US and Canada when dealing with very high value commercial or multi-family properties.

**5. Auction's capabilities and inherent limitations**: Suitability of an auction format depends on the nature of dominantly embedded value consideration for the object. Value uncertainty or more specifically, information asymmetry is a key feature of auction. In an auction, each bidder is assumed to make rational bidding based on his assessment on value consideration. Following are the two important valuation specifications:

a. **Private Value -** When an object is wanted for personal consumption and a bidder has no primary motive to resell. The bidder is motivated to pay up to a certain maximum, independent of valuations made by others. Art bought for personal pleasure is an example. A private valuation is a subjective decision. It is private in that one bidder does not know another's value. Sometimes it is possible to infer this information by observing other bidders. Private value objects have the features like: (i) No bidder knows fully other bidders' value content, each bidder keeps the full value sense strictly as private information, (ii) Knowledge of few bidders' valuation does not affect how much the object is worth to a particular bidder, (iii) It is not applicable in case the asset or the object has an active resale market. (exact value is derived only on its full consumption by any sole bidder as in the case of, say, paintings, stamps and antics).

**b. Common Value -** Objects acquired primarily for profitable resale in secondary markets. Individual bids not predicated only on personal

valuation but also on valuation of prospective buyers. Each bidder tries to estimate value of an object using the same measurements. Each one tries to estimate object's ultimate worth using same standard. Art bought for resale is an example. Common value objects have some specific features, namely : (i) Actual value is same but not known. (ii) Bidders have different private information about the common value. Available information, called as private signal or a view, could be an expert estimate correlated with the value that is going to emerge finally; further add on relative value estimate could be attached by individual bidders. Exact value, as it were, derived from a process with *interdependent values.* (iii) Common value is a special case of interdependent value, where the value is commonly unknown but assumed to be same for all the bidders, as if every bidder is anchored to a pure common value.

Clear classification into common value and private value components could be quite contentious and Treasury security auction occupies the centre stage for that. Real life classifications are not always based on quantitatively calibrated methods. For example, the auction of a unique work of art not for resale is prototypical private-values model whereas a Treasury auction, with each bidder guessing at the security's value at the end of the day, would idealy follow a common-values model. Historically, oil tract auctions are conducted on common value perceptions. After all the winner's curse pehnomenon, as realised to be mostly arising out of robust common value component; it came of as a quantitatively established fact in the offshore Mexican oil tract auction data. Current research on auction formats proceeds in the form of extending the theory of private value auctions and making empirically suited tailor made evaluations of the real-world auction markets, be it analysing sealedbid auctions of US Forest Service timber auctions (Athey, S *et al*, 2004) or Structural Estimation of Czech and Canadian Treasury Bill Auctions (Kastl, 2008a). In a divisible good setting, such as treasury bill auctions, bidders with private values who obtain information about rivals' bids use this information only to update their prior about the distribution of residual supply. In the model with a common value component, they also update their prior about the value of the good being auctioned. Private value case could be relevant in Treasury auction in case some bidders have to route their bids through dealers (e.g., Canadian

treasury bill market, Indian government securities market) who also submit bids on their own. For example, Hortacsu *et al* (2008) found that in the Canadian Treasury bill issuance, the null hypothesis of private values in the data for 3-months treasury bills could not be rejected; but the test rejects private values for 12-months treasury bills.

**6. GOI securities auctions system**: The government securities market in India has transformed into a vibrant system in the last one and a half decade. Financial reforms in the captive government securities markets commenced in the beginning of the 1990s, against the backdrop of it being portrayed as a highly controlled, sub-venting framework for administered interest rate mechanism and near static manual system of bilateral market transactions lacking price-time priority, imposing thereby counter-party credit risk in an otherwise illiquid market with bulging short-term debt in the eighties that used to be propelled by an automatic route of *ad hoc* Treasury Bills creation by the country's central bank at the behest of the government. Reforms process encompasses important developments in active policy making, strengthening institutional system, establishing dedicated clearing and settlement systems, trading expansion, diversification of market participants and instruments, consolidating transparent regulatory system, implementation of state of the art technology and enforcing enabling market legislations, rules and procedures. Some notable milestones are: (i) introduction of 'delivery-versus-payment' (DVP) system in the government securities market (1995), (ii) establishing of Primary Dealer system (1996), (iii) statutory agreement with the central government on withdrawing ad hoc Treasury Bills (1997), (iv) launching price-based auctions (1999), (v) introducing electronic Trading System (NDS) and CCIL (2002), (vi) legislation of the FRBM Act (2003), (vii) When-Issued market (2006), (viii) Short – sale permitted up to five days (2007), (ix) GS Act (2007).

Salient features of the GOI securities auction system are:

- As part of overall economic reforms, auction method of primary issuance for Government of India Securities was introduced in June 3, 1992 (RBI Bulletin Nov 1996). The first price-based auction was conducted on May 11, 1999. The RBI initiated reforms in Government

securities market has evolved primary auctions over these years. With implementation of the Fiscal Responsibility and Budget Management (FRBM) Act, 2003, the participation of RBI in the primary auction issuance has been prohibited with effect from April 1, 2006. The primary auctions in Government of India securities during 2006-07 have been subscribed completely by the market at market determined prices.

● As a part of the reform process in the primary issuance of Government Securities, a few securities were initially issued through auctions and gradually the portion of market borrowing raised through auction was increased while RBI's participation in auction with devolvement option as well as private placement with RBI declined. The primary auctions become fully market determined with withdrawal of RBI from auction with effect from April 1, 2006 on implementation of FRBM Act. The process can be observed from the gradual reduction in RBI subscriptions of market borrowings as given below:

| **Year** | **Gross Market Borrowings (Dated securities)** | **Dated Securities raised through Auctions** | **Amount of Devolvement on Reserve Bank** |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
| 1996-97 | 27,911 | 27,911 | 3,698 |
| 1997-98 | 43,390 | 37,390 | 7,028 |
| 1998-99 | 83,753 | 53,753 | 8,205 |
| 1999-00 | 86,630 | 59,630 | – |
| 2000-01 | 1,00,183 | 82,183 | 13,151 |
| 2001-02 | 1,14,213 | 86,000 | 679 |
| 2002-03 | 1,25,000* | 94,000 | 5,175 |
| 2003-04 | 1,21,500* | 1,00,000 | 0 |
| 2004-05 | 80,350 | 80,000 | 847 |
| 2005-06 | 1,31,000 | 1,21,000 | 0 |
| 2006-07 | 1,46,000 | 1,46,000 | 0 |

* : Includes borrowings for pre-payment of external debt.

**Source :** RBI Annual Reports.

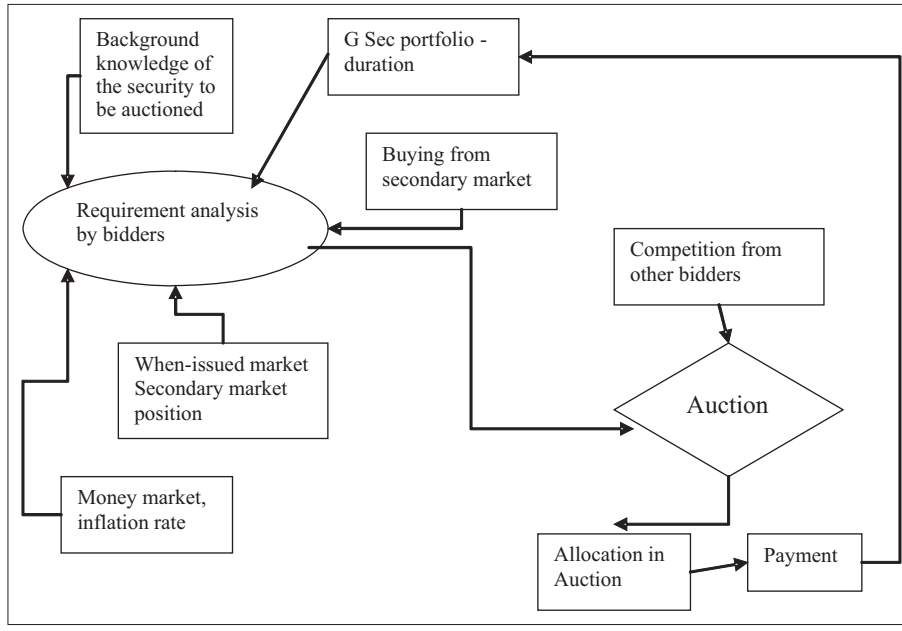
From 2006-07 onward, entire market borrowing of Government of India being raised at market-determined rate and auction analysis truly reflects the cent par cent market behaviour in auctions.

● As regards the types and mode of auction bid submission, buyers of the Government of India dated securities typically submit their sealed bids specifying quantity and price (or yield) at which they wish to purchase the quantity demanded. Initially, bid submission procedure used to be paper-based, which was moved to electronic form since 2002. Once submitted these bids are arranged from highest to the lowest price (or from lowest to highest yield) and the quantity for sale is awarded to the best bids.

● The annual Budget presented to the Parliament every year provides the total quantum of the issuance. Based on the total requirement, RBI, announces the half-yearly calendar of issuance indicating the amount, tenor (maturity bucket) of issuance. The auction calendar helps in cash flow planning of the prospective investors. The auction calendar for first half is announced in the last week of March and second half calendar is announced in last week of September. The specific issue is normally notified to the market one week before the auction date. The securities to be auctioned are traded in 'When-issued' market for the week.

● Then follows the actual conduct of auction by the RBI. Following flowchart highlights the decision-making behaviour of a bidder in the GOI securities auction.

**7. Auction theories**: Prior to early 1980s, the *independent private value* model was central to auction theory (cf. Steven A. Matthews Discussion Paper #1096 on "*A Technical Primer on Auction Theory: Independent Private Values*" (1995), The Centre for Mathematical Studies in Economics & Management Sciences, North-western University). Then came the most influential paper on 'A Theory of Auctions and Competitive Bidding' (Milgrom et al, 1982). Based on the theoretical analyses of the classic private value model, seven most important results of auction theories were established: (i) First-price auction is strategically equivalent to Dutch auction. (ii) Second price auction is strategically equivalent (weekly) to the English auction. (Here it is assumed that successful bidder has a dominant strategy of knowing the value of the object as opposed to stronger equivalence in case of




first-price auction as it does not require that a bidder know the value of the object). (iii) The English as well as second-price auction is Pareto optimal (at the dominant-strategy equilibrium). The winner is the bidder who values the object most highly (The maximum value he succeeds to get, as it were, known to him as a dominant strategy). (iv) In the independent private value model, all the four auction formats lead to identical expected revenues for the seller. (v) At the symmetric equilibriums of the English, Dutch, first-price and second-price auctions, the expected selling price is the same (popularly known as Revenue Equivalence result). (vi) By viewing bidder's decision problems (conditional upon fixed strategies of the other bidders) as one of choosing a probability distribution of winning and the corresponding expected pay-off and then, formulating the problem of auction design (seller's revenue maximization problem) as a constrained optimal problem, the four standard auction forms (with suitably chosen reserve prices or entry fees) are optimal for most of the common standard bid probability distributions. (vii) In the case where either the seller or the buyers are risk averse, seller will strictly prefer the Dutch (first-price) auction to the English (second-price) auction.

Auction theory, therefore, predicts that in the statistically independent private value model, the four most common auction forms lead to the same expected price.

Auction experts have analysed some of the auction's capabilities and inherent limitations, the roles of various rules, the possibilities for introducing combinatorial bidding, and some considerations in adapting the auction for sales with a revenue goal. Drawing on both traditional and new elements of auction theory, they conclude that theorists have been able to analyse proposed designs, detect biases, predict shortcomings, identify tradeoffs, and recommend solutions. But in designing real auctions there are important practical questions for which theory currently offers no answers. The "bounded rationality" constraints that limit the effectiveness of the generalised Vickrey auction have so far proved particularly resistant to simple analysis. Because of such limits to our knowledge, auction design is a kind of engineering activity. It entails practical judgments, guided by theory and all available evidence, but it also uses ad hoc methods to resolve issues about which theory is silent. As with other engineering activities, the practical difficulties of designing effective real auctions themselves inspire new theoretical analyses, which appear to be leading to new, more efficient, and more robust designs.

For example, the US Treasury's experiments with different kinds of auctions yielded inconclusive results and the broader empirical literature is also inconclusive. However, small differences in auction performance can be significant when such large amounts of money are involved, and collusion could be an issue in government securities (Klemperer, 2004). Buyer market power leading to collusion and entry deterrence is the key to auction problems, which suggests that auction design may not matter very much when there is a large number of potential bidders for whom entry to the auction is easy. It therefore calls forth for periodic empirical evaluations of the auction bid data emanating from various formats used to auction government securities even to tightly regulated entities in the financial markets.

**8. U.S. Treasury auctions**: The Federal Reserve issues U.S. Treasury bonds, notes, and bills in accordance with their fiscal policy. These

instruments are brought to market through a Dutch auction process where the government dealers and others bid for the particular issue. (cf. *AFTER THE TRADE IS MADE* – Processing Securities Transactions by David M. Weiss (2006), Portfolio, Penguin Group). Until recently only a special group of dealers known as government dealers could bid for these securities. The auction was a regular auction with the highest bids getting filled first. The dealers would sell the issues to their clients and to other broker/dealers for investment or for their clients. Fed has then changed its procedures and now permits qualified entities to bid for the issues directly. They also changed the auction process to a Dutch auction, where all accepted bids filled at the same price. The U.S. Treasury switched from discriminatory to uniform auctions in October 1998 after several years of experimentation

**9. Multiunit auctions:** Treasury auctions typically take place in a multiple price/quantity bid format in the double sense that the auctioneer puts up many units for sale and bidders also demand many units. Such format is basically different from multiunit auctions of Milgrom-Weber variety whereby bidders demand only one unit. The computation of equilibrium bidding strategies in multiunit Treasury auction is extremely difficult. Based on certain simplifying assumptions on strategic bidding behaviour, it has been established using game theory and associated quadratic optimisation techniques, that the *competitive* auctions, also known as stop-out price auctions, where bidders pay the lowest accepted bid, are technically more acceptable than its dual version of *discriminatory* auctions from the efficiency point of view (i.e., revenue maximisation principle) as it optimises *truthful bidding* and hence efficient transaction is assured. However, the simplicity aspect about strategic behaviour requires to be underscored as it is also undeniable that experienced and well-informed bidders could still achieve better performance based on their skilful bidding strategies, which may not match with the simplistic assumptions. On the other hand, stop-out bidders in the so-called competitive framework need not be so sophisticated because it is *optimal to simply bid one's true valuation*. Pareto-efficiency is always assured in a competitive auction, whereas in a discriminatory auction, it requires that all bidders have realistic expectations in a close neighbourhood of

the possible stop-out price range. Though it is claimed that *competitive* bidding is superior to discriminatory auction both in terms of efficiency and strategic simplicity, it is not prevalent in financial markets, specially in the segment of bond market, whereby more strategic flexibilities practised by technically superior bidders like Primary Dealers and Bankers seem to be eking out better gains out of discriminatory auction formats. In case of new assets market (e.g., IPOs floated by newly formed corporate) with lot of unknowns and skewed information asymmetry, however, discriminatory format ought to be inefficient in the face of the established supremacy of the generalised Vickery auction introduced by Ausubel (2004). His main contention is about winner's curse getting highly pronounced in case of *common value* item of assets if there is more than one unit for sale and bidders demand multi-units quoted at different price tags. This becomes more pronounced so if the number of bidders is sufficiently large to embrace common investors without any specialised perception about value and pricing. Common investors, being a rational agent, would always take recourse to bid shading as a cautious approach, causing thereby inefficient revenue realisation in the case of sealed bid multiunit single bid auctions. Role of specialised dealers driven auction markets like that of the bond market in circumventing the phenomenon of bid shading as well as mitigating the winner's curse, therefore, requires empirical validation about whether the dealers are successful in biding truthfully so that much needed optimality and efficiency targets are maintained.

## Statement 1: Auction-wise Bid Price Distribution Statistics

| Security | Cut-Off | Average | Median | Mode | Skewness | Kurtosis |
|---|---|---|---|---|---|---|
| 7.5% GOVT STOCK2034 | 94.73 | 93.57 | 93.51 | 94.75 | 0.015 | 0.501 |
| 7.95% G.S 2032 | 99.33 | 98.86 | 99.00 | 99.50 | -2.248 | 11.892 |
| 7.40% G.S. 2012 | 101.64 | 101.63 | 101.65 | 101.69 | -0.992 | 1.409 |
| 7.59% GOVT.STOCK 2016 | 100.26 | 100.23 | 100.26 | 100.30 | -1.409 | 4.353 |
| 7.5% GOVT. STOCK 2034 | 92.90 | 92.82 | 92.95 | 93.36 | -0.874 | 0.470 |
| 9.39% G. S. 2011 | 108.33 | 108.20 | 108.26 | 108.30 | -7.821 | 84.855 |
| 7.37% G.S. 2014 | 96.84 | 96.89 | 96.94 | 97.00 | -1.984 | 4.504 |
| 7.94% GOVT.STOCK 2021 | 95.65 | 96.01 | 96.07 | 96.00 | -1.160 | 2.180 |
| 7.59% GOVT.STOCK 2016 | 95.36 | 94.99 | 95.06 | 95.30 | -1.412 | 3.194 |
| 7.5% GOVT. STOCK 2034 | 86.99 | 85.74 | 85.61 | 85.62 | 0.156 | -0.469 |
| 7.55% G.S. 2010 | 99.53 | 99.49 | 99.53 | 99.50 | -2.914 | 13.970 |
| 7.59% GOVT.STOCK 2016 | 95.51 | 95.37 | 95.40 | 95.32 | -3.203 | 14.895 |
| 9.39% G. S. 2011 | 105.76 | 105.59 | 105.69 | 105.65 | -10.392 | 110.778 |
| 8.07% GS 2017 | 99.62 | 99.47 | 99.51 | 99.50 | -0.729 | 7.624 |
| 8.33% GOVT.STOCK 2036 | 95.76 | 95.52 | 95.66 | 95.85 | -1.102 | 0.874 |
| 7.5% GOVT. STOCK 2034 | 89.83 | 89.44 | 89.50 | 89.75 | -0.697 | 0.227 |
| 7.59% GOVT.STOCK 2016 | 98.85 | 98.70 | 98.72 | 98.72 | -3.940 | 34.546 |
| 7.59% GOVT.STOCK 2016 | 99.71 | 99.76 | 99.80 | 99.80 | -1.856 | 5.130 |
| 8.33% GOVT.STOCK 2036 | 102.50 | 102.06 | 102.20 | 102.10 | -2.436 | 9.677 |
| 7.40% G.S. 2012 | 99.54 | 99.45 | 99.51 | 99.51 | -2.741 | 11.818 |
| 7.5% GOVT. STOCK 2034 | 94.23 | 93.72 | 93.88 | 93.91 | -1.654 | 3.163 |
| 8.07% GS 2017 | 104.47 | 104.42 | 104.46 | 104.45 | -9.019 | 111.507 |
| 7.37% G.S. 2014 | 100.32 | 100.21 | 100.30 | 100.30 | -13.276 | 197.318 |
| 8.33% GOVT.STOCK 2036 | 108.15 | 107.75 | 107.90 | 107.60 | -1.391 | 1.831 |
| 8.33% GOVT.STOCK 2036 | 101.00 | 102.80 | 103.07 | 103.12 | -0.465 | -0.617 |
| 7.94% GOVT.STOCK 2021 | 97.81 | 97.37 | 97.67 | 97.40 | -2.156 | 6.328 |
| 7.37% G.S. 2014 | 97.25 | 97.07 | 97.23 | 97.41 | -2.719 | 8.464 |
| 8.33% GOVT.STOCK 2036 | 101.53 | 100.73 | 101.40 | 101.75 | -14.531 | 214.285 |
| 8.07% GS 2017 | 100.05 | 99.73 | 99.85 | 100.00 | -3.489 | 17.324 |
| 8.33% GOVT.STOCK 2036 | 99.22 | 98.42 | 98.70 | 98.15 | -2.093 | 5.494 |
| 6.65% G.S. 2009 | 97.70 | 97.65 | 97.67 | 97.73 | -0.191 | -0.636 |
| 6.65% G.S. 2009 | 97.55 | 97.54 | 97.55 | 97.55 | -1.868 | 11.300 |
| 6.65% G.S. 2009 | 97.49 | 97.41 | 97.42 | 97.42 | -1.058 | 2.666 |
| 6.65% G.S. 2009 | 97.26 | 97.29 | 97.30 | 97.31 | -0.609 | 0.255 |

**Note :** The above data relates to priced-based auction and large figures are due to few unusual bids in some issues only.

## Statement 2: Auction-wise Average Bid-price Difference of Investor-Groups

| Security Name | Co-op. Banks | Foreign Banks | Insu-rance Cos | Mutual Funds | Nation-alised Banks | New Pvt. Sec Banks | Primary Dealers | Pvt. Sect Banks | SBI Group | Issue Total |
|---|---|---|---|---|---|---|---|---|---|---|
| % GS 2016 | 0.01 | 0.16 | -0.03 | 0.04 | 0.03 | 0.01 | 0.03 | 0.04 | | 0.03 |
| 7.50% GS 2034 | -0.31 | -1.79 | 1.84 | -0.08 | | -0.84 | -1.37 | | | -1.16 |
| 7.95% G.S 2032 | -0.30 | -0.57 | -0.21 | 0.31 | -0.46 | 0.30 | -0.68 | 0.22 | 0.30 | -0.47 |
| 7.40% G.S. 2012 | -0.49 | -0.14 | - | 0.12 | 0.03 | -0.01 | -0.01 | -0.34 | -0.03 | -0.01 |
| 7.59% GS 2016 | -0.20 | -0.09 | -0.02 | -0.03 | -0.08 | -0.08 | -0.01 | 0.02 | 0.03 | -0.03 |
| 7.50% GS 2034 | -1.09 | -1.04 | -0.19 | -1.59 | 0.19 | 0.13 | -1.34 | 0.07 | -0.02 | -0.92 |
| % GS 2021 | 0.13 | | -0.07 | 0.11 | 0.03 | -0.05 | 0.02 | 0.08 | 0.01 | 0.02 |
| % GS 2036 | | | -0.02 | 0.17 | -0.23 | 0.04 | 0.10 | 0.27 | | 0.09 |
| 9.39% G S 2011 | -0.43 | -0.09 | 0.12 | -0.05 | -0.03 | -0.06 | -0.16 | | -0.08 | -0.13 |
| 7.37% G.S. 2014 | -0.49 | -0.19 | 0.13 | 0.12 | 0.18 | 0.01 | 0.03 | 0.14 | 0.12 | 0.05 |
| 7.94% GS 2021 | | | 0.61 | 0.09 | 1.04 | | 0.28 | | 0.40 | 0.32 |
| 7.59% GS 2016 | -0.28 | -0.02 | -0.12 | -0.37 | -0.21 | -0.43 | -0.46 | -0.28 | | -0.37 |
| 7.50% GS 2034 | | -0.38 | -1.61 | | | -0.46 | -1.29 | | | -1.25 |
| 7.55% G.S. 2010 | -0.21 | -0.05 | 0.09 | 0.05 | -0.03 | 0.02 | -0.06 | -0.03 | | -0.04 |
| 7.59% GS 2016 | -0.19 | -0.07 | -0.05 | -0.37 | -0.13 | -0.11 | -0.15 | -0.09 | -0.18 | -0.14 |
| 9.39% G.S. 2011 | -0.00 | -0.00 | -0.04 | -0.06 | -0.12 | -0.07 | -0.11 | -0.16 | | -0.10 |
| 8.07% GS 2017 | -0.42 | -0.20 | -0.16 | -0.11 | -0.12 | -0.13 | -0.16 | -0.20 | -0.17 | -0.16 |
| 8.33% GS 2036 | 0.11 | 0.01 | -0.00 | | -0.15 | -0.03 | -0.32 | | -45.38 | -2.20 |
| 7.50% GS 2034 | -0.29 | -0.35 | -0.01 | -0.49 | 0.05 | -0.60 | -0.44 | | -0.40 | -0.39 |
| 7.59% GS 2016 | -0.14 | -0.13 | 0.06 | -0.15 | -0.10 | -0.12 | -0.17 | -0.12 | -0.15 | -0.15 |
| 7.59% GS 2016 | 0.03 | | -0.03 | | 0.11 | 0.15 | 0.00 | 0.06 | 0.14 | 0.04 |
| 8.33% GS 2036 | -0.46 | | 0.46 | | -0.20 | -1.06 | -0.48 | | -0.09 | -0.44 |
| 7.40% G.S. 2012 | -0.14 | 0.08 | 0.06 | -0.09 | -0.04 | -0.06 | -0.13 | 0.02 | -0.02 | -0.09 |
| 7.50% GS 2034 | | | -0.01 | -0.73 | -0.27 | -21.41 | -0.60 | -0.45 | -0.32 | -1.08 |
| 8.07% GS 2017 | -0.09 | | -7.93 | -0.34 | 0.00 | -0.00 | -0.09 | -0.05 | 0.01 | -0.40 |
| 7.37% G.S. 2014 | -0.09 | | -0.41 | -0.04 | -0.01 | -0.27 | -0.13 | -0.13 | -0.01 | -0.12 |
| 8.33% GS 2036 | -0.05 | | -10.69 | -0.27 | -0.23 | -0.33 | -0.46 | | | -0.98 |
| 8.33% GS 2036 | 2.94 | | 3.15 | | 2.93 | 2.51 | 1.54 | 3.53 | | 1.80 |
| 7.94% GS 2021 | -2.22 | | 0.25 | 0.08 | 0.06 | -0.61 | -0.55 | -0.80 | -0.32 | -0.44 |
| 7.37% G.S. 2014 | -0.25 | | -0.02 | 0.01 | -0.01 | -0.25 | -0.23 | -0.41 | -0.11 | -0.18 |
| 8.33% GS 2036 | -1.05 | | -0.05 | 0.14 | 0.02 | -0.03 | -0.41 | -1.15 | -0.96 | -0.35 |
| 8.07% GS 2017 | -0.48 | - | -0.26 | -0.27 | -0.27 | -0.12 | -0.35 | -0.50 | -0.27 | -0.32 |
| 8.33% GS 2036 | | | -0.18 | -0.49 | -0.06 | -0.67 | -1.10 | -0.03 | 0.54 | -0.80 |
| 6.65% G.S. 2009 | | -0.06 | | -0.25 | -0.04 | -0.15 | -0.04 | 0.02 | 0.04 | -0.05 |
| 6.65% G.S. 2009 | | 0.00 | | 0.01 | -0.03 | -0.03 | -0.01 | 0.01 | 0.01 | -0.01 |
| 6.65% G.S. 2009 | | -0.07 | | -0.05 | -0.03 | -0.06 | -0.11 | -0.09 | -0.06 | -0.08 |
| 6.65% G.S. 2009 | 0.03 | 0.08 | | 0.12 | 0.08 | 0.04 | 0.02 | 0.01 | -0.00 | 0.03 |
| **Grand Total** | **-0.17** | **-0.14** | **-1.26** | **-0.10** | **-0.04** | **-0.23** | **-0.25** | **-0.07** | **-0.90** | **-0.26** |

## Statement 3: Auction-wise Success Ratio of Various Investor Groups

(per cent)

| Security Name | Co-op. Banks | Foreign Banks | Insu-rance Cos | Mutual Funds | Nation-alised Banks | New Pvt. Sec Banks | Primary Dealers | Pvt. Sect Banks | SBI Group | Issue Total |
|---|---|---|---|---|---|---|---|---|---|---|
| % GS 2016 | 0.00 | 4.76 | 100.00 | 25.79 | 52.63 | 55.81 | 36.00 | 37.50 | | 44.06 |
| 7.5% GS 2034 | 0.00 | 0.00 | 100.00 | 50.00 | | 7.46 | 3.28 | | | 41.56 |
| 7.95% G.S 2032 | 33.33 | 11.29 | 68.13 | 100.00 | 11.11 | 52.94 | 14.96 | 100.00 | 84.31 | 42.36 |
| 7.40% G.S. 2012 | 0.00 | 66.67 | 46.28 | 100.00 | 81.35 | 66.72 | 45.93 | 0.00 | 59.82 | 51.65 |
| 7.59% GS 2016 | 0.00 | 77.67 | 50.00 | 55.56 | 39.73 | 40.85 | 52.79 | 46.41 | 100.00 | 52.82 |
| 7.5% GS 2034 | 0.00 | 0.00 | 99.21 | 0.00 | 56.10 | 57.77 | 14.70 | 60.00 | 52.48 | 46.25 |
| % GS 2021 | 0.00 | | 49.63 | 0.00 | 47.57 | 100.00 | 39.14 | 33.33 | 40.00 | 43.73 |
| % GS 2036 | | | 71.43 | 0.00 | 100.00 | 22.22 | 28.07 | 0.00 | | 45.55 |
| 9.39% G. S. 2011 | 0.00 | 94.12 | 100.00 | 43.48 | 64.63 | 98.58 | 19.31 | | 0.00 | 40.66 |
| 7.37% G.S. 2014 | 0.00 | 0.00 | 100.00 | 100.00 | 98.68 | 75.00 | 55.15 | 90.00 | 100.00 | 61.18 |
| 7.94% GS 2021 | | 100.00 | 66.67 | 100.00 | | 40.68 | | 100.00 | 60.06 | |
| 7.59% GS 2016 | 66.67 | 90.91 | 9.84 | 0.00 | 22.97 | 0.00 | 21.23 | 0.00 | | 21.00 |
| 7.5% GS 2034 | 14.29 | 0.00 | | | 0.00 | 4.84 | | | 2.55 | |
| 7.55% G.S. 2010 | 0.00 | 50.00 | 100.00 | 77.52 | 72.08 | 46.28 | 35.93 | 12.57 | | 44.07 |
| 7.59% GS 2016 | 0.00 | 19.77 | 76.58 | 0.00 | 3.40 | 0.00 | 11.70 | 31.25 | 0.00 | 30.65 |
| 9.39% G. S. 2011 | 50.00 | 81.82 | 0.00 | 25.13 | 0.00 | 18.79 | 44.52 | 0.00 | | 39.03 |
| 8.07% GS 2017 | 0.00 | 4.00 | 0.00 | 45.45 | 25.06 | 47.08 | 39.34 | 0.00 | 0.00 | 31.66 |
| 8.33% GS 2036 | 82.64 | 58.33 | 49.42 | | 16.92 | 67.89 | 25.32 | | 2.43 | 37.72 |
| 7.5% GS 2034 | 5.56 | 18.18 | 56.25 | 0.00 | 62.24 | 60.63 | 15.43 | | 0.00 | 36.64 |
| 7.59% GS 2016 | 8.59 | 18.35 | 100.00 | 0.00 | 59.99 | 53.19 | 17.20 | 0.00 | 0.00 | 35.78 |
| 7.59% GS 2016 | 63.64 | | 96.92 | | 81.98 | 97.34 | 38.57 | 82.35 | 100.00 | 56.55 |
| 8.33% GS 2036 | 0.00 | | 100.00 | | 12.30 | 0.00 | 0.22 | | 0.00 | 43.21 |
| 7.40% G.S. 2012 | 14.29 | 100.00 | 50.00 | 8.19 | 34.67 | 58.58 | 30.36 | 66.67 | 58.30 | 39.17 |
| 7.5% GS 2034 | | 97.09 | 0.00 | 10.99 | 0.00 | 0.56 | 0.00 | 0.00 | 40.89 | |
| 8.07% GS 2017 | 28.00 | | 38.12 | 66.67 | 57.28 | 91.84 | 21.35 | 31.03 | 47.59 | 36.32 |
| 7.37% G.S. 2014 | 36.31 | | 0.00 | 46.68 | 78.38 | 39.06 | 36.05 | 9.34 | 53.96 | 46.49 |
| 8.33% GS 2036 | 35.00 | | 71.42 | 9.52 | 33.33 | 13.56 | 15.03 | | | 38.24 |
| 8.33% GS 2036 | 100.00 | | 100.00 | | 100.00 | 100.00 | 59.87 | 100.00 | | 69.77 |
| 7.94% GS 2021 | 0.00 | | 68.33 | 42.19 | 58.15 | 36.46 | 34.69 | 0.00 | 21.94 | 41.47 |
| 7.37% G.S. 2014 | 0.00 | | 0.00 | 45.83 | 56.99 | 0.00 | 64.42 | 0.00 | 26.67 | 59.54 |
| 8.33% GS 2036 | 0.00 | | 49.50 | 66.67 | 29.00 | 60.98 | 24.32 | 0.00 | 0.00 | 34.24 |
| 8.07% GS 2017 | 0.00 | 28.57 | 0.00 | 16.67 | 2.38 | 0.00 | 40.96 | 0.00 | 48.11 | 33.95 |
| 8.33% GS 2036 | | 57.38 | 45.45 | 43.83 | 0.00 | 9.01 | 55.56 | 79.14 | 36.54 | |
| 6.65% G.S. 2009 | 0.00 | | 0.00 | 65.19 | 2.50 | 43.75 | 50.00 | 64.55 | 44.98 | |
| 6.65% G.S. 2009 | 33.33 | | 89.84 | 28.47 | 64.08 | 46.86 | 59.12 | 12.94 | 40.22 | |
| 6.65% G.S. 2009 | 10.00 | | 0.00 | 29.62 | 34.08 | 24.32 | 0.00 | 4.71 | 22.79 | |
| 6.65% G.S. 2009 | 100.00 | 88.89 | | 100.00 | 94.37 | 78.86 | 49.95 | 69.30 | 15.87 | 54.48 |
| **Total - Category** | **22.73** | **53.44** | **64.56** | **34.77** | **50.11** | **53.43** | **32.85** | **34.88** | **47.20** | **41.90** |

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# *Imported Inflation: The Evidence from India*

**Janak Raj, Sarat Dhal and Rajeev Jain***

In the backdrop of recent developments in global commodity prices, this study provides analytical and empirical perspectives on imported inflation in the Indian context. Sources and commodity-wise trends in imported inflation are analysed during the last four decades. Empirical analysis suggests that at the global level, export of inflation from oil exporting countries is significantly higher than that of industrial and non-oil developing countries including Asia. At the same time, despite low domestic inflation, export of inflation from industrial countries is significantly higher than that of non-oil developing countries. Inflation in India is positively influenced by import price, capital flows and exchange rate. Based on a non-parametric approach, import price inflation on an average accounts for about 1 to 2 percentage points increase in domestic inflation. Within the framework of the vector error correction and cointegration model, about 5 percentage points increase in import prices contribute to 1 to 1.5 percentage points increase in domestic prices. In terms of variance decomposition analysis, capital flows have a greater impact on domestic inflation, deriving from the former's association with exchange rate and import prices.

**JEL Classification** : E31, E37

**Keywords** : Inflation, Exchange Rate Pass-through

## Introduction

Until recently, economists generally held an optimistic view on globalisation. Despite various adverse financial market developments, globalisation ensured rapid economic progress and low inflation rates across countries especially during the 1980s and the 1990s, accompanied by a significant cross-border dispersion of capital flows and enhanced competition for foreign trade in goods and services. However, of late, there is a great deal of concern over the impact of globalisation on exporting and importing of inflation across countries spurred by the record

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level of global commodity prices, particularly in respect of oil, metals and food articles. In India too, the hardening of inflation condition in the domestic sphere has been attributable to global factors in various quarters (Reddy, 2007, Mohan 2006, 2007). However, empirical analysis of the import price pass-through to domestic prices are rather scarce. Studies on conventional exchange rate pass-through to domestic prices do not provide definitive answers. In this milieu, the present study exemplifies various issues. Illustratively, how critical are imports for the economy? Where does inflation come from? What are the channels of imported inflation? Our objective is to address some of these critical issues, based on various facts and figures and investigate the degree to which inflation, whether low or high, is an imported phenomenon. The paper comprises four sections. Section I provides a brief discussion on the various channels through which globalisation affects domestic prices, along with a summary of the literature on cross-country findings. Section II provides various aspects of imported inflation across sources, destinations and commodities at global and regional levels. Section III and Section IV are devoted to the Indian context in terms of stylised facts followed by the empirical analysis of the pass-through of India's import prices to domestic prices. Section V concludes the study.

## Section I

## The Pass-through Literature: A Cross-country Perspective

Globalisation can impact domestic prices in four ways through (i) cheaper imports of raw materials and capital goods and enhanced competition, (ii) labour mobility and cheaper labour costs, (iii) capital flows and (iv) exchange rates. However, there is disagreement with respect to the impact of various channels. Rogoff (2003) argues that globalisation may not enhance competition, leading to a steeper Phillips curve. In contrast, the IMF supports the fact that globalisation increases competition and thus, flattens the Phillips curve (Ball, 2006). Generally, it is viewed that globalisation, in the form of growing trade integration and reduced barriers to market access by foreign producers, enhances competition in domestic markets through increased imports. Such competition, in turn, leads to efficient allocation of factors as per the comparative advantages, resulting in increasing volumes of trade and higher productivity as economies concentrate their resources in those

sectors in which they have core competence. The overall outcome could be the lower prices.

From cross-country perspective, several studies have examined the retail price sensitivity to exchange rates particularly after the collapse of Bretton-woods system (Box 1). These studies provide various perspectives on the subject. In the early years of floating exchange rates, it was widely expected that movements in exchange rates could have significant impact on domestic prices. Deriving from the purchasing-power parity postulate, it was felt that control of domestic inflation would become more challenging in the phase of exchange rate volatility. However, in recent years, inflation in a number of industrial and emerging market countries has remained surprisingly stable in the face of wide swings in exchange rates. This development drew attention to the issue of exchange rate pass-through (ERPT) to import and domestic prices and to whether and why it has declined. Literature broadly suggests that the exchange rate pass-through, in general, is incomplete. For example, Gagnon and Ihrig (2004), Campa and Goldberg (2005), Bouakez and Rebei (2005) and Bailliu and Fujii (2004) have looked at ERPT in developed economies and found that it has declined for most of them during the 1990s. In a cross-country analysis, McCarthy (2000) and Mihailov (2005) suggested that pass-through to consumer prices is small and in fact, in some cases, it is insignificant. Fact is that many industrialised countries have experienced large exchange rate depreciations in more recent periods but despite that they were able to have a low inflation as exchange rate depreciations had much smaller effects on consumer prices than anticipated (Bailliu and Fujii, 2004). Devereux and Yetman (2002) found empirical evidence suggesting that exchange rate changes were, at best, weakly associated with changes in domestic prices at the consumer level.

In the context of declining pass-through to domestic inflation, two arguments are often made. First is the microeconomic phenomenon based on various structural features of international trade, such as pricing to market by imperfectly competitive firms (Corsetti and Dedola, 2002), domestic content in the distribution of traded goods (Corsetti and Dedola, 2002 and Burstein, Neves and Rebelo, 2000), the importance of non-traded goods in consumption (Betts and Kehoe, 2001), and the scope of

## Box 1: Cross-Country Studies on Exchange Rate/Import Prices Pass-through on Consumer Prices

| Author(s)/ year | Country/ Period | Extent of ER/IP pass-through to CP | Variables | Methodological Framework |
|---|---|---|---|---|
| Advanced Economies | | | | |
| Jonas Stulz (2008) | Switzerland (1976.1 – 2004.12) | IP→CP: Strong | Endogenous variables: Δ ER ΔIP, ΔCP, OG, ΔM Exogenous variable: ΔFCP | Recursive VAR, Impulse Response Function |
| Reginaldo Pinto Nogueira Junior (2007) | Canada<br>Sweden<br>UK<br>South Korea | ER→CP: NS<br>ER→CP: S<br>ER→CP: NS<br>ER→CP: S [LRPT] | ΔER, ΔCP, ΔPP1 | Granger Causality |
| Sekine (2006) | US<br>Japan<br>Germany<br>UK<br>France<br>Italy<br>(1974Q1-2004Q1) | ER→IP: Declined<br>IP→CP: Declined<br>(In all countries) | ΔIP, ΔEER, ΔFP, ΔCOMP, OG, IPR | Single equation regression |
| Emerging and Developing Economies | | | | |
| Nkunde Mwase (2006) | Tanzania (1990Q1-2005Q1) | ER→CP: Declined during 1990s | ΔOG, ΔER, ΔCP, ΔM | Granger Cause, Structural VAR, VEC. |
| Nombulelo Duma (2008) | Sri Lanka (2003.1 – 2007.7) | IP→CP: Incomplete (19% after 10 months) | ΔOP, OG, ΔER, ΔIP, ΔWP, ΔCP, ΔM | VAR, Impulse Response Function |
| Reginaldo Pinto Nogueira Junior (2007) | Brazil<br>Mexico<br>South Africa<br>Czech Rep. (post-IT) | ER→CP: NS<br>ER→CP: S<br>ER→CP: S<br>ER→CP: S [LRPT] | | |
| Jeevan Kumar Khundrakpam (2007) | India (Post Reform) | ER→Domestic Prices (Coefficient of LRPT is 0.20 for ER appreciation and 0.05 for ER depreciation) | | VAR, Rolling regressions |
| Dubravko Mihaljek and Marc Klau (2008) | Hong Kong<br>India<br>Malaysia<br>Philippines<br>Singapore<br>Thailand<br>Columbia<br>Hungary<br>Peru<br>Venezuela<br>Czech Rep.<br>Poland<br>South Africa<br>Turkey<br>Israel<br>(Late 1980s/early 1990s–2000 to 1994–2006:Q2) | ER→CP : Decline<br>ER→CP : Decline<br>ER→CP : Increase<br>ER→CP : Decline<br>ER→CP : Decline<br>ER→CP : Decline<br>ER→CP : Decline<br>ER→CP : Decline<br>ER→CP : Decline<br>ER→CP : Decline<br>ER→CP : Increase<br>ER→CP : Decline<br>ER→CP : Decline<br>ER→CP : Decline<br>ER→CP : Decline | ΔCP, ΔFP<br>ΔER<br>OG<br>ΔEREERG | Simple regression |

**Notations:** CP: Consumer prices, IP: Import prices, ER: Exchange Rate, OG: Output gap, M: Money Stock, FP/ FCP: Foreign Consumer Prices, WP: Wholesale Prices, OP: Oil Prices, RI: Rate of Interest, PPI: Producer Price Index, LRPT: Long-run Pass-through, IT: Inflation Targeting, ERERG: Equilibrium Real Exchange Rate Gap, IPR: Import Penetration Ratio, COMP: Commodity Prices, EER: Effective Exchange Rate.
**Note:** S: Significant, NS: Not Significant.

substitution between goods in response to exchange rate changes (Burstein, Eichenbaum and Rebelo, 2002). Others argued, however, that the failure of pass-through is more of a macroeconomic phenomenon, related to the slow adjustment of goods prices at the consumer level (Engel, 2002). Campa and Goldberg (2002) provided evidence for OECD countries that both micro and macro factors are important in the evolution of exchange rate pass-through estimates over time, but they ultimately come down on the side of a microeconomic explanation, based on the changing composition of import goods. Campa and Goldberg (2006) argued that there are a number of forces that contribute to less than complete pass through of exchange rates into the final consumption prices of imported goods. Calvo and Reinhart (2000), using a VAR model of exchange rate and inflation, found that the impact of ERPT is considerably higher for emerging markets than for developed economies. Using an Error Correction Model, Hausmann, Panizza and Stein (2001) found similar results. Sekine (2006) estimated the ERPT for major industrial countries (the United States, Japan, Germany, the United Kingdom, France and Italy) by dividing into impacts of exchange rate fluctuations to import prices (first-stage pass-through) and those of import price movements to consumer prices (second-stage pass-through). He found that both the first and second-stage pass-through effects declined over time for all of the sample countries. He supported the view that more competitive pressures as reflected in high import penetration ratio have reduced the pass-through effect. However, there are arguments that relationship with import penetration might go in both directions. On the one hand, the higher import penetration and the consequent greater competition may turn the domestic firms merely as price taker, thus leading to an increase in the pass-through effect. On the other hand, greater competition and a commensurate reduction in the market power of dominant firms may reduce the pass-through effect.

In the context of Canada, Lapham and Leung (2006) explored two potential explanations for the observed decline in exchange rate pass-through to consumer prices over the last two decades: (i) a general fall in inflation and (ii) the restructuring in the retail industry. They argued that the restructuring in Canadian retail sector apparently had increased competition and reduced firms' pricing power and contributed to low

inflation. Shifts in monetary policy towards lower inflation may have altered the consumer behaviour and may have changed the competitive environment in the retail sector. These forces together have lowered retailers' ability and willingness to pass-through the exchange rate movements to their prices. Leiderman and Bar-Or (2000), Eichengreen (2002), Mishkin and Savastano (2001) and Schmidt-Hebbel and Werner (2002) also argued that the declining ERPT is a by-product of credibility gains of monetary policy. According to them, credible monetary authorities are expected to act according to the inflation stability objective, which keeps low inflation expectations even in the advent of a large depreciation. In this sense, Levin, Natalucci and Piger (2004) actually suggested that measuring the degree of ERPT would be an indirect assessment of central bank credibility.

Zorzi *et al.* (2007) examined the degree of exchange rate pass-through to prices in 12 emerging markets in Asia, Latin America and Central and Eastern Europe. Their findings falsified the conventional hypotheses that ERPT into both import and consumer prices is always higher in emerging than in developed economies. For emerging markets, most notably the Asian countries, pass-through to import and consumer prices was found to be low and not very dissimilar from the levels of developed economies (Table 1). Ito and Sato (2007), covering the crises hit countries of the 1990s, found that the degree of ERPT is higher in Latin American countries and Turkey than in most of the East Asian

**Table 1 : Accumulated Percentage Response of Consumer Prices to 1 percentage Exchange Rate Shock**

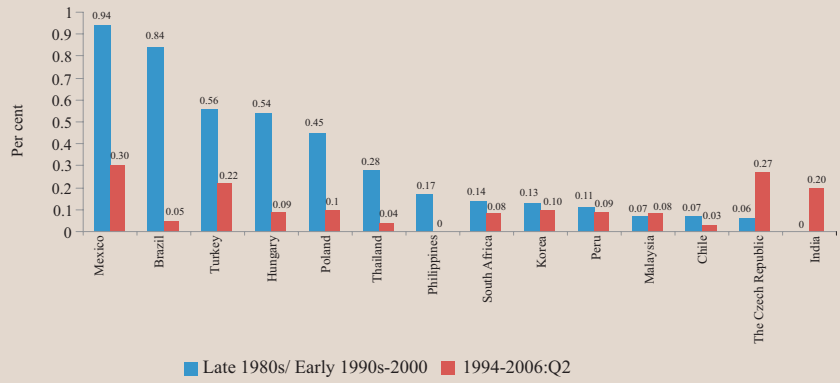
| Country | 4 Qtr Response | 8 Qtr Response |
|---|---|---|
| China | 0.08 | 0.77 |
| Hong Kong | 0.07 | 0.37 |
| Korea | 0.19 | 0.13 |
| Singapore | -0.15 | -0.06 |
| Taiwan | 0.01 | 0.01 |
| Czech Rep. | 0.61 | 0.77 |
| Hungary | 0.48 | 0.91 |
| Poland | 0.31 | 0.56 |
| Turkey | 0.09 | 0.12 |
| Argentina | 0.02 | 0.04 |
| Chile | 0.35 | 0.35 |
| Mexico | 0.76 | 1.39 |

Source: ECB Working Paper No.739, March 2007.

countries. In particular, Indonesia, Mexico, Turkey and to a lesser extent, Argentina showed a strong response of CPI to the exchange rate shock. Mihaljek and Klau (2008) provided estimates of the pass through from exchange rate and foreign prices changes to inflation in 14 emerging market countries for the period 1994 to mid-2006. They also confirmed that in general the extent of pass through has declined in recent periods (Chart 1). In the case of China, Yu (2007) found an incomplete ERPT to domestic prices. Nogueria Jr. (2007) compared the change in the degree of ERPT for a set of emerging and developed countries which have adopted inflation targeting. He found that ERPT on consumer as well as producer prices decreased after the adoption of inflation targeting for most of the economies. Producer prices, however, were found to be more responsive than consumer prices to the exchange rate shocks. He argued that ERPT are still important for driving domestic inflation over the long run.

Some researchers argued that exchange rate pass-through to domestic prices would also depend on whether the movement in exchange rate is perceived to be temporary or permanent phenomenon. Using staggered price setting behavior, Taylor (2000) showed that firms tended to change prices more often when cost changes were perceived to be more persistent. In this case when inflation is high, ERPT tends to be high as well. According to Campa and Goldberg (2005), the pass-through of costs into mark-ups is endogenous to a country's inflation performance, which

**Chart 1: Pass-Through of Exchange Rates to Inflation**




**Source:** Mihaljek and Klau, 2008.

has been confirmed empirically by Choudhri and Hakura (2006), Baqueiro, Diaz de Leon and Torres (2003), Gagnon and Ihrig (2004) and Ca'Zorzi, Hahn and Sanchez (2006). Arguing that the extent of pass-through to consumer prices is less than that to import prices, Bacchetta and Wincoop (2001) argued that apart from the local distribution costs, there could be an alternative complementary explanation based on the optimal pricing strategies of firms based on the fact whether importing domestic firms face competition from other domestic final goods producing sectors (*e.g.*, the non-traded goods sector) in the domestic markets or not. If yes, such firms prefer to price in domestic currency, while exporting firms tend to price in the exporter's currency. In that case, the pass-through to import prices is complete, while the pass-through to consumer prices is zero. Furthermore, it may be argued that since exchange rate hedging has become more prevalent in recent years, it would take longer time lags from changes in exchange rates to reflect in changes in import or final consumer prices. Even though, the variable and methodology varied but they reflected that the reasons behind the decline in exchange rate pass-through to consumer prices could be a macroeconomic as well microeconomic phenomenon and in some cases may be common for the most and sometimes it may be more country-specific (Devereux and Yetman, 2002).

## Section II

## Global Trade in Inflation

Inflation rates remained well within the comfort zones of most of economies particularly the advanced and also in a number of emerging market economies during the 1980s and 1990s (Table 2). There are various explanations to the question whether the underlying factors were common or country specific that led to a general fall in inflation. For instance, low inflation is often construed as one of the benefits from increased globalisation and thus, intense global competition and low costs in the recent decades. To be specific, the greater participation of emerging market economies in the world trade has ensured low inflation by supplying at low costs. Examining this hypothesis, IMF (2006) found that the direct impact of globalisation through import prices has, in

**Table 2: Global Consumer Price Inflation**

**(Per cent)**

| Region | 1970s | 1980s | 1990s | 2000s | 2003-07 |
|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 |
| WORLD | 10.9 | 15.6 | 15.1 | 3.7 | 3.6 |
| (1) Industrial | 8.7 | 6.2 | 2.8 | 2.1 | 2.2 |
| (a) US | 7.1 | 5.6 | 3.0 | 2.8 | 2.9 |
| (b) Euro Area | – | – | 1.5 | 2.2 | 2.1 |
| (2) Developing | 16.2 | 36.8 | 36.1 | 5.7 | 5.4 |
| (a) Non-oil Developing | 17.6 | 42.9 | 39.3 | 5.3 | 5.0 |
| (i) Asia | 10.3 | 9.0 | 8.0 | 3.1 | 3.8 |
| (b) Oil Exporting | 11.2 | 12.0 | 18.2 | 9.0 | 9.5 |
| India | 9.0 | 8.0 | 8.1 | 5.1 | 5.5 |

**Note:** – Not Available.
**Source:** IMF.

general, been small in the industrial economies though the impact on relative prices through foreign competition has been significant. However, IMF confirmed that inflations rates in advanced countries had become less sensitive to domestic capacity constraints, *i.e.*, supply side constraints. Besides globalisation, low inflation rates were attributed to the more credible monetary policies of central banks. White (2008) contended that the argument of more effective central bank policy did not explain why inflation fell sharply in countries with varied levels of economic and financial developments, central bank independence and exchange rate regimes. Another line of argument for low inflation relates to domestic deregulations that have taken place in many countries during recent period. Lastly, the literature also suggests that excess global savings in recent periods or equivalently a global investment drought led to low prices. Apart from these, there is another alternative associated argument of broad productivity gains reflected in lower prices.

White (2008) argued that none of these four arguments fully explained the low inflation phenomenon and thus advocated a global demand and supply approach in which all these explanations mattered to varying degrees during different periods. If one casts a glance over the inflation record of past three-four years across the countries, it was largely subdued despite significant rise in commodity prices, strong growth and accommodative monetary policy in major currency areas. However, of

late, most of the advanced as well as emerging market and developing economies have witnessed inflationary pressures generally attributable to rising energy and food prices. Does this mean the supply side concerns can no longer be hidden and thus have to necessarily reflect through high inflation. More important will be to know the extent to which the underlying arguments for low inflation hold good in the circumstances when most of advanced and emerging markets faced increasing inflationary pressures and conduct of monetary policy was becoming more difficult. Recent developments also raise the issues whether the recent phase of high prices across countries had nothing to do with globalisation and instead was on account of those items which are less substitutable and the demand for which was less price elastic. In short, it is debatable whether the recent rise in headline inflation across the countries was solely a supply-side phenomenon and thus making the task of price stability more challenging for the hapless central banks or inflation is still a monetary phenomenon and central banks' monetary policies will again prove to be credible and relevant.

**II.1 Where does the inflation come from?**

Reflecting the trends in domestic prices, export and import prices (or export and import unit value indices) across countries show as to how inflation is exported from sources and imported at destinations across the globe. Deriving from the IMF's International Finance Statistics, Table 3 provides a comparative perspective on export price inflation at global and various regional levels through the 1950s to the current decade.

At the global level, export prices witnessed a substantial rise in the 1970s, significant moderation in the 1980s, deflation during the 1990s and strong revival in the current decade, especially since 2003. At the regional level, export of inflation during the 1970s was mainly due to oil exporting countries. Due to the sharp increase in the oil price, aggregate export of inflation from developing economies was higher than that of industrial countries. Interestingly, as the reference shifts to non-oil developing countries, especially Asia, a different picture emerges; export of inflation from these countries was not higher than industrial countries.

During the 1980s and the 1990s, the sharp decline of export price inflation could be attributable to two major developments. On the one

**Table 3: Global and Regional Export Price Inflation**

**(Per cent)**

| Regions | 1950s | 1960s | 1970s | 1980s | 1990s | 2000s | 2003/7 |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| WORLD | 1.8 | 0.6 | 12.8 | 3.3 | -0.1 | 4.1 | 7.6 |
| Industrial | 0.4 | 0.4 | 11.1 | 3.3 | 0.2 | 4.0 | 7.7 |
| (a) US | 1.6 | 1.6 | 9.5 | 3.8 | 0.4 | 2.1 | 3.4 |
| (b) Japan | 1.4 | -0.1 | 9.0 | 3.6 | -0.2 | -0.5 | 1.6 |
| (c) Euro Area | - | - | - | - | 6.2 | 6.9 | 11.6 |
| Germany | 4.3 | 1.9 | 12.4 | 3.2 | -0.3 | 4.3 | 8.7 |
| Developing | 0.4 | 1.9 | 19.3 | 3.0 | -1.0 | 4.3 | 7.6 |
| (a) Non-oil | 0.6 | 2.9 | 10.7 | 1.8 | -1.2 | 2.2 | 5.1 |
| (i) Asia | 1.1 | 2.4 | 9.7 | 2.0 | -0.8 | 1.4 | 3.9 |
| (b) Oil Exporting | 0.3 | -0.3 | 38.5 | 1.2 | 1.4 | 16.8 | 19.6 |
| **India** | **-0.5** | **1.0** | **8.6** | **2.6** | **-2.0** | **4.6** | **10.2** |

**Note:** – Not Available.

**Source:** IMF International Financial Statistics.

hand, export of inflation from the oil exporting countries remained subdued, despite the second-oil shock in the early 1980s. Non-oil developing countries maintained low export price inflation, despite the substantial acceleration in their domestic inflation, as they were engaged aggressively in enhancing the world market for their exports. In the 1990s too, the non-oil developing countries played a key role in deflation of export prices at global level. On the other hand, industrial countries continued to have their export price inflation more or less similar to developing countries but a percentage point higher than Asia. In the more recent period, region-wise trends showed that in the current environment oil exporting and industrial countries played a major role in global trade in inflation. Export prices of oil exporting countries increased on average 19.6 per cent annually during 2003-07, about twenty times the average in the 1980s and the 1990s. During the same period, export prices of industrial countries also increased by 7.7 per cent, comprising Euro area export price inflation at 11.6 per cent (up from 6.2 per cent in the 1990s) and the US export price inflation at 3.4 per cent (up from 0.4 per cent in the 1990s). Similarly, export prices of non-oil developing countries and the emerging Asia witnessed an increase of 5.1 per cent and 3.9 per cent, respectively, during 2003-07, but lower than the trends in the industrial countries.

## II.2 Where does inflation go?

Table 4 shows the import price inflation at global and regional levels through the 1950s to the current decade. Similar to the export price inflation, import price inflation was substantially lower during the 1980s and 1990s as compared with the 1970s and the more recent period. Across regions, there are several distinguishing features of imported inflation. During the 1970s, unlike export price inflation, import price inflation of developing countries was lower than that of industrial countries. For non-oil developing Asia, import price inflation was lower by 400 basis points than industrial countries. During the 1980s, industrial countries continued to maintain import price inflation higher by about 180 basis points than that of developing countries, notwithstanding substantial moderation in import price inflation in general. In the 1990s, import price inflation at global level witnessed a deceleration, accompanied by marginal inflation in industrial countries and a deceleration in developing countries. In the more recent period, there is more or less convergence of import price inflation of developing and industrial countries. Import price inflation is relatively high in the Euro area than the US and developing Asia.

**Table 4: Global and Regional Import Price Inflation**

(percent)

| **Region** | **1950s** | **1960s** | **1970s** | **1980s** | **1990s** | **2000s** | **2003/7** |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| WORLD | 0.6 | 0.4 | 12.7 | 3.2 | -0.1 | 4.4 | 7.9 |
| Industrial | 0.7 | 0.0 | 13.0 | 3.5 | 0.1 | 4.5 | 8.0 |
| (a) US | 2.3 | 1.0 | 13.4 | 3.6 | 0.3 | 3.2 | 5.0 |
| (b) Japan | -1.3 | 0.2 | 15.3 | 3.6 | -0.1 | 5.1 | 8.8 |
| (c) Euro | - | - | - | - | - | 8.4 | 12.1 |
| Germany | -3.3 | -0.1 | 13.3 | 2.3 | -0.2 | 5.5 | 10.2 |
| Developing | -0.8 | 3.3 | 11.3 | 1.7 | -0.7 | 4.3 | 7.4 |
| (a) Non-oil | -0.8 | 3.2 | 11.1 | 1.8 | -0.7 | 4.3 | 7.4 |
| Asia | -1.1 | 5.2 | 8.8 | 2.0 | -0.3 | 3.5 | 6.0 |
| (b) Oil Exporting | - | - | - | - | 0.6 | 2.1 | 5.9 |
| **India** | **-0.9** | **0.4** | **13.9** | **0.3** | **-3.2** | **4.1** | **5.0** |

**Note:** – Not Available.

**Source:** IMF International Financial Statistics.

## II.3 Net Terms of Trade

Deriving from Table 3 and Table 4, it can be inferred that all regions/ countries could engage in exporting as well as importing of inflation. For some countries, import of inflation could be greater than export of inflation and *vice versa* for other countries. At a more formal level, export and import price inflation differential as shown in Table 3 and 4 translates to changes in terms of (net) terms of trade (NTT), which in turn reflect gains for countries and regions from the cross-border trade. Trends in the terms of trade indicator reveal various aspects of gains from trade for industrial and developing countries (Table 5). First, over a long horizon from the 1950s through the current decade, the net terms of trade showed a declining trend for industrial countries but a rising trend for developing countries region. Within developing countries, there were disparities as NTT showed a declining trend for non-oil exporting countries but a sharp rising trend for oil exporting countries. Second, a crucial insight derives from the comparision between average terms of trade for various periods with the benchmark value of NTT at 100 for the base year 2000. For the more recent period (2003-07) in particular, industrial countries continued to enjoy a favourable terms of trade, as the NTT was higher than the

**Table 5: Global and Regional Terms of Trade**

(Per cent)

| **Region** | **1950s** | **1960s** | **1970s** | **1980s** | **1990s** | **2000s** | **2003-07** |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| World | 95.8 | 100.3 | 104.1 | 100.5 | 103.9 | 100.9 | 101.1 |
| Industrial Countries | 109.5 | 118.2 | 113.6 | 97.8 | 104.3 | 101.4 | 101.5 |
| United States | 119.3 | 133.4 | 115.8 | 100.3 | 103.3 | 100.1 | 98.8 |
| Euro Area | | | | | 117.1 | 100.8 | 100.8 |
| Developing and | - | - | - | - | - | - | - |
| Emerging Economies | 66.4 | 55.0 | 81.0 | 106.3 | 102.4 | 99.6 | 100.2 |
| Non-oil developing | 129.6 | 114.8 | 118.7 | 102.3 | 107.4 | 95.7 | 93.7 |
| Developing Asia | 121.6 | 81.2 | 113.7 | 104.2 | 106.0 | 94.1 | 91.9 |
| Western Hemisphere | 108.4 | 169.0 | 157.0 | 140.8 | 117.9 | 110.8 | 113.7 |
| Africa | 77.2 | 67.2 | 90.9 | 118.2 | 106.9 | 104.4 | 107.8 |
| Oil Exporting | - | - | - | 58.5 | 68.9 | 129.9 | 153.7 |
| **India** | **89.0** | **93.7** | **90.1** | **83.7** | **105.1** | **97.8** | **99.6** |

**Note:** - Not Available.

**Source:** IMF.

benchmark. On the other hand, for developing countries, the NTT was almost stable, closer to the benchmark, attributable to oil exporting countries, which witnessed the spurt in the NTT. Within developing countries, the NTT was lower by 7 to 8 per cent than the benchmark for the same period for non-oil developing and Asia regions.

## II.4. Global Commodity Prices

According to the commodity price index data of the IMF and the World Bank, all commodities price index witnessed a sharp 18.4 per cent increase during 2003-07 as compared with a deceleration, *albeit* marginally, during the 1990s, spurred by metals, energy, and food commodities. The World Bank's commodity price index of low and middle income countries also showed a sharp acceleration during the current decade, as compared with deflation trends in the 1980s and the 1990s (Table 6). In the first quarter of 2008, several commodities witnessed record level of prices. Food price inflation was highest since the late 1970s whereas prices of metals and non-fuel commodities were highest since the late 1980s.

**Table 6: Trends in Global Commodity Price Inflation**

(Per cent)

| Commodity Group | 1960s | 1970s | 1980s | 1990s | 2000s | 2003-07 | 2008(Q1)* |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| All Commodities | - | - | - | -0.4 | 13.9 | 18.4 | 45.5 |
| Non Fuel Commodities | - | - | 0.8 | -2.0 | 8.2 | 12.9 | 48.3 |
| Food | 1.2 | 12.1 | -1.7 | -2.1 | 6.1 | 9.0 | 72.9 |
| Beverages | -0.4 | 17.8 | -5.4 | 1.9 | 4.6 | 8.8 | 34.2 |
| Agr. Raw Materials | 0.3 | 14.2 | 4.2 | -0.3 | 2.6 | 3.8 | 21.4 |
| Metals | 3.8 | 9.4 | 2.0 | -3.3 | 17.7 | 28.5 | 30.4 |
| Energy | - | - | - | 2.1 | 19.9 | 23.2 | 87.2 |
| Crude oil spot average | -0.6 | 46.4 | -2.4 | 2.0 | 20.6 | 23.8 | 66.5 |
| Developing Countries Index (World Bank LMIS) | 0.9 | 12.4 | -1.8 | -1.5 | 9.4 | 16.2 | 36.02 |

**Note:** - Not Available.

* : Current trend from World Bank Commodity price pink sheet, May 2008.

**Source:** IMF: IFS Online; World Bank: Commodity prices Online database.

### *II.4.1 Oil Price Inflation*

The surge in international prices of petroleum products since the early part of the current decade is attributable to growing consumption demand of emerging economies, led by China. In order to support high economic growth, China's oil demand as per cent to world oil demand more than doubled from the average 4.1 per cent in the early 1990s to 8.9 per cent in 2006 (Table 7). In terms of incremental trends in oil consumption, emerging market economies accounted for about 80.0 per cent of global oil demand during 2000-05, with China accounting for almost half of the demand of emerging economies. In 2006, China's incremental oil demand was about 72 per cent of global oil demand. On the other hand, India's oil consumption demand, though showed an increasing trend, did not witness the sharp acceleration, which was observed in the case of China. The recent trends showed that softening of incremental oil demand from industrial and other developing countries to the extent of 36 per cent whereas the incremental oil demand for emerging economies increased to 136 per cent of global demand.

**Table 7: Trends in Growth of Energy Oil consumption**

**(Per cent)**

| **Period** | **1965/69** | **1970/74** | **1975/79** | **1980/84** | **1985/89** | **1990/94** | **1995/99** | **2000/05** | **2006** |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Share in world (per cent) | | | | | | | | | |
| EMEs | 14.8 | 15.3 | 17.8 | 21.4 | 23.8 | 26.8 | 31.3 | 33.9 | 36.6 |
| China | 0.8 | 1.7 | 2.7 | 2.8 | 3.3 | 4.1 | 5.5 | 7.0 | 8.9 |
| India | 0.9 | 0.8 | 0.9 | 1.2 | 1.6 | 1.9 | 2.5 | 3.0 | 3.1 |
| Average growth (per cent) | | | | | | | | | |
| EMEs | 7.8 | 7.6 | 6.5 | 1.5 | 4.2 | 4.0 | 4.3 | 3.6 | 2.9 |
| China | 17.7 | 25.3 | 8.5 | -1.4 | 6.6 | 6.0 | 7.6 | 8.7 | 6.6 |
| India | 11.9 | 3.4 | 6.4 | 5.4 | 7.2 | 4.0 | 8.6 | 3.8 | 0.2 |
| Average Incremental share (per cent) | | | | | | | | | |
| EMEs | 14.4 | 7.8 | 20.8 | -28.2 | 64.0 | -307.5 | 77.6 | 79.6 | 136.0 |
| China | 1.6 | 0.2 | -1.5 | -0.3 | 15.8 | -248.6 | 19.0 | 35.2 | 72.1 |
| India | 1.2 | 0.7 | 1.2 | -3.1 | 8.8 | -20.7 | 15.6 | 8.1 | 0.9 |
| Oil price increase (per cent) | 1.8 | 4.2 | 15.6 | 31.9 | 18.5 | 18.8 | 17.6 | 28.8 | 64.3 |

### *II.4.2 Prices of Food grains*

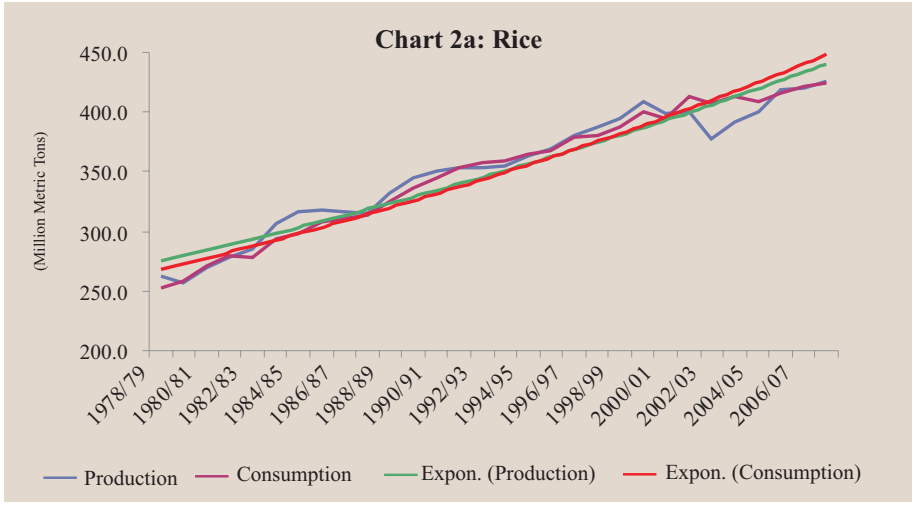
The trends in production, consumption and stock of major cereals and grains reveal various insights about the factors underlying the price dynamics of these commodities in recent years (Table 8). For major food items, such as rice and wheat, the underlying trend in consumption was lower than that of production until the early part of the current decade, thereby, resulting in accumulation of stocks and subdued prices in the 1980s and 1990s. However, this situation has reversed in recent years.

**Table 8: Major Food grains: World Demand and Supply**

(Million metric tons)

| | Rice | | | Wheat | | |
|---|---|---|---|---|---|---|
| **Year** | **Production** | **Consumption** | **Stock** | **Production** | **Consumption** | **Stock** |
| **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| 1978/79 | 262.4 | 252.3 | 54.8 | 438.9 | 413.3 | 134.8 |
| 1979/80 | 256.8 | 257.6 | 54.0 | 417.5 | 431.9 | 120.5 |
| 1980/81 | 269.9 | 271.2 | 52.6 | 435.9 | 444.1 | 112.7 |
| 1981/82 | 277.9 | 280.0 | 50.5 | 445.0 | 445.1 | 112.5 |
| 1982/83 | 285.0 | 278.7 | 56.8 | 472.7 | 455.6 | 129.9 |
| 1983/84 | 306.9 | 294.4 | 69.3 | 484.3 | 468.9 | 145.3 |
| 1984/85 | 316.8 | 298.4 | 87.7 | 508.9 | 486.2 | 168.0 |
| 1985/86 | 318.0 | 307.9 | 97.7 | 494.8 | 484.6 | 178.3 |
| 1986/87 | 316.0 | 310.4 | 103.3 | 524.1 | 511.4 | 191.0 |
| 1987/88 | 315.3 | 313.3 | 105.3 | 498.3 | 530.4 | 158.8 |
| 1988/89 | 332.1 | 325.7 | 111.7 | 494.9 | 519.4 | 134.4 |
| 1989/90 | 345.2 | 336.3 | 120.6 | 533.2 | 531.2 | 136.4 |
| 1990/91 | 351.0 | 345.0 | 126.7 | 588.4 | 553.9 | 170.9 |
| 1991/92 | 353.4 | 353.2 | 126.8 | 543.0 | 551.5 | 162.4 |
| 1992/93 | 354.1 | 357.6 | 123.3 | 561.9 | 548.0 | 176.1 |
| 1993/94 | 354.7 | 358.9 | 119.1 | 558.3 | 552.9 | 181.5 |
| 1994/95 | 363.9 | 365.2 | 117.8 | 522.9 | 542.2 | 162.2 |
| 1995/96 | 368.7 | 368.1 | 118.4 | 537.0 | 544.5 | 154.7 |
| 1996/97 | 381.1 | 378.9 | 120.6 | 581.3 | 573.2 | 162.8 |
| 1997/98 | 387.0 | 379.7 | 127.9 | 610.0 | 577.2 | 195.6 |
| 1998/99 | 394.6 | 388.2 | 134.3 | 589.9 | 578.9 | 206.6 |
| 1999/00 | 408.9 | 399.7 | 143.4 | 586.4 | 584.8 | 208.2 |
| 2000/01 | 398.9 | 395.3 | 147.1 | 582.1 | 584.5 | 205.7 |
| 2001/02 | 399.7 | 413.5 | 133.3 | 581.6 | 586.1 | 201.2 |
| 2002/03 | 378.1 | 407.9 | 103.5 | 569.2 | 604.5 | 165.9 |
| 2003/04 | 391.7 | 413.2 | 82.1 | 554.2 | 588.2 | 131.8 |
| 2004/05 | 400.8 | 408.4 | 74.4 | 626.1 | 607.2 | 150.8 |
| 2005/06 | 418.1 | 416.0 | 76.5 | 621.3 | 624.4 | 147.7 |
| 2006/07 | 420.6 | 420.9 | 76.1 | 593.0 | 615.8 | 124.8 |
| 2007/08 | 425.3 | 424.2 | 77.2 | 606.7 | 619.1 | 112.5 |

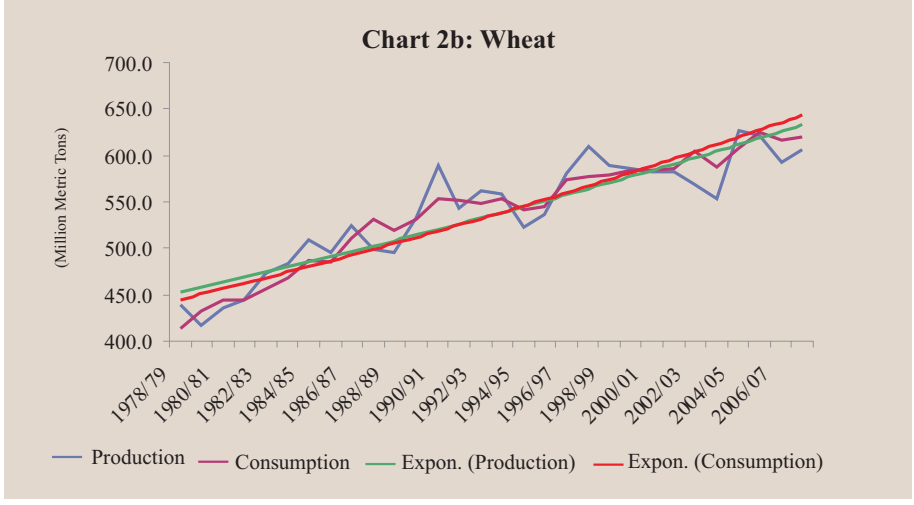
**Source:** US Department of Agriculture.

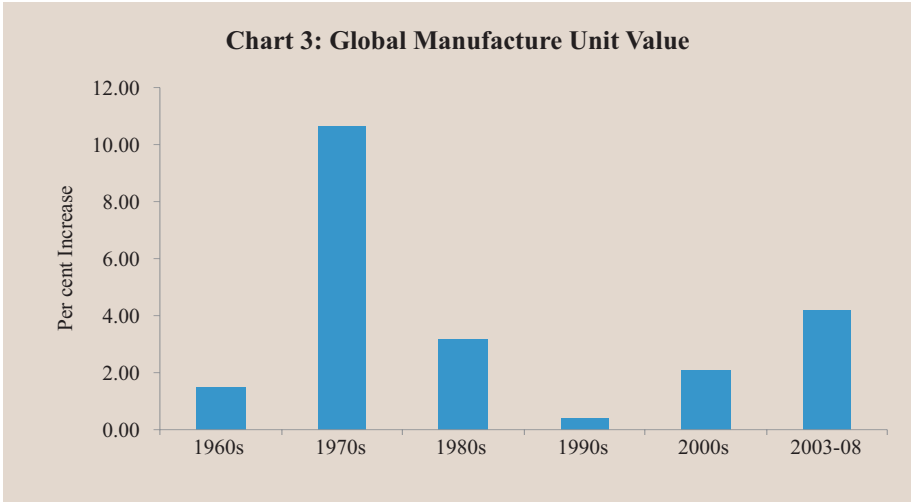



The trend in consumption has outpaced that of the production (Chart 2a and Chart 2b). Consequently, the stock level has declined substantially, fueling the acceleration in price inflation of these commodities. Illustratively, the stock of rice in 2007-08 showed a decline of 47.5 per cent from the peak in 2000-01. Similarly, the stock of wheat in 2007-08 showed a sharp 54.0 per cent decline from the peak in 1999-2000.

### *II.4.3 Global Manufacture Unit Value Index*

According to the World Bank, industrial countries' manufacture export price inflation, which reflects on the import cost for developing






countries, increased to an average of 4.2 per cent during 2003-08 as compared with negligible 0.4 per cent during the 1990s and 3.2 per cent in the 1980s. On a positive note, however, manufactures export price inflation did not witness the kind of acceleration that was witnessed in the 1970s, despite oil price inflation in the more recent period being substantially higher than the 1970s (Chart 3).

## Section III

## The Evidence from India

In the Indian context, the study addresses the following questions: (i) How important are imports for the economy?, (ii) What do we import?, (iii) Where do we import from? and How does imported inflation affect domestic prices? In order to examine these aspects, developments at the aggregate level and in respect of sources and commodity composition of imports are discussed below.

### III.1 Role of Imports in the economy

The ratio of imports to GDP at factor cost at current prices (M/GDP), which is often used as the indicator of aggregate import intensity in the economy increased from 6.7 per cent in 1950-51 to 22.9 per cent by 2007-08 (Chart 4). Decade-wise, the import intensity which averaged 7.4 per cent in the 1950s, moderated to about 6.0 per cent in the 1960s and 1970s but accelerated to 8.7 per cent, 11.8 per cent, and 20.0 per

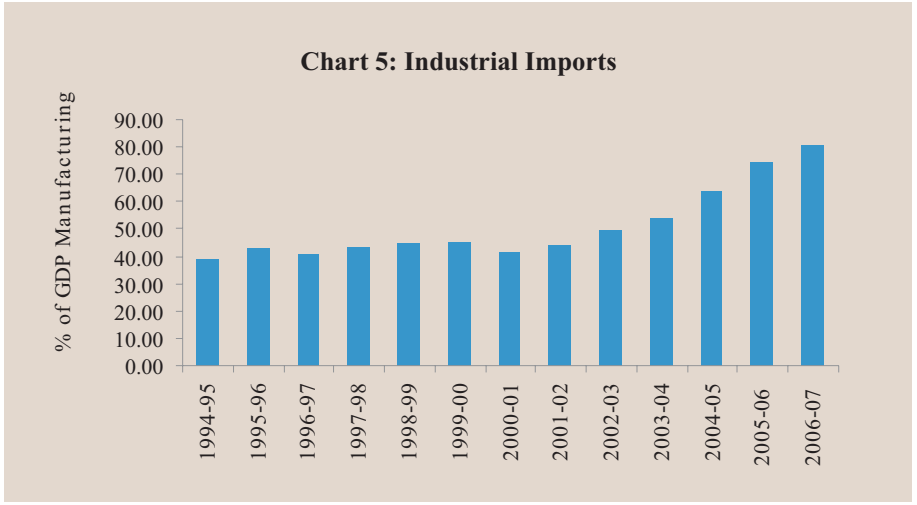
**Chart 4: Import-GDP Ratio**


cent during the 1980s, the 1990s and the current decade (up to 2007-08), respectively. Since services dominate the Indian economy, it is useful to relate merchandise imports to GDP originating from commodities sector including agriculture, mining and manufacturing activities. From this perspective, the ratio of total merchandise imports to GDP of the commodity sector (M/GDPG) increased from 10.5 per cent in 1950-51 to 61.4 per cent in 2007-08 (Chart 4).

Yet another consideration is that large component of imports relates to the manufacturing sector in the form of industrial inputs. Accordingly, imports of industrial inputs (non-oil imports less imports of bulk consumption goods, gold and silver, manufactured fertiliser and professional instruments) should relate to GDP originating from the industrial sector. Deriving from the Directorate General of Commercial Intilligence and Statisties (DGCI&S) data, the ratio of imported industrial inputs to GDP originating from the industry sector (which includes mining and quarrying, manufacturing, electricity, and construction sectors) increased from 24 per cent in 1994-95 to 48 per cent in 2006-07; the acceleration was noticeable particularly during the current decade (Chart 5).

### *III.1.1 Oil Imports*

Oil imports (in US dollar terms) accounted for 33 per cent of India's total imports in 2007-08, as compared with the average 23.2 per cent in




the 1990s, 27.2 per cent in the 1980s and 21.2 per cent in the 1970s. The rising share of oil imports is attributable to the sharp increase in international crude oil price and volume growth of oil imports. The Indian basket oil price increased sharply from US$ 27.8 per barrel in 2003-04 to US$ 106.1 per barrel in 2007-08; 33.2 per cent increase annually during 2004-05 to 2007-08. According to the Petroleum Planning Analysis Cell (PPAC), oil imports in volume terms grew on average 10.2 per cent per annum during 2004-05 to 2007-08. In quantity terms, domestic consumption of petroleum products in India grew at an average of 3.2 per cent during 2000-01 to 2007-08, as compared with 4.9 per cent growth in the 1970s and 6.3 per cent growth in the 1980s and the 1990s (Table 9). In recent years, especially, since the late 1990s, domestic oil consumption growth has been significantly differing from oil import volume growth, reflecting the impact of oil imports for exports of oil refined products. Illustratively, during 2000-01 to 2007-08, in quantity terms, oil imports in volume terms grew at an average of 8.3 per cent as compared with domestic oil consumption growth of 3.2 per cent. Exports of oil refinery, mainly due to private sector oil companies, have emerged as an important component of India's exports, surpassing traditional exports like textiles. According to British Petroleum (BP) energy statistics country database, India has become 6 respescitive largest refinery country in the world. In 2007-08, oil exports accounted for about 17 per cent of India's total exports as compared with the share of textiles exports at 12 per cent.

**Table 9: Oil Imports Volume Growth**

**(Per cent)**

| Year | Domestic Consumption | Oil Imports (Gross) Volume Growth | Oil imports (net) volume growth |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
| 1997-98 | 6.5 | - | - |
| 1998-99 | 7.4 | 10.6 | 14.1 |
| 1999-2000 | 7.2 | 17.0 | 17.2 |
| 2000-01 | 3.1 | 12.0 | 1.8 |
| 2001-02 | 0.4 | 2.8 | 0.8 |
| 2002-03 | 3.7 | 4.1 | 4.4 |
| 2003-04 | 3.5 | 10.3 | 6.2 |
| 2004-05 | 3.6 | 6.4 | 3.2 |
| 2005-06 | 1.4 | 7.8 | 3.4 |
| 2006-07 | 6.7 | 14.5 | 6.9 |
| 2007-08 (Apr-Feb) | - | 12.2 | 9.4 |
| Average 1997-98 to 2007-08 | 4.4 | 9.8 | 6.7 |
| Average 2000-01 to 2007-08 | 3.2 | 8.8 | 4.5 |

**Note :** In gross terms, total oil imports in volume include imports of crude oil and finished petroleum products. In net terms, oil import volume growth pertains to total oil imports in volume less exports of oil in volume.

: – Not Available.

**Source :** Petroleum Planning Analysis Cell (PPAC), Ministry of Petroleum and Natural Gas, Government of India.

### *III.1.2 Non-oil Imports*

Within non-oil imports, industrial inputs including capital goods and raw materials account for a major share of India's total imports. Industrial inputs (non-oil imports *less* imports of bulk consumption goods, gold and silver, manufactured fertiliser and professional instruments) accounted for 58.0 per cent of India's total imports or 82.8 per cent of total non-oil imports in 2006-07. Commodity-wise, capital goods comprising machinery and transport equipment accounted for about a fifth of India's total imports during 2003-07 (or 34.4 per cent of non-oil imports and 42.6 per cent of industrial inputs). Within capital goods, non-electrical machinery, electronics and transport equipment were the key components; for instance, in 2006-07, these three commodities accounted for about 85 per cent of total capital goods imports, leaving only 15 per cent for imports of metals, machine tools, project goods,

electrical machinery, *etc.* Imports of mainly export related items accounted for 12.6 per cent of India's total imports (17.6 per cent of non-oil imports and 22 per cent of industrial inputs imports) during the same period. Two major items in this category were chemicals and pearls and precious stones such as diamond and articles of jewellery, which account for 86 per cent of imports of mainly export related items. Among bulk goods, fertiliser imports accounted for about 1.5 per cent of India's total imports during 2003-07 as compared with 1.9 per cent, 2.4 per cent and 3.6 per cent during the 1970s, 1980s, and the 1990s, respectively. Among other major items of imports, vegetable oil accounted for 2.2 per cent and 1.8 per cent of total imports during 2000-01 to 2006-07 and 2003-04 to 2006-07, respectively as compared with 3.3 per cent, 3.7 per cent and 1.6 per cent in the 1970s, 1980s, and the 1990s, respectively. The share of gold in India's total imports increased sharply from about 2.5 per cent in the early 1990s to 9.6 per cent during the second-half of the 1990s and remained almost steady at 8.5 per cent during the current decade, accompanied by rising international gold prices and the quantum jump gold consumption supported by liberalised gold imports policy.

### *III.1.3 Food Imports*

India's dependence on food imports in general declined over the years (Table 10). The share of food imports in total imports was 4.8 per cent during 2000-2006, as compared with the average 5.0 per cent in the 1990s, 8.3 per cent in the 1980s, 18.3 per cent in the 1970s and 23.2 per cent in the 1960s. Currently, vegetable oil is the major item of food

**Table 10: India's Food Trade**

| Period | Food Exports (per cent to total exports) | Food Imports (per cent to total imports) |
|---|---|---|
| 1 | 2 | 3 |
| 1960s | 34.3 | 23.2 |
| 1970s | 31.7 | 18.3 |
| 1980s | 23.5 | 8.3 |
| 1990s | 16.8 | 5.0 |
| 2000s | 10.8 | 4.8 |

**Source:** World Bank and UNCTAD.

**Table 11: Growth Trend in Production and Consumption of Wheat and Rice in India**

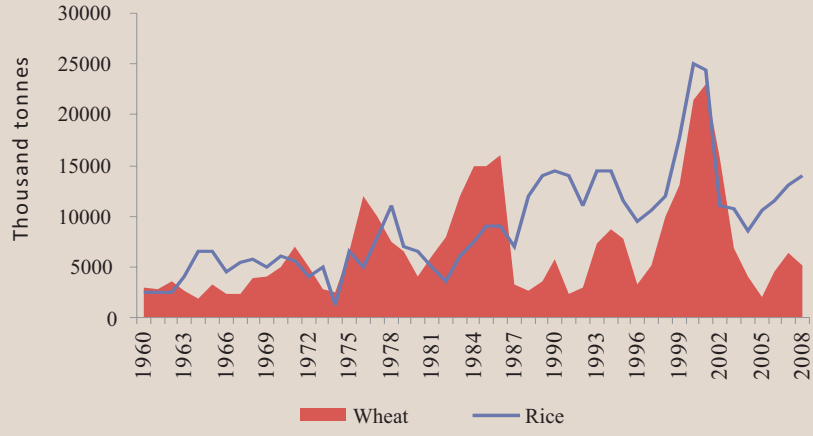
(Per cent)

| | Wheat | | Rice | |
|---|---|---|---|---|
| | **Production** | **Consumption** | **Production** | **Consumption** |
| 1 | 2 | 3 | 4 | 5 |
| 1960s | 8.2 | 5.0 | 9.3 | 5.5 |
| 1970s | 7.1 | 5.4 | 4.8 | 4.7 |
| 1980s | 4.7 | 4.4 | 4.6 | 5.4 |
| 1990s | 2.9 | 3.0 | 2.6 | 1.4 |
| 2000s | 1.2 | 1.6 | 1.6 | 2.8 |

**Source:** US Department of Agriculture (USDA).

imports. It accounted for 2.2 per cent and 1.8 per cent of total imports during 2000-01 to 2006-07 and 2003-04 to 2006-07, as compared with 3.3, 3.7 and 1.6 per cent in the 1970s, 1980s, and the 1990s, respectively. However, in the current environment, India's food balance in respect of major cereals such as rice and wheat show some critical trends. The declining stock of major cereals reflects impact of consumption growth outpacing production growth (Table 11). The stock of wheat has declined sharply from the peak of 23 million tonns in 2003 to 5.1 million tonns in 2008, while the stock of rice has declined from the peak of 25 million tonns in 2000 to 14 million tonns in 2008 (Chart 6).

**Chart 6: Stock of Wheat and Rice (milled) in india**



### III.2 Imports Volume Growth

At the aggregate level, the quantum index of imports has grew rapidly to an annual average growth of 27.0 per cent during 2003-07, from 5.8 per cent in the 1970s, 5.9 per cent in the 1980s, and 12.4 per cent in the 1990s (Chart 7). Spurred by high growth and capacity expansion of Indian industries in the recent years, the surge in import growth was accompanied by import volume growth of machinery and transport equipment (46.6 per cent) and chemicals (25.3 per cent). Similarly, basic metals such as iron and steel, copper, aluminum, lead and tin posted a high growth rate of above 20 per cent in volume terms during 2003-07. Bulk imports such as fertiliser and vegetable oil also grew at an average of 53.0 per cent and 26.0 per cent, respectively during 2003-07.

### III.3 Import Unit Value Index

An analysis of DGCIS data reveals various aspects of imported inflation (Table 12 and Annex 1). First, the aggregate import price inflation in domestic currency terms in the current decade (upto 2006-07) softened significantly as compared with the trends in the decades of the 1950s through the 1990s, excepting the 1970s which witnessed the first major oil shock. Second, it is interesting to gauge foreign price of India's imports (price of imports in foreign currency such as the US dollar); since import price in domestic currency as provided by the DGCI&S is affected by

**Chart 7: India's Imports Volume Growth**

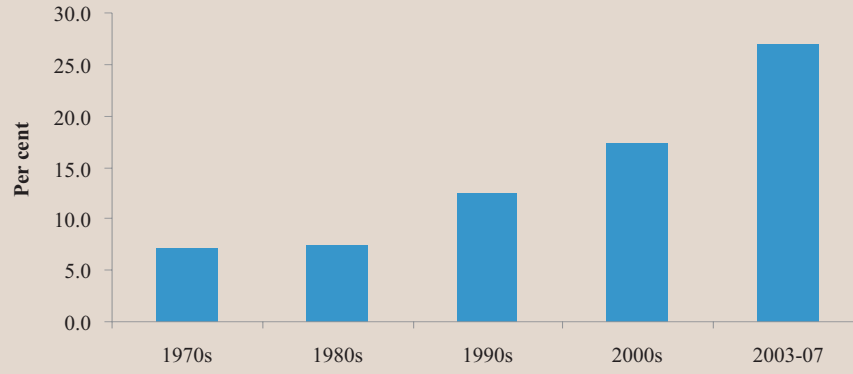


**Table 12: Trends in India's Domestic Price and Import Price Inflation rates**

(Per cent)

| Period | Import Price Inflation (US dollar)* | Import Price Inflation (domestic currency) | Domestic Inflation (WPI) | Exchange Rate Depreciation |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
| 1950s | 1.6 | 1.6 | 1.8 | 0.0 |
| 1960s | 1.2 | 6.3 | 6.4 | 5.1 |
| 1970s | 12.6 | 13.4 | 9.0 | 0.8 |
| 1980s | 0.4 | 8.0 | 8.0 | 7.7 |
| 1990s | -3.2 | 7.2 | 8.1 | 10.5 |
| 2000s | 5.2 | 4.5 | 5.1 | -0.7 |
| 2003-07 | 6.6 | 3.3 | 5.3 | -3.3 |

* : Estimated as import price inflation inclusive of transaction cost (cost, insurance and freight, *i.e.*, cif basis) in domestic currency (Import Unit value index of DGCI&S) less the changes in exchange rate.

exchange rate. The latter reveals that excepting the decade of the 1970s, India's import price inflation in US dollar terms remained subdued through the 1950s to the 1990s. In the current decade, however, such measure of import price inflation averaged 5.2 per cent, in contrast to the deceleration trend in the 1990s and the subdued trend in the 1980s.

### III.4 Sources of India's Import Price Inflation

Table 13 reflects on the source of India's non-oil import price inflation in terms of export price inflation of countries, which account for major share of India's total imports. Furthermore, Table 14 shows the association of the source with India's principal commodities' imports. The share of 22 countries shown in this Table accounted for 61 per cent and 53 per cent of India's total imports during the 1990s and the current decade, respectively. Among 22 select countries, export price inflation during 2003-07 was highest for South Africa and Australia. From South Africa, India imports mainly natural or cultured pearls, precious or semiprecious stones, precious metals such as gold and articles thereof. From Australia, India imports mainly gems, pearls, precious and semi-precious stones, gold and jewelry, which together account for 70 per cent of India's total imports from this country. Export prices of countries in the Euro area, which account for 19 per cent of India's total imports,

**Table 13: Export Price Inflation of India's Major Import Partners**

(Per cent)

| | Export Price Inflation | | | | India's Imports Share | |
|---|---|---|---|---|---|---|
| **Countries** | **1990s** | **2000s** | **2003-07** | **Latest Trend Year on Year 2008 (Jan/Feb)** | **1990s** | **2000s** |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Australia | -2.4 | 9.4 | 14.3 | | 3.1 | 2.9 |
| Belgium | 0.5 | 5.3 | 9.7 | | 6.6 | 4.8 |
| Brazil | 1.0 | 6.8 | 11.3 | 12.2 | 0.8 | 0.5 |
| Canada | -0.2 | 5.7 | 9.4 | 17.9 | 1.1 | 0.8 |
| China | | 0.6 | 2.1 | | 1.6 | 5.4 |
| France | -2.3 | 2.9 | 7.7 | | 2.3 | 1.6 |
| Germany | -0.3 | 3.0 | 7.5 | | 7.0 | 3.9 |
| HK | 0.3 | -0.2 | 0.8 | | 0.8 | 1.7 |
| Indonesia | -0.8 | 7.1 | -2.6 | | 1.1 | 2.2 |
| Israel | 1.1 | 2.7 | 5.5 | | 0.7 | 0.9 |
| Italy | 1.8 | 7.2 | 12.4 | | 2.4 | 1.4 |
| Japan | -0.2 | -0.5 | 1.6 | 5.7 | 6.3 | 3.2 |
| Korea | -4.3 | -0.6 | 2.5 | | 2.2 | 2.8 |
| Netherlands | -0.1 | 4.6 | 8.9 | | 1.4 | 0.8 |
| Singapore | -0.8 | 1.1 | 2.9 | 9.3 | 0.2 | 0.1 |
| South Africa | -1.4 | 8.5 | 18.0 | | 2.8 | 3.2 |
| Spain | -0.7 | 4.8 | 9.9 | | 0.5 | 0.3 |
| Sweden | 0.1 | 4.6 | 9.7 | 12.8 | 0.7 | 0.8 |
| Switzerland | 2.0 | 4.8 | 7.9 | 17.2 | 3.0 | 3.7 |
| Thailand | 1.5 | 2.9 | 6.0 | 8.2 | 0.4 | 0.8 |
| UK | 1.2 | 4.2 | 8.2 | 13.1 | 5.9 | 4.1 |
| US | 0.4 | 2.1 | 3.4 | 6.8 | 9.4 | 6.4 |
| **Regional Groups** | | | | | | |
| World | -0.1 | 4.0 | 7.6 | | 100.0 | 100.0 |
| Industrial Countries | 0.2 | 4.0 | 7.7 | | 51.5 | 36.1 |
| EU | 6.2 | 6.9 | 11.6 | | 28.8 | 19.2 |
| Developing | -1.0 | 4.3 | 7.6 | | 48.5 | 63.9 |
| Asia | -0.8 | 1.4 | 3.9 | | 13.8 | 21.3 |
| Oil exporting | 1.4 | 16.8 | 19.6 | | 21.2 | 8.6 |
| Non-oil developing | -1.2 | 2.2 | 5.1 | | 25.5 | 28.7 |
| India (import price inflation) | | | | | | |

have also witnessed sharp acceleration in the current decade as compared with the 1990s. The latest trend for 2008 (January/February) showed that for most countries in the Euro area, year-on-year export price inflation has increased by about 500 basis points than the average inflation during 2003-07. From the Euro area, India mainly imports industrial machinery from countries like Germany. India's import from the US could be much

**Table 14: India's Non-oil Imports from Select Countries**

| **Countries** | **Major Commodities** | **Import Value (US $ billion)** | **Total Imports (US $ billion)** | **Share** (%) |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
| Australia | Gems and jewellery, mineral fuels, ores, cereals | 6.1 | 7.0 | 87.1 |
| Belgium | Gems and jewellery | 3.3 | 4.1 | 80.5 |
| Brazil | Mining (ores and iron and steel) | 0.5 | 1.0 | 49.5 |
| Canada | Cereals, Vegetables, Fertiliser, Paper, machinery | 1.0 | 1.8 | 56.1 |
| China | Electronics, machinery, chemicals, minerals, project goods, plastic, silk | 13.7 | 17.5 | 78.3 |
| France | Machinery (aircrafts) | 3.0 | 4.2 | 71.2 |
| Germany | Industrial machinery | 4.9 | 7.5 | 65.3 |
| HK | Gems and jewellery and electronics | 1.9 | 2.5 | 76.0 |
| Israel | Gems and jewellery, electronics, fertiliser | 0.8 | 1.1 | 72.7 |
| Italy | Machinery and metals | 1.6 | 2.7 | 59.3 |
| Japan | Machinery, iron & steel, professional instruments, ships, chemicals, vehicles | 3.4 | 4.6 | 73.9 |
| Korea | Electrical, machinery, minerals, plastic, vehicles | 3.6 | 4.8 | 75.0 |
| Netherlands | Metals, machinery, plastic, chemicals | 0.7 | 1.2 | 54.2 |
| Singapore | Machinery, fuels, electrical, chemicals, paper, project goods, professional instruments | 4.8 | 5.5 | 86.5 |
| South Africa | Gems and jewellery | 1.5 | 2.5 | 60.0 |
| Sweden | Metals, machinery, gems and jewellery | 1.5 | 1.9 | 78.9 |
| Switzerland | Gems and jewellery | 7.0 | 9.1 | 76.9 |
| Thailand | Machinery, electronics, metals, plastic | 0.9 | 1.7 | 55.3 |
| UK | Gems and Jewelry, machinery and electronics, metals and professional instruments | 3.0 | 4.2 | 70.2 |
| US | Machinery, metals, fertiliser, chemicals, gems and jewellery, professional instruments | 9.5 | 11.7 | 81.2 |

cheaper than the Euro area, as export price inflation of the former was significantly lower than the later. As regards select developing countries and China, which has emerged recently as the largest source of India's imports, their export price inflation was substantially lower than that of industrial countries in Euro area.

## Section IV

## Import Price Pass-through to Domestic Prices in India

The pass-through of globalisation to domestic prices in India can be gauged in two stages. In the first-stage, export prices of foreign partners at global and regional levels percolate to import prices of India. In the second stage, changes in import prices affect costs of production and domestic supply of goods and services, thus, affect aggregate domestic inflation measured by producers' prices, which in India relates to wholesale prices. In this context, it is crucial to consider a caveat. Import prices can be measured in two ways: in foreign currency and domestic currency terms. The latter is usually measured in cost-insurance-freight *(cif)* basis and thus, includes transaction cost and also takes into account the effect of exchange rate as explained in Annex 2. In what follows, we examine the pass-through using various empirical approaches.

### IV.1 Correlation Analysis

Table 15 provides correlation of India's import price inflation in US dollar terms with export price inflation at global and regional level for industrial, developing and oil exporting countries, based on annual data. Export price inflation of oil economies showed greater correlation with India's import price.

Table 16 shows the correlation of India's import prices in domestic currency with domestic prices. In level form, the import price index had near perfect correlation with domestic price index. Since such correlation could be exaggerated due to the trend components in variables, it is meaningful to consider the correlation of inflation rates. In terms of the latter, the import price inflation had significant correlation with domestic inflation.

**Table 15: Correlation of India's Import prices with Global and Regional Export Prices**

| | India | Emerging | Industrial | Oil | World |
|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 |
| India | 1.00 | | | | |
| Emerging Economics | 0.68 | 1.00 | | | |
| Industrial Economics | 0.63 | 0.71 | 1.00 | | |
| Oil | 0.72 | 0.84 | 0.57 | 1.00 | |
| World | 0.70 | 0.86 | 0.97 | 0.72 | 1.00 |

**Table 16: Correlation of India's import price index with domestic price (WPI)**

| | Correlation of Import Price Index with Domestic Price Index | Correlation of Import price inflation with domestic inflation rates |
|---|---|---|
| **Variables** | **1950-2007** | **1950-2007** |
| 1 | 2 | 3 |
| WPI | 0.99 | 0.61 |
| Domestic Fuel price | 0.99 | 0.62 |
| Domestic manufactured Price | 0.99 | 0.56 |
| Exchange Rate | 0.96 | 0.19 |

However, cross-correlation measure reflects contemporaneous association, which may not translate into causal relation. Table 17 shows as to whether India's import price inflation measured in US dollar could be Granger caused by export price inflation at global and regional levels. Results suggest that the export price inflation of world, industrial countries and developing countries Granger cause India's import price inflation and the latter does not cause the former. The uni-directional causal relation of global and regional export price with India's import price suggests

**Table 17: Granger Causal Relation of India's Import Price with Global and Regional Export Prices**

| Null Hypothesis: | F-Statistic | Probability |
|---|---|---|
| 1 | 2 | 3 |
| (i) Developing economies export price inflation does not Granger Cause India's import price inflation | 3.95 | 0.03 |
| (ii) India's import price inflation does not Granger Cause Developing economies export price inflation | 0.22 | 0.80 |
| (iii) Industrial economies export price inflation does not Granger Cause India's import price inflation | 6.98 | 0.00 |
| (iv) India's import price inflation does not Granger Cause Industrial economies export price inflation | 0.81 | 0.45 |
| (v) Oil exporting economies export price inflation does not Granger Cause India's import price inflation | 1.14 | 0.33 |
| (vi) India's import price inflation does not Granger Cause Oil economies export price inflation | 0.32 | 0.73 |
| (vii) World export price inflation does not Granger Cause India's import price inflation | 7.71 | 0.00 |
| (viii) India's import price inflation does not Granger Cause world export price inflation | 1.24 | 0.30 |

that India is price taker, consistent with a small country engaged in world trade. Interestingly, export price inflation of oil exporting countries did not cause import price inflation of India, contrary to contemporaneous correlation measure.

## IV.2. Measuring the Pass-through

The pass-through of import prices to domestic prices can be assessed in two ways using the non-parametric approach and the model based approach such as the vector error correction model (VECM). Under the non-parametric approach, the contribution of import price inflation to domestic inflation is derived as the weight assigned to imports (the share of imports in economic activity) multiplied by import price inflation. Illustratively, taking into account the import share of gross output at about 20 per cent and the average import price inflation at 4.7 per cent during 2003-08, the impact on domestic inflation would be 0.94 percentage points or 17.6 per cent share of domestic inflation averaging at 5.3 per cent during the same period (Table 18). Since non-agricultural commodities account for the bulk of merchandise imports, the contribution of imports price inflation to domestic inflation could be about 1.4 percentage points, based on imports-GDP ratio with GDP excluding agriculture and community and personal services.

**Table 18: Impact of Imports Price Inflation on Domestic Inflation: Non-parametric approach**

(Per cent)

| Year | Import price Inflation | Domestic Inflation (WPI) | Imports/ GDP Ratio | Imports/ GDP Ratio* | Impact 1 | Impact 2 | Ratio1 | Ratio2 |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6=2* 4 | 7=2*5 | 8=6/3 | 9=7/3 |
| 1970s | 14.7 | 9.0 | 6.0 | 12.3 | 0.89 | 1.81 | 9.9 | 20.2 |
| 1980s | 8.0 | 8.0 | 8.7 | 15.9 | 0.70 | 1.27 | 8.7 | 16.0 |
| 1990s | 7.2 | 8.1 | 11.8 | 20.0 | 0.85 | 1.45 | 10.5 | 17.8 |
| 2000s | 4.8 | 5.1 | 16.8 | 25.8 | 0.81 | 1.24 | 15.7 | 24.1 |
| 2003-07 | 3.4 | 5.5 | 19.9 | 29.7 | 0.67 | 1.00 | 12.3 | 18.3 |
| 2003-08 | 4.7 | 5.3 | 19.9 | 29.7 | 0.94 | 1.40 | 17.6 | 26.3 |

* : GDP measure excludes the components of agriculture and allied activities and community and personal services.

### IV.2.1 Vector Error Correction and Cointegration Analysis

The vector error correction model comprises six variables including domestic prices (LWPI), import prices or unit value index (LMUV), Indian Rupee-US dollar exchange rate (LEXR) and GDP at factor cost at constant prices in natural logarithm scale, and interest rate (call money rate) and capital flows, defined as the current account deficit *plus* capital account surplus to GDP ratio (XBOPRS) to investigate as to how import prices affect domestic prices. Domestic inflation rate for fuel group and growth of agricultural production were used as exogenous variable to account for domestic and external supply shocks. The economic intuition is that capital flows would depend upon macroeconomic fundamentals such as the growth and inflation condition, apart from gains from the movement in exchange rates. Moreover, these variables determine policy actions, which is critical for sustained capital flows. At the same time, capital flows is expected to affect macroeconomic variables. Of particular interest, rise (fall) in capital flows would exert appreciation (depreciation) pressures on exchange rate and thus, affect import prices, domestic prices and growth.

The VECM model used annual data for the period 1950-2007, since import prices data were available annually. Empirical estimation involved 2 lags of endogenous variables based on various lag section criteria such as Akaike information criteria (AIC) and final prediction criteria (FPE). In order to derive meaningful insights about the role of policy and capital flows, the model was estimated initially with four variables (LWPI, LMUV, LEXR, LY) and then interest rate and capital flows were included. Table 19 presents results of Johansen's cointegration rank test, which confirms the existence of a single cointegration relation among endogenous variables domestic prices, import prices, exchange rate and output, subject to the linear deterministic trend with intercept as well as trend in endogenous variables.

Given our objective of investigating whether domestic prices depend upon import prices and other variables, we retrieved the coefficients of the single long-run cointegrating vector using normalised restriction on domestic prices (*i.e.*, as the dependent variable). Subsequently, interest rate and capital flows were allowed as additional endogenous variable,

**Table 19: Johansen's Cointegration Rank Test**

| Cointegration Rank Test (Trace) | | | | | | |
|---|---|---|---|---|---|---|
| Hypothesised No. of CE(s) | Statistic | Critical Value (5 %) | Probability | Statistic | Critical Value (5 %) | Probability |
| None | 44.46 | 47.86 | 0.10 | 77.68 | 63.88 | 0.00 |
| At most 1 | 20.02 | 29.80 | 0.42 | 32.10 | 42.92 | 0.38 |
| At most 2 | 5.80 | 15.49 | 0.72 | 15.99 | 25.87 | 0.49 |
| At most 3 | 1.30 | 3.84 | 0.25 | 4.50 | 12.52 | 0.67 |
| Cointegration Rank Test (Maximum Eigen value) | | | | | | |
| None | 24.44 | 27.58 | 0.12 | 45.58 | 32.12 | 0.00 |
| At most 1 | 14.22 | 21.13 | 0.35 | 16.12 | 25.82 | 0.53 |
| At most 2 | 4.50 | 14.26 | 0.80 | 11.48 | 19.39 | 0.46 |
| At most 3 | 1.30 | 3.84 | 0.25 | 4.50 | 12.52 | 0.67 |

one after the other, to examine the changes in the long-run coefficients deriving from the VECM. It may be noted that the cointegration rank test confirmed single cointegration relation for all alternative scenarios. The estimated long-run cointegration relation is presented in Table 20. Since the variables are in logarithm scale, these coefficients of long-run cointegration relation quantify elastic response of domestic prices to other variables.

**Table 20: Cointegration of Domestic Prices with Import prices and Other variables**

| | Coefficients of the single long-run vector from alternative VECM | | |
|---|---|---|---|
| **Variables** | **VECM1** | **VECM2** | **VECM3** |
| 1 | 2 | 3 | 4 |
| LMUV1(-1) | 0.19526 | 0.3227 | 0.27724 |
| | [3.56121] | [4.70008] | [4.14283] |
| LEXR(-1) | 0.36981 | 0.5067 | 0.55268 |
| | [3.80792] | [4.12529] | [4.72840] |
| LY(-1) | -1.229657 | -2.383422 | -3.078489 |
| | [- 4.13155] | [- 4.98767] | [- 6.54669] |
| CALL(-1) | | -0.041073 | -0.035195 |
| | | [ -3.87498] | [- 3.40215] |
| XBOPRS(-1) | | | 0.07438 |
| | | | [3.54023] |
| Trend | 0.08816 | 0.12315 | 0.14847 |
| | [7.97285] | [7.25340] | [9.06413] |
| C | 15.5623 | 29.4086 | 38.0105 |

Figures in brackets indicate the estimates of 't'statistic associated with the coefficients. Most coefficients reported in the Table are statistically significant, since the computed't' statistic is higher than the critical value of 2.0 at 5 per cent level of significance.

Beginning with the model of four variables (VECM1), it was found that import prices and exchange rate had a statistically significant positive impact while real output had significant negative impact on domestic prices in the long-run. As interest rate was included in the model (VECM2), there was strengthening of the response of domestic prices to imports prices, exchange rate and output. Comparing the model with interest rate with the model without interest rate, the long-run response of domestic prices to output witnessed a sharp acceleration. The interest rate variable showed statistically significant inverse relationship with domestic prices, though the size of its coefficient was substantially lower than other variables. Subsequently, with the introduction of the capital flows variable in the model (VECM3), there was a marginal strengthening of exchange rate impact on domestic prices. However, there was substantial strengthening of output impact on domestic prices due to capital flows. The impact of import prices on domestic prices in this model witnessed some moderation, *albeit* marginally, as compared with the earlier models, VECM1 and VECM2. All the three models showed that domestic output had predominant role in determining the long-run path of domestic prices. The elasticity response of domestic prices was greater with respect to exchange rate than with respect to import prices. From policy perspective, a significant finding was that the impact of capital flows was about twice the impact of interest rate on domestic prices.

### *Manufacturing Price Response*

Alluding to earlier discussion, the response of aggregate price indices with respect to exchange rate, import prices, capital flows and interest rate could be affected due to inclusion of administered prices such as oil price and food price and thus, weaken the causal relationship among the variables. Although, the VECM models discussed above included oil prices and food prices as exogenous variable, the need was felt to gauge the response of domestic prices of non-oil manufacturing commodities exclusively. In this regard, Johansen's cointegration rank test continued to support the existence of single long-run relationship binding the variables. As evident from Table 21, import price and exchange rate variables had statistically significant long-run impact on domestic

**Table 21: Cointegration of Domestic Manufacturing Prices (with capital flows and interest rate)**

| Variables | VECM4 (without capital flows and interest rate) | VECM5 (with capital flows) | VECM6 (with capital flows and interest rate) |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
| LPMNF | -1 | -1 | -1 |
| LMUV1 | 0.23543 | 0.219101 | 0.289839 |
| | (3.88865) | (2.91520) | (3.34168) |
| LEXR | 0.454016 | 0.596261 | 0.622291 |
| | (4.26786) | (4.45521) | (4.09531) |
| LY | -1.5973 | -2.705071 | -3.157122 |
| | ( -4.69181) | (- 6.03089) | (- 5.04258) |
| Capital flows | | 0.068645 | 0.070082 |
| | | (2.73659) | (2.65166) |
| Interest rate | | | -0.020112 |
| | | | (- 1.51959) |
| Trend | 0.09035 | 0.124445 | 0.137823 |
| | (7.05193) | (7.44409) | (6.27093) |
| C | 20.09129 | 33.65366 | 39.08988 |

Figures in bracket indicate asymptotic 't' statistic, which could be statistically significant for value above 2.0 for 5 per cent level of significance.

manufacturing prices. Real activity had inverse relationship with domestic prices. The elasticity response of domestic prices with respect to exchange rate was higher than the elastic response of domestic prices with respect to import prices. The long-run cointegration relation suggested that, *ceteris paribus*, as much as 4 per cent increase in import prices affected domestic prices of manufactured commodities by a percentage point. On the other hand, about 1.5 per cent increase in the exchange rate increased domestic prices by a percentage point. However, in terms of absolute coefficient size, the increase in real activity had significantly larger impact on domestic prices than exchange rate and import prices. The capital flows had statistically significant positive impact on domestic prices in the long-run, but such impact was lower than the impact of import prices, exchange rate and output. The interest rate variable had a negative association with domestic prices in the long-run, though its statistical significance was not as strong as other variables as evident from asymptotic 't' statistic. Moreover, with capital flows and interest rate, there was a strengthening of the elastic response of domestic prices with respect to import prices, exchange rate and output.

### *Impulse Response Analysis*

Given the underlying long-run and short-run dynamics, a VECM serves useful for analysing dynamic interaction among economic variables by way of impulse response and forecast error variance decomposition (FEVD) analysis. The impulse response function enables to evaluate as to how a shock to a variable affects other variables in the model. On the other hand, for each variable, the FEVD enables to evaluate the importance of other variables in terms of accounting of total variation in the variable under investigation. Based on the above VECM, generalised impulse response analysis showed that a standard deviation shock to import prices in domestic currency was associated with increase domestic prices, depreciation of exchange rate and rise in interest rate. Domestic output responded negatively to higher domestic prices and rising import costs accompanied by exchange rate depreciation, despite an increasing response of capital flows. The increasing response of capital flows to rising import costs and domestic prices but lower output is in line with the real world situation of an emerging economy like India. A possible explanation could be that when domestic prices are high, authorities pursue tight policy in the form of higher interest rates. This, in turn, impinges domestic and foreign interest rate differential and fuel greater capital flows, which are induced by arbitrage opportunities. As regards other variables, shock to exchange rate (entailing a depreciation pressure) was associated with rise in import prices, domestic prices and interest rate but decline in capital flows and output. A positive shock to capital flows was associated with rising prices and interest rate, appreciation of exchange rate and decline in output.

### *Variance Decomposition Analysis*

The forecast error variance decomposition provides another perspective on the importance of the variables in terms of their volatility characteristics and spillover. Unlike the generalised impulse response analysis, the FEVD analysis of the VECM, based on Choleski decomposition procedure, requires a specification of ordering of variables. In this regard, we adopted the ordering of variables with (i) interest rate as the instrument of policy appearing in the first place (*i.e.*, autonomous policy actions), followed by (ii) capital flows as they are arbitrage induced,

(iii) exchange rate as it is determined in the market by demand and supply conditions for foreign exchange resources, (iv) import prices (which depend upon exogenous foreign supplier price and exchange rate), (v) domestic output, which depends on exchange rate impact on exports and import costs, and (vi) domestic prices in the final place, to depend upon all the preceding variables. Results of FEVD are summarised in Table 22. It was found that over medium term 3-5 year horizon, about 30-40 per cent of total variation in domestic prices was explained by other variables, with dominant share of capital flows (19-20 per cent), followed by exchange rate (10-12 per cent) and import prices (2-3 per cent). The predominance of capital flows on prices variable was due to the former's impact on exchange rate consistent with market determined exchange rate regime. Moreover, the inadequate response of capital flows to macroeconomic variables such as output and inflation could be another factor. Finally in the aggregate analysis, global factors comprising the capital flows, exchange rate and import prices, accounted for about 18 per cent, 30 per cent and 50 per cent of total variation in domestic prices over short, medium and longer horizons of 1-year, 3-year and 10-year, respectively.

### *A Numerical Simulation*

Based on the vector error correction model for aggregate price index, the coefficients of long-run cointegration vector were used to compute the underlying contribution of global factors such as import prices, exchange rate and capital flows to domestic inflation in the more recent period, especially during 2000-01 to 2007-08. Results of the numerical exercise are summarised in Table 23. On average, global factors could have played a dominant role in determining domestic inflation during the period 2000-01 to 2007-08. Shifting reference to period 2003-04 to 2007-08, which witnessed capital flows with appreciation of exchange rate, the contribution of global factors was reduced by more than 50 per cent. However, despite exchange rate appreciation in the more recent period 2006-07 to 2007-08, global factors could have had a significant impact on domestic inflation but could have been moderated significantly due to domestic factors such as high output growth.

## Table 22: Variance Decomposition of LPMNF

| Period | S.E. | LPMNF | LMUV1 | LEXR | LY | XBOPRS | CALL |
|---|---|---|---|---|---|---|---|
| 1 | 0.03 | 81.38 | 3.18 | 3.91 | 0.49 | 10.88 | 0.16 |
| 2 | 0.06 | 73.00 | 2.68 | 7.20 | 0.25 | 15.95 | 0.92 |
| 3 | 0.07 | 70.05 | 2.35 | 7.78 | 0.16 | 17.59 | 2.08 |
| 4 | 0.09 | 67.11 | 2.14 | 9.69 | 0.14 | 18.84 | 2.07 |
| 5 | 0.10 | 63.12 | 2.48 | 12.11 | 0.26 | 20.34 | 1.68 |
| 6 | 0.11 | 58.96 | 3.09 | 14.53 | 0.47 | 21.62 | 1.33 |
| 7 | 0.12 | 55.16 | 3.71 | 16.75 | 0.70 | 22.60 | 1.08 |
| 8 | 0.14 | 51.71 | 4.26 | 18.79 | 0.95 | 23.37 | 0.91 |
| 9 | 0.15 | 48.49 | 4.78 | 20.69 | 1.24 | 24.02 | 0.78 |
| 10 | 0.16 | 45.46 | 5.30 | 22.46 | 1.55 | 24.55 | 0.68 |
| Variance Decomposition of LMUV1: | | | | | | | |
| 1 | 0.10 | 0.00 | 85.99 | 5.23 | 0.00 | 7.23 | 1.55 |
| 2 | 0.16 | 1.68 | 72.95 | 4.29 | 0.02 | 14.87 | 6.19 |
| 3 | 0.20 | 1.52 | 72.80 | 3.44 | 0.03 | 16.21 | 6.00 |
| 4 | 0.22 | 1.28 | 73.80 | 3.22 | 0.05 | 16.38 | 5.28 |
| 5 | 0.25 | 1.12 | 74.11 | 3.12 | 0.04 | 16.44 | 5.18 |
| 6 | 0.27 | 1.02 | 73.98 | 3.12 | 0.04 | 16.58 | 5.27 |
| 7 | 0.29 | 0.95 | 73.98 | 3.11 | 0.03 | 16.70 | 5.23 |
| 8 | 0.31 | 0.88 | 74.01 | 3.12 | 0.03 | 16.80 | 5.16 |
| 9 | 0.33 | 0.82 | 74.00 | 3.15 | 0.03 | 16.87 | 5.14 |
| 10 | 0.35 | 0.77 | 73.96 | 3.19 | 0.02 | 16.93 | 5.14 |
| Variance Decomposition of LEXR: | | | | | | | |
| 1 | 0.05 | 0.00 | 0.00 | 92.01 | 0.00 | 0.59 | 7.41 |
| 2 | 0.09 | 1.07 | 3.03 | 76.90 | 0.17 | 0.38 | 18.45 |
| 3 | 0.14 | 3.29 | 4.37 | 67.23 | 0.21 | 1.25 | 23.65 |
| 4 | 0.17 | 4.85 | 5.33 | 63.22 | 0.14 | 1.24 | 25.22 |
| 5 | 0.19 | 6.14 | 5.32 | 61.25 | 0.18 | 1.04 | 26.06 |
| 6 | 0.20 | 7.51 | 5.05 | 59.16 | 0.37 | 0.88 | 27.04 |
| 7 | 0.22 | 9.18 | 4.68 | 56.78 | 0.73 | 0.79 | 27.83 |
| 8 | 0.23 | 11.19 | 4.29 | 54.14 | 1.32 | 0.81 | 28.25 |
| 9 | 0.24 | 13.44 | 3.91 | 51.24 | 2.15 | 0.96 | 28.30 |
| 10 | 0.25 | 15.83 | 3.59 | 48.11 | 3.22 | 1.24 | 28.01 |
| Variance Decomposition of LY: | | | | | | | |
| 1 | 0.01 | 0.00 | 5.93 | 6.04 | 67.85 | 13.13 | 7.05 |
| 2 | 0.02 | 0.43 | 2.71 | 19.48 | 63.31 | 10.82 | 3.26 |
| 3 | 0.02 | 3.00 | 2.56 | 27.20 | 57.08 | 8.38 | 1.79 |
| 4 | 0.03 | 5.95 | 3.01 | 30.05 | 50.92 | 9.02 | 1.06 |
| 5 | 0.04 | 8.59 | 3.49 | 31.24 | 46.81 | 9.14 | 0.72 |
| 6 | 0.05 | 9.87 | 4.30 | 33.04 | 42.95 | 9.09 | 0.74 |
| 7 | 0.06 | 10.41 | 5.28 | 34.45 | 39.66 | 9.32 | 0.90 |
| 8 | 0.08 | 10.82 | 6.08 | 35.42 | 37.07 | 9.56 | 1.05 |
| 9 | 0.09 | 11.20 | 6.74 | 36.14 | 35.02 | 9.69 | 1.22 |
| 10 | 0.10 | 11.45 | 7.31 | 36.71 | 33.33 | 9.79 | 1.40 |
| Variance Decomposition of XBOPRS: | | | | | | | |
| 1 | 0.88 | 0.00 | 0.00 | 0.00 | 0.00 | 95.69 | 4.31 |
| 2 | 1.02 | 5.12 | 0.72 | 3.41 | 0.95 | 86.46 | 3.33 |
| 3 | 1.17 | 4.01 | 1.40 | 5.68 | 1.86 | 79.80 | 7.24 |
| 4 | 1.33 | 3.61 | 2.99 | 4.70 | 1.59 | 79.18 | 7.93 |
| 5 | 1.43 | 3.31 | 2.74 | 4.14 | 1.40 | 80.72 | 7.69 |
| 6 | 1.48 | 3.10 | 2.53 | 4.17 | 1.32 | 81.33 | 7.55 |
| 7 | 1.54 | 3.14 | 2.35 | 4.50 | 1.34 | 81.14 | 7.54 |
| 8 | 1.61 | 3.51 | 2.21 | 5.43 | 1.53 | 79.98 | 7.34 |
| 9 | 1.67 | 4.08 | 2.22 | 7.07 | 1.97 | 77.73 | 6.93 |
| 10 | 1.75 | 4.77 | 2.43 | 9.35 | 2.65 | 74.36 | 6.44 |
| Variance Decomposition of CALL: | | | | | | | |
| 1 | 2.44 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 100.00 |
| 2 | 3.27 | 0.18 | 3.64 | 0.35 | 0.49 | 2.71 | 92.63 |
| 3 | 3.54 | 0.16 | 4.13 | 2.45 | 0.84 | 4.25 | 88.18 |
| 4 | 3.78 | 0.36 | 3.73 | 3.12 | 0.80 | 4.22 | 87.78 |
| 5 | 4.11 | 0.42 | 3.73 | 2.81 | 0.68 | 4.34 | 88.02 |
| 6 | 4.44 | 0.42 | 4.17 | 2.47 | 0.59 | 5.12 | 87.24 |
| 7 | 4.72 | 0.50 | 4.54 | 2.21 | 0.52 | 5.85 | 86.37 |
| 8 | 5.01 | 0.70 | 4.88 | 1.97 | 0.50 | 6.37 | 85.59 |
| 9 | 5.31 | 0.90 | 5.30 | 1.79 | 0.51 | 6.91 | 84.59 |
| 10 | 5.61 | 1.10 | 5.78 | 1.70 | 0.57 | 7.49 | 83.36 |
| Cholesky Ordering: CALL, XBOPRS, LEXR, LMUV1 and LY LPMNF | | | | | | | |

**Table 23 Contribution of Global Factors to Domestic Inflation**

| Period | WPI inflation (Actual) | Simulated Contribution of Global factor (Impact of Exchange rate, Capital flows and Import prices) |
|---|---|---|
| 2001 to 2007-08 | 4.8 | 4.5 |
| 2003-04 to 2007-08 | 5.3 | 2.0 |
| 2006-07 | 5.4 | 17.8 |
| 2007-08 | 4.6 | 6.1 |

## Section V

## Key Findings and Conclusion

This study attempted a comprehensive analysis of imported inflation in the Indian context, based on various facts and figures from global developments and stylised facts relating to India's merchandise trade growth and import unit value indices. The study explored non-parametric and parametric time series models such as Johansen's vector error correction and cointegration to gauge the pass-through of import prices to domestic prices. Empirical exercises revealed various perspectives.

(i) The ratio of imports to GDP at factor cost at current prices (M/GDP), which is often used as the indicator of aggregate import intensity in the economy increased from 6.7 per cent in 1950-51 to 22.9 per cent by 2007-08.

(ii) Oil imports (in US dollar terms) accounted for 33 per cent of India's total imports in 2007-08, as compared with the average 23.2 per cent in the 1990s, 27.2 per cent in the 1980s and 21.2 per cent in the 1970s.

(iii) The rising share of oil imports is attributable, mainly, to the sharp increase in international crude oil price. The Indian basket oil price increased sharply from US $ 27.8 per barrel in 2003-04 to US $ 106.1 per barrel in 2007-08; 33.2 per cent increase annually during 2004-05 to 2007-08. However, the price of Indian oil basket has fallen to around US$40 per barrel by December 2008. According to the Petroleum Planning Analysis Cell (PPAC), in quantity terms, domestic consumption of petroleum products in India grew at an

average of 3.2 per cent during 2000-01 to 2007-08, as compared with 4.9 per cent growth in the 1970s and 6.3 per cent growth in the 1980s and the 1990s.

(iv) India's dependence on food imports in general declined over the years. The share of food imports in total imports was 4.8 per cent during 2000-2006, as compared with the average 5.0 per cent in the 1990s, 8.3 per cent in the 1980s, 18.3 per cent in the 1970s and 23.2 per cent in the 1960s. Currently, vegetable oil is the major item of food imports; it accounted for 2.2 per cent and 1.8 per cent of total imports during 2000-01 to 2006-07 and 2003-04 to 2006-07, as compared with 3.3, 3.7 and 1.6 per cent in the 1970s, 1980s, and the 1990s, respectively.

(v) Within non-oil imports, industrial inputs including capital goods and raw materials account for a major share of India's total imports. Industrial inputs (non-oil imports less imports of bulk consumption goods, gold and silver, manufactured fertiliser and professional instruments) accounted for 58.0 per cent of India's total imports or 82.8 per cent of total non-oil imports in 2006-07. Commodity-wise, capital goods comprising machinery and transport equipment account for about a fifth of India's total imports during 2003-07 (or 34.4 per cent of non-oil imports and 42.6 per cent of industrial inputs).

(vi) At the aggregate level, the quantum index of imports grew rapidly to an annual average growth of 27.0 per cent during 2003-07, from 5.8 per cent in the 1970s, 5.9 per cent in the 1980s, and 12.4 per cent in the 1990s (Chart 7). Spurred by high growth and capacity expansion of Indian industries in the recent years, the surge in import growth was accompanied by import volume growth of machinery and transport equipments (46.6 per cent) and chemicals (25.3 per cent). Similarly, basic metals such as iron and steel, copper, aluminum, lead and tin posted a high growth rate in volume terms above 20 per cent during 2003-07. Bulk imports such as fertiliser and vegetable oil also grew at an average of 53.0 per cent and 26.0 per cent, respectively, during 2003-07.

(vii) India's food balance shows the declining trend in stocks of major cereals such as rice and wheat show, reflecting the impact of

consumption growth outpacing production growth. The stock of wheat declined sharply from the peak of 23 million tonns in 2003 to 5.1 million tonns in 2008, while the stock of rice declined from the peak of 25 million tonns in 2000 to 14 million tonns in 2008.

(viii) The aggregate import price inflation in domestic currency term in the current decade (upto 2006-07) softened significantly as compared with the trends in the 1950s through the 1990s, excepting the 1970s which witnessed the first major oil shock. India's import price inflation in US dollar terms remained subdued through the 1950s to the 1990s. In the current decade, however, such measure of import price inflation averaged 5.2 per cent, in contrast to the deceleration trend in the 1990s and the subdued trend in the 1980s.

(ix) Export prices of countries in the Euro area, which account for a fifth of India's total imports, have also witnessed sharp acceleration in the current decade as compared with the 1990s. In the Euro area, India mainly imports industrial machinery from countries like Germany. India's import from the US could be much cheaper than the Euro area, as export price inflation of the former was significantly lower than the latter. As regards select developing countries and China, which has emerged recently as the largest source of India's imports, their export price inflation was substantially lower than that of industrial countries in the Euro area.

(x) Export price inflation of oil economies had greater correlation with India's import price. The import price inflation had significant correlation with domestic inflation.

(xi) Based on non-parametric estimation, import price inflation could contribute to domestic inflation on average ranging between 1 and 2 percentage points. The vector error correction model suggested that every percentage point increase in import prices in domestic currency could affect domestic inflation upward by 20 to 30 basis points; alternatively, every five percentage point increase in import price inflation would be associated with one percentage point increase in domestic price inflation.

(xii) Import prices, capital flows and exchange rate had statistically significant positive association with domestic inflation in the long-

run. The interest rate variable had a negative association with domestic prices in the long-run, though its statistical significance was not as strong as other variables. Moreover, with capital flows and interest rate, there was a strengthening of the elastic response of domestic prices with respect to import prices, exchange rate and output. In terms of variance decomposition analysis of the cointegration model, the impact of capital flows on domestic prices was more pronounced than the impacts of import prices and exchange rate, due to the impact of capital flows on the latter variables. The empirical findings suggested that global factors (import prices, capital flows, movements in exchange rate) contributed 20 to 30 per cent in domestic inflation in India.

Significant implication of capital inflows for domestic prices, *albeit* not the case for 2008-09, points toward the need for rising absorptive capacity of the domestic economy. In the long-term perspective, the absorptive capacity of the economy has to be strengthened. Once the global financial markets improve and the capital flows to India resume the rising trend in the period to come, efficient allocation of capital and rising absorptive capacity need to be improved. Otherwise, rising capital flows may have some stabilising impact on domestic inflation through exchange rate appreciation and resultant reduced import prices, but inefficient capital allocation without sufficient absorptive capacity, may lead to the asset bubbles and overheating of the economy. In fact, the dominance of the latter over the former may not be ruled out. Ideally, overheating in the big emerging economies like India, with vast investment requirements in infrastructure, should not emanate on account of foreign capital flows. Lack of the absorptive capacity raises doubts not only regarding the potential gains to the domestic economy from the globalisation but also the overall institutional and policy environment of the country.

## Annex 1: Import Price Inflation of Principal Commodities Imports of India

| Commodity | 1980s | 1990s | 2000s | 2003-07 |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
| General Industrial Machinery & Equipment | 16.8 | 32.2 | 21.6 | 46.4 |
| Non-Ferrous Base Metals, Waste & Scrap n.e.s. | 5.5 | 14.7 | 24.4 | 43.8 |
| Metal Working Machinery | 14.6 | 178.3 | 6.8 | 31.4 |
| Professional, Scientific & Controlling Instruments & Apparatus n.e.s. | 26.9 | 3.0 | 19.6 | 31.0 |
| Copper(KG) | 7.5 | 11.4 | 12.5 | 30.3 |
| Tin | -0.1 | 8.3 | 14.4 | 28.5 |
| Lead | 6.1 | 11.0 | 12.7 | 22.9 |
| Petroleum Crude | -0.6 | 10.7 | 26.1 | 22.2 |
| Manufactures of Metals | 9.0 | 10.6 | 17.9 | 20.9 |
| Petroleum Products | -0.4 | | 36.2 | 20.5 |
| Electrical Machinery | 7.2 | 16.3 | 12.3 | 18.5 |
| Machinery Specialised for Particular Industries | 16.4 | 14.4 | 6.6 | 15.2 |
| Inorganic Chemicals | 1.6 | 13.8 | 9.7 | 14.9 |
| Miscellaneous Manufactured Articles | 17.3 | -0.9 | 19.3 | 14.2 |
| Power Generating Machinery & Equipment | 30.9 | 15.7 | 16.3 | 14.2 |
| Nickel(KG) | 27.3 | 4.1 | 15.6 | 13.8 |
| Fruits & Nuts | 8.3 | 13.1 | 6.7 | 13.3 |
| Photographic Apparatus, etc. | 12.3 | -1.1 | 23.0 | 13.0 |
| Aluminium(KG) | 12.1 | 9.1 | 8.8 | 12.6 |
| Artificial Resin & Plastic Material & Cellulose Ester | 14.2 | 4.9 | 10.1 | 11.7 |
| Crude Rubber Incl. Synthetic & Reclaimed | 7.5 | 12.8 | 7.8 | 10.6 |
| Bevarages | 18.2 | 12.5 | 1.9 | 10.0 |
| Dairy Products | 9.6 | 27.0 | 8.1 | 9.4 |
| Textile Fibres & Waste | 8.7 | 12.1 | 5.3 | 9.3 |
| Paper, Paperboard & Articles thereof | 30.6 | 12.0 | 4.2 | 9.1 |
| Minerals excluding Coal, Petroleum, Crude Fertilisers, Sulphur & Precious Stones | 8.1 | 15.1 | 1.5 | 8.9 |
| Fertilisers, Manufactured | 8.7 | 33.1 | 6.1 | 8.4 |
| Pulp & Waste Paper | 10.1 | 10.0 | 6.3 | 7.0 |
| Iron & Steel(KG) | 13.8 | 11.6 | 5.5 | 6.9 |
| Crude Fertilisers | 5.6 | 11.7 | 2.8 | 6.9 |
| Ores & Concentrates of Base Metals n.e.s. | 20.8 | 15.2 | 2.2 | 6.7 |
| Spices | -3.8 | 0.3 | 30.6 | 5.5 |
| Transport Equipment | 14.5 | 9.8 | 4.8 | 3.8 |
| Medicinal & Pharmaceutical Products | 12.8 | 12.3 | -3.0 | 3.4 |
| Textile Yarn | 10.3 | 7.3 | 3.3 | 2.1 |
| Organic Chemicals | 14.3 | -1.7 | 20.6 | 2.0 |
| Dyeing, Tanning & Colouring Materials | 11.2 | 10.2 | -2.7 | 1.2 |
| Cereals & Cereal preparations | 1.7 | 16.1 | 9.8 | -6.9 |
| memo : commodity groups | | | | |
| General Index | 4.9 | 8.5 | 5.5 | 3.4 |
| Food & Food Articles | 1.8 | 15.5 | 6.2 | 2.3 |
| Beverages & Tobacco | 18.2 | 12.5 | 1.9 | 10.0 |
| Crude Materials, Inedible, except Fuels | 7.3 | 11.3 | 8.7 | 17.2 |
| Mineral Fuels, Lubricants, etc. | -0.4 | 10.5 | 26.4 | 22.0 |
| Chemicals & Related products | 6.8 | 15.3 | 7.7 | 6.3 |
| Machinery & Transport Equipment | 7.5 | 12.2 | -1.7 | -0.2 |
| *Note: Estimated from DGCI&S data on Import Unit value indices* | | | | |
| Manufactured Goods Classified Chiefly by Material | 12.0 | 12.3 | 6.7 | 10.7 |

## Annex 2: Methodology

Conceptually, import price can be measured in two ways: in domestic currency and foreign currency. In domestic currency, import price accounts for the impact of foreign price, exchange rate, taxes and transaction cost (transport and insurance). Aggregate price of commodities supplied in the economy is postulated as a weighted geometric mean of prices of commodities produced domestically and prices of imports. A notable assumption here is that imports play an important role in augmenting rather than substituting domestic supply of commodities.

$$P_S = P_D^{\omega} P_M^{1-\omega}$$

With logarithm transformation and first difference, the above translates to aggregate price inflation in the domestic economy as the weighted average of price inflation of domestic goods and imports.

$$\pi_S = (1-\omega)\pi_D + \omega\pi_M$$

In the above, the impact of exchange rate also can be incorporated since import prices in domestic currency are a product of foreign price and exchange rate.

$$\pi_S = (1-\omega)\pi_D + \omega(\pi_F + \Delta E)$$

A crucial point here is how to assign weights to imports and domestic goods. One approach is to assign weights to imports in terms of its share in the aggregate measure of economic activity.

$$\omega_N = \frac{M}{Y}$$

The nominal weight, however, is affected by relative price of imports and therefore, in real terms the weight can be derived:

$$\omega_N = \frac{Q_M P_M}{Q_Y P_Y} = \omega_R p_Y^M$$

## Notes

[1] This index is generally accepted as a proxy for the price of developing country imports of manufactures in U.S. dollar terms. The index is a weighted average of export prices of manufactured goods for the G-5 economies (the United States, Japan, Germany, France, and the United Kingdom), with local-currency based prices converted into current U.S. dollars using market exchange rates. Weights are the relative share in G-5 exports of manufactured goods to developing countries in a base year (currently 1995), with values: U.S. (32.2%), Japan (35.6%), Germany (17.4%), France (8.2) and United Kingdom (6.6%). The MUV tends to be dominated by movements in the cross exchange rates between the US dollar on the one hand and Japanese yen, euro and pound sterling on the other. At a time of US dollar depreciation, for example, the index will rise, suggesting higher-dollar-based prices from non-U.S. G-5 countries. In contrast, a rising dollar will tend to lower growth in the MUV, as diminishing values of local-currency prices in dollar terms dominate the movements of MUV.

[2] For the trends in 1960s through 1990s, data source is British Petroleum (BP) Energy Statistics Yearbook 2007.

[3] There could also be a third or final stage of the pass-through as consumer prices would be affected by changes in wholesale prices. Since WPI is used for policy purposes in India, this study does not engage in analysing such pass-through.

[4] The lag selection based on Akaike information criterion (AIC) as well as the final prediction error criteria (FPE). Although, the Schwartz-Bayes' criteria and Hannan-Quinn criteria suggested one-period lag, 2 lags were chosen to avoid first order autocorrelation of residuals from the model.

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# *Bank Penetration and SHG-Bank Linkage Programme: A Critique*

**Pankaj Kumar and Ramesh Golait***

This paper examines the outreach of Self Help Group (SHG)-Bank Linkage Programme (SBLP) in the backdrop of growing banking and socio-economic divide between regions in India. The 'defining event' in the build-up of financial architecture in India was the nationalisation of major commercial banks. The aftermath of nationalisation witnessed a remarkable spread of the banking system to the unbanked and under-banked rural areas. However, the dependence on informal sources of credit has not decreased in rural areas. The problem accentuated as banks veered away from rural to urban India. The relative decline of commercial banking network in the rural areas runs contrary to the objective of financial inclusion and is a formidable challenge in the way of faster and more inclusive growth.

SBLP was conceived to fill the existing gap in the formal financial network and extending the outreach of banking to the poor. However, the present distribution of the SBLP is skewed against the poorer regions of the country. While less than one-fifth of total loans to SHGs went into the Eastern and Central Regions taken together, they accounted for more than three-fifth of the total poor in India. Banks need to be encouraged as facilitators in extending the SHG movement in the poorer regions, perhaps by introducing a scheme of performance-linked incentive. Specific funds may be created to address the regional imbalances in the SBLP. SHGs need to be formed around activities of rural infrastructure such as construction and renovation of minor irrigation tanks, feeder channels, rural roads, *etc*. This will generate significant external economies for agricultural yields and overall rural development. Enhanced efforts should be made towards embedding livelihood activities, micro-insurance and grain banks in the SHG model.

**JEL Classification :** G21, G29

**Key words :** Scheduled Commercial Banks, Credit, Deposit, Self-Help Groups

The 'defining event' in the build-up of financial architecture in India was the nationalisation of major commercial banks. It essentially reflected the national aspiration for rapid and equitable economic and social development. The aftermath of nationalisation witnessed a remarkable spread of the banking system to the hitherto neglected sectors and regions. Significant progress was made in terms of coverage of the rural population by formal credit institutions, with

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nearly 70 per cent of all commercial bank branches and approximately 1,00,000 cooperative credit outlets at present operating in the rural areas. These networks apart from working as financial institutions also play a pivotal role in the development and transformation of the rural and agrarian economy.

Notwithstanding concerted and multi-pronged efforts to extend institutional credit to all sections of society, the dependence on informal sources of credit has not decreased in rural areas and has, in fact, increased in several regions. The banking outreach continues to be unevenly spread with poorer regions at a particularly disadvantaged position. According to an estimate by the World Bank, the credit requirement of the poorer sections in India was placed at around Rs.50,000 crore per annum in 2002. Against this requirement, the credit outstanding of the poorer sections with the formal banking sector is stated to be Rs.5,000 crore or 10 per cent of the total demand (Planning Commission, 2007). Furthermore, the physical outreach of the rural credit has not been effective in achieving income expansion and poverty reduction, and access to needed financial services is still an issue in the rural areas.

Against this background, this paper presents the regionally disaggregated progress made in the last decade (1996-2006) in terms of spread and depth of commercial banks. Accordingly, Section I begins with the assessment of important banking indicators at the all-India level. Section II provides the disaggregated picture at the regional level. Section III covers the widely acclaimed outreach programme of Bank-SHG linkage in detail. Finally, Section IV on conclusion and policy implications sums up the insights of this enquiry.

## Section I :

## Spread of Banking at All-India Level

Over the years, the spread of commercial banking network in India has skewed in favour of metropolitan centres. To illustrate, Table 1 presents population group-wise number of offices of Scheduled Commercial Banks (SCBs) in India at two points of time, March 1996 and March 2006. There are about 70,776 branches of SCBs in India. The decade since 1996 saw an addition of 6,320 offices of SCBs at

**Table 1: Population Group-wise Offices of SCBs in India**

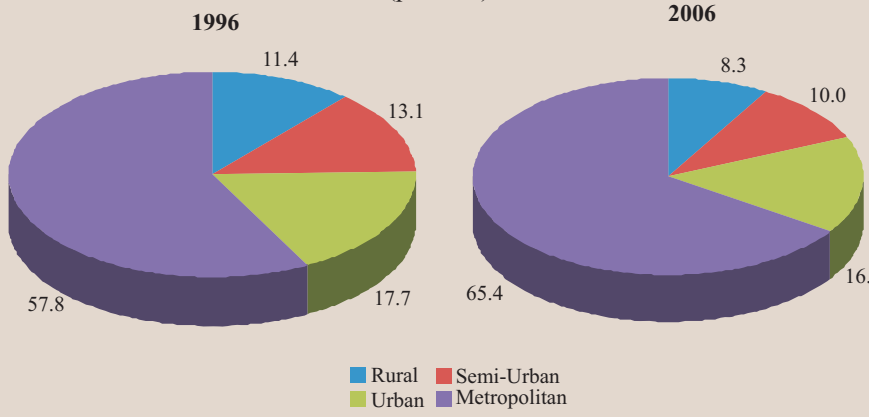
| Region | 1996 | 2006 | Change |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
| Rural | 32,981 | 30,610 | -2,371 |
| | (51.2) | (43.2) | (-37.5) |
| Semi-Urban | 13,731 | 15,471 | 1,740 |
| | (21.3) | (21.9) | (27.5) |
| Urban | 9,798 | 12,697 | 2,899 |
| | (15.2) | (17.9) | (45.9) |
| Metropolitan | 7,946 | 11,998 | 4,052 |
| | (12.3) | (17.0) | (64.1) |
| All India | 64,456 | 70,776 | 6,320 |
| | (100.0) | (100.0) | (100.0) |

**Note:** Figures in bracket are percentage share in total.
**Source:** Basic Statistical Returns (BSR) RBI (Various Issues).

the all-India level, 4,052 (64.1 per cent) of which was into the metropolitan category. On the contrary, rural category witnessed a decline of 2,371 offices leading to decline in its share in the total SCBs offices from 51.2 per cent in 1996 to 43.2 per cent in 2006. Diminishing presence of SCBs in the rural areas may constrain the objective of faster and more inclusive growth set out by the Government of India for the Eleventh Plan Period (2007-08 to 2011-12).

The pattern of population group-wise share in total credit outstanding of SCBs is shown in Chart 1. The share of rural regions

**Chart 1: Population Group-wise Share in SCBs Credit Outstanding**
(per cent)



in credit outstanding of SCBs declined to 8.3 per cent in 2006 from over 11.4 per cent in 1996. The share of semi-urban and urban centres also declined in credit outstanding during the decade leaving only the metropolitan centres to gain in share by about 7.6 percentage points.

All-India Credit-Deposit Ratio (CDR) stood at 72.4 per cent in 2006, which was about 12.6 percentage points higher than in 1996 partly reflecting buoyant credit growth in the recent years. While the CDR has increased for all population-groups during the decade ending 2006, it remains in the range of 50-55 per cent in the rural, semi-urban and urban centres and substantially higher at over 85 per cent in the metropolitan centres (Chart 2).

The shrinking share of smaller credit in total credit disbursed by the SCBs is highlighted in Table 2. The smallest category of Rs 25,000 and below accounted for only 3 per cent (14.2 per cent in 1996) of the total credit outstanding in 2006. While the increasing share of the category above Rs. 25,000 and upto Rs.25 lakh almost completely offset the shrinkage observed in the case of the smallest category of Rs 25,000 and below, the direction of change appears to be contrary to the objective of financial inclusion, which is to provide financial services and timely and adequate credit needed by vulnerable groups such as weaker sections and low income groups at an

**Chart 2: Credit-Deposit Ratio** (per cent)

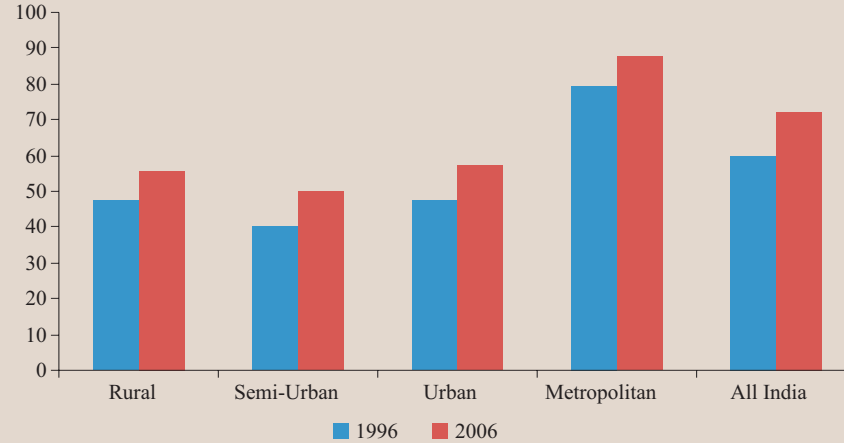


**Table 2: Share of SCBs Credit according to Size Limit**

(per cent)

| Size of Credit Limit | 1996 | | 2006 | |
|---|---|---|---|---|
| | No. of Accounts | Amount Outstanding | No. of Accounts | Amount Outstanding |
| < Rs. 25,000 | 91.6 | 14.2 | 45.0 | 3.0 |
| Rs. 25,000 - Rs.25 lakh | 8.2 | 24.6 | 54.6 | 36.0 |
| Rs. 25 lakh - Rs.10 crore | 0.2 | 41.1 | 0.4 | 21.2 |
| > Rs.10 Crore | 0.0 | 20.1 | 0.0 | 39.8 |

**Source:** Own computations based on BSR (Various Issues).

affordable cost.

An overview of the operations of SCBs during the past ten years reveals that their presence in the rural areas has been declining in terms of number of offices and credit disbursal. Furthermore, there has been a disconcertingly significant decline in the smallest category of credit (Rs. 25,000 and less) in terms of both, number of accounts and amount outstanding. These trends indicate that the banking system is still hesitant on various grounds to purvey credit to the poor and low income groups especially in the rural areas.

## Section II

## Regional Spread of Banking

Like many other socio-economic indicators, banking indicators also are not uniform across regions in India. Lower value of population per office indicates higher banking density. It is observed that the banking density is significantly higher in the Southern, Northern and Western Region as compared with North-Eastern, Central and Eastern Region (Table 3). Further, the banking density has deteriorated more in the North-Eastern, Central and Eastern Region, where it was already low, in the decade since 1996.

In the context of regional spread of SCBs, it is observed that of the 6,320 offices opened since 1996, 4,925, or more than three quarters, have been in the Southern, Northern and Western Region while the other three regions, North-Eastern, Central and Eastern

**Table 3: Region-wise Banking Density**

Population per Office ('000)

| Region | 1996 | 2006 | Change |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
| Northern Region | 11.9 | 12.6 | 0.7 |
| North-Eastern Region | 18.4 | 21.7 | 3.3 |
| Eastern Region | 17.8 | 19.9 | 2.1 |
| Central Region | 17.4 | 20.2 | 2.8 |
| Western Region | 13.7 | 14.9 | 1.2 |
| Southern Region | 12.2 | 12.2 | 0.0 |
| **All India** | **14.7** | **15.9** | **1.2** |

**Source:** Own computations based on BSR, RBI and National Accounts Statistics, Government of India. (NAS) (Various Issues).

Region taken together, have accounted for less than a quarter (Table 4). As a result, the latter regions, individually and collectively, now account for a lower share of SCB offices as compared with that a decade ago.

It is believed in general that financial development is robustly and positively related to economic development. In India, various regions have shown diverse economic growth and are at different

**Table 4: Regional Spread of Banks**

(No. of Offices of SCBs)

| Region | 1996 | 2006 | Change |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
| Northern Region | 10,021 | 11,821 | 1,800 |
| | (15.5) | (16.7) | (28.5) |
| North-Eastern Region | 1,936 | 1,949 | 13 |
| | (3.0) | (2.8) | (0.2) |
| Eastern Region | 11,686 | 12,308 | 622 |
| | (18.1) | (17.4) | (9.8) |
| Central Region | 13,344 | 14,104 | 760 |
| | (20.7) | (19.9) | (12.0) |
| Western Region | 9,938 | 10,996 | 1,058 |
| | (15.4) | (15.5) | (16.7) |
| Southern Region | 17,531 | 19,598 | 2,067 |
| | (27.2) | (27.7) | (32.7) |
| **All India** | **64,456** | **70,776** | **6,320** |
| | **(100.0)** | **(100.0)** | **(100.0)** |

**Note:** Figures in bracket represent share in all-India.
**Source:** BSR (Various Issues).

levels of socio-economic development. As a consequence, they may be expected to show different levels of banking penetration. In view of this, emphasising only on banking density (defined in terms of population per office) may not be adequate to highlight the extant disparity in banking spread across regions. Accordingly, Table 5 presents the data on region-wise credit from the SCBs as a ratio of regional GDP. The bank Credit-GDP ratio varied from 13.2 per cent in the North-Eastern Region to 76.6 per cent in the Western Region in 2006. There was considerable variation in the region-wise credit-deposit ratio also. The highest credit-deposit ratio was found in the Western Region (92 per cent) closely followed by the Southern Region (84.4 per cent). However, Southern Region was distinctly ahead in terms of the proportion of population having credit account as compared with other regions. Overall, it appears that the spread and depth of banking is much higher in the Southern, Western and Northern Regions as compared with their North-Eastern, Central and Eastern counterparts even after accounting for diverse economic growth and development across regions.

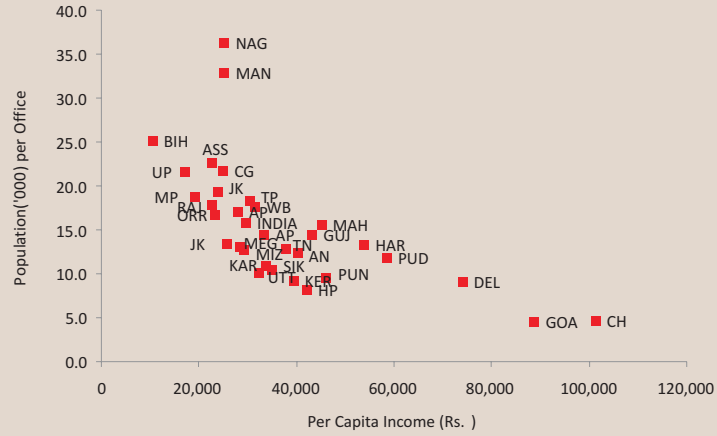
Chart 3 presents a scatter plot of States according to banking density and per capita income. It can be observed clearly that relatively poorer States have lower presence of SCBs. This is expected to constrain access and usage of banking services in the poorer states. If it is assumed that a plethora of economic opportunities exist in

**Table 5: Region-wise Banking Indicators**

| Regions | 2006 | | |
|---|---|---|---|
| | % Population having Credit Account | Credit-Output Ratio | Credit-Deposit Ratio |
| 1 | 2 | 3 | 4 |
| Northern Region | 6.2 | 54.8 | 64.6 |
| North-Eastern Region | 3.9 | 13.2 | 40.7 |
| Eastern Region | 4.5 | 22.4 | 49.2 |
| Central Region | 4.3 | 21.1 | 44.2 |
| Western Region | 7.5 | 76.6 | 92.0 |
| Southern Region | 16.4 | 46.7 | 84.4 |
| **All India** | **7.6** | **45.8** | **72.4** |

Source: Computed based on data from BSR and NAS.

**Chart 3: Banking Density and Per Capita Income**




these states, which may be leveraged with access to basic financial services, then this pattern of banking penetration appears to be a formidable challenge in the way of faster and more inclusive growth.

Table 6 reinforces an earlier point that lower expansion of banking in the last decade in North-Eastern, Eastern and Central regions does not necessarily reflect relatively lower economic growth and, therefore, lower banking opportunity in these regions. Eastern and North-Eastern Region witnessed higher than average All-India growth in their per capita income during the decade 1996-2006 but recorded much lower growth in offices of SCBs than at All-India.

An outcome of the pattern of expansion of banking during the decade 1996-2006 in terms of banking and income disparity among

**Table 6: Region-wise Progress of Banking**

| Region | Decadal (1996-2006) % Growth in | |
|---|---|---|
| | Offices of SCBs | Per Capita Income |
| **1** | **2** | **3** |
| Northern Region | 18.0 | 127.9 |
| North-Eastern Region | 0.7 | 130.4 |
| Eastern Region | 5.3 | 145.7 |
| Central Region | 5.7 | 93.3 |
| Western Region | 10.6 | 123.1 |
| Southern Region | 11.8 | 148.5 |
| **All India** | **9.8** | **127.9** |

**Source:** Own computations based on BSR and NAS (Various Issues).

**Table 7: All India Disparity@ Measures**

Coefficient of Variation (in %)

| Disparity | 1996 | 2006 |
|---|---|---|
| Banking | 34.3 | 45.4 |
| Income | 43.7 | 53.5 |

@: Banking Disparity is calculated as coefficient of variation (cv) in population per office of various States.
Income Disparity is calculated as cv in Per Capita Income of various States.
**Source:** Own computations based on BSR and NAS (Various Issues).

states is presented in Table 7. While banking disparity remained lower than income disparity, the decade witnessed rising disparity among states both in terms of banking spread and per capita income. However, the fact that the magnitude of increase in banking disparity was higher than that in income disparity in the last decade is a matter of concern. Hence, there is a need to intensify efforts towards increasing the banking outreach in the poorer regions of the country, which are less served by the formal financial network. Traditionally, banks played an integral part in the poverty alleviation programmes of the Government and thereby performed a critical role in the efforts towards inclusive growth. Recently, the SHG-Bank Linkage Programme is a major plank of the strategy for delivering financial services to the poor in a sustainable manner. This is discussed in the next Section.

## Section III

## Bank-SHG Linkage Programme

A sizeable share of population in India continues to remain outside the formal banking system despite considerable expansion in branch network. Alternative models are being experimented with to meet the objective of financial inclusion. The SHG-Bank linkage model is the indigenous model of micro-credit evolved in India and has been widely acclaimed as a successful model. SHG-Bank linkage programme is considered a promising approach to reach the poor and has since its inception made rapid strides exhibiting considerable democratic functioning and group dynamism. The SHG-Bank linkage model was introduced in 1991-92 with a pilot project of linking 500

SHGs with banks. This figure has gone up to more than 34 lakh by the end of March 2008. Cumulatively, these SHGs have accessed credit of Rs. 22,268 crore from banks during the period. About 4.1 crore poor households have gained access to the formal banking system through the programme. During the last nine years the number of SHGs linked to banks has gone up from 32,995 during 1998-99 to 34,77,965 during 2007-08. This shows an impressive 68 per cent compound annual growth rate. The compound annual growth rate for the cumulative bank loan to SHGs is even more impressive at 94 per cent, *i.e.*, close to doubling each year. The faster growth in bank loans to SHGs has led to almost a four-fold increase in the average loans per SHG from Rs. 16,816 in 1999-2000 to Rs. 63,926 in 2007-08. These figures reflect the outstanding success of the programme (Chart 4).

## Spatial Disparity in the SHG-Bank linkage Programme

Notwithstanding the remarkable progress, geographically there has been a skewed development of SHG-Bank linkage programme in India. There is wide regional disparity both in terms of the spread of SHGs linked to banks and cumulative bank loans disbursed under the programme. In March 2008, while the Southern Region accounted for 48.2 per cent of the total SHGs, the share of North- Eastern Region was just 3.4 per cent (Table 8). In terms of share in the total bank loans to SHGs, the region-wise differential gets further magnified.

**Chart 4: Growth of the SHG-Bank linkage Programme**

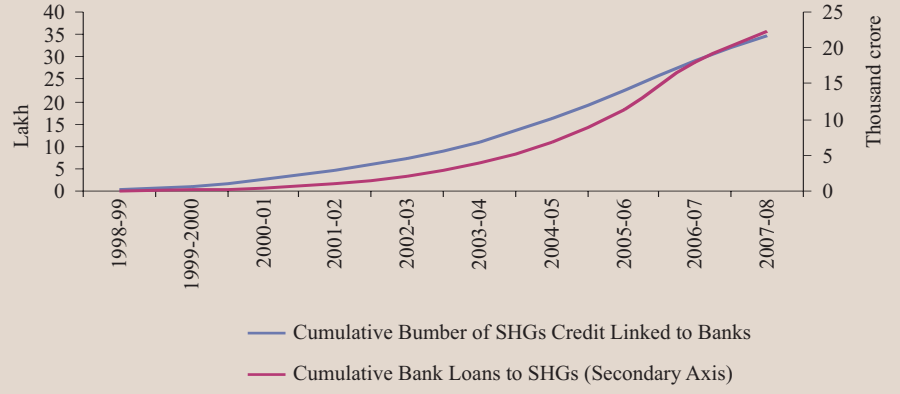


**Table 8: Region-wise Progress of SHG-Bank Linkage Programme**

(As on March 31, 2008)

| Regions | Share (%) in Total | | | | | |
|---|---|---|---|---|---|---|
| | No. of SHGs | Loans to SHGs (Rs. crore) | Average Loans per SHG (Rs.) | No. of SHGs | Loans to SHGs | SHGs per Lakh Population |
| **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| Northern | 2,30,740 | 851 | 36,899 | 6.6 | 3.8 | 156 |
| North Eastern | 1,19,520 | 327 | 27,364 | 3.4 | 1.5 | 283 |
| Eastern | 6,72,626 | 2,372 | 35,268 | 19.3 | 10.7 | 274 |
| Central | 4,05,707 | 1,501 | 36,990 | 11.7 | 6.7 | 142 |
| Western | 3,74,561 | 1,320 | 35,254 | 10.8 | 5.9 | 229 |
| Southern | 16,74,811 | 15,896 | 94,915 | 48.2 | 71.4 | 703 |
| **All India** | **34,77,965** | **22,268** | **64,027** | **100.0** | **100.0** | **310** |

**Source:** NABARD

While the Southern Region accounted for 71.4 per cent of the total loans to SHGs, the share of North-Eastern Region was just about 1.5 per cent. For all regions excluding Southern Region, even though the share of total SHGs linked to banks was close to 51.8 per cent, their share in total loans to SHGs was only 28.6 per cent implying that adequate credit is not being routed through SHGs in these regions. As the regions vary in geographical area and population, the number of SHGs is normalised by the population of the region and SHG per lakh population has been taken as a better indicator of SHG spread in the respective regions. The number of SHGs per lakh population for the Southern Region is 703, which is more than double the average at all-India (310) and almost five times of the Central Region (142).

In addition to the inter-regional disparity, there is wider intra-regional disparity among the constituent States in SHG spread. The progress of SHG-Bank linkage programme has not been homogeneous in any region (Table 9). In the Southern Region, where the programme has been very successful, SHGs per lakh population varied between 891 in Andhra Pradesh and 435 in Kerala during March 2008. In the North-Eastern region, the major share was accounted for by Assam with 3.1 per cent of the total SHGs while the rest of the six States in the region had a negligible share in the total SHGs. Similarly, Rajasthan and Himachal Pradesh were distinctly ahead in the Northern Region in terms of spread of SHGs. In the Eastern Region, SHG spread in Orissa was comparable with the Southern States. There is clear evidence of the fact that the SHG movement in India has spread to

other regions/States, though not to the same extent as in the Southern States. However, a major concern remains the scale of finance in the non-southern regions. The average loan per SHG in these regions continues to be much lower than that in the Southern Region. Further progress in the SHG-Bank linkage programme needs to reckon these regional variations in the spread of the programme.

**Table 9: State-wise Variations in the SHG-Bank Linkage Programme**

| NORTHERN REGION | | | | |
|---|---|---|---|---|
| State | Share (%) in | | Indicator of SHG | |
| | Total SHGs | Total Loans | Spread | Finance |
| 1 | 2 | 3 | 4 | 5 |
| Haryana | 0.4 | 0.5 | 54 | 86.6 |
| HP | 0.9 | 0.6 | 473 | 43.6 |
| J&K | 0.1 | 0.1 | 30 | 57.6 |
| Punjab | 0.3 | 0.3 | 33 | 69.2 |
| Rajasthan | 5.0 | 2.3 | 275 | 29.7 |
| New Delhi | 0.0 | 0.0 | 3 | 110.1 |

| NORTH-EASTERN REGION | | | | |
|---|---|---|---|---|
| State | Share (%) in | | Indicator of SHG | |
| | Total SHGs | Total Loans | Spread | Finance |
| 1 | 2 | 3 | 4 | 5 |
| ArP | 0.0 | 0.0 | 101 | 56.6 |
| Assam | 3.1 | 1.3 | 371 | 26.1 |
| Manipur | 0.1 | 0.1 | 104 | 42.0 |
| Megh | 0.0 | 0.0 | 49 | 27.7 |
| Mizoram | 0.1 | 0.1 | 241 | 68.0 |
| Nagaland | 0.0 | 0.0 | 19 | 42.8 |
| Tripura | 0.1 | 0.0 | 127 | 17.0 |

| EASTERN REGION | | | | |
|---|---|---|---|---|
| State | Share (%) in | | Indicator of SHG | |
| | Total SHGs | Total Loans | Spread | Finance |
| 1 | 2 | 3 | 4 | 5 |
| Bihar | 2.7 | 1.4 | 102 | 32.7 |
| Jharkhand | 1.2 | 0.9 | 144 | 45.3 |
| Orissa | 8.8 | 5.4 | 784 | 38.8 |
| Sikkim | 0.0 | 0.0 | 58 | 64.2 |
| WB | 6.6 | 3.0 | 273 | 29.6 |
| A&N Is | 0.0 | 0.0 | 68 | 66.3 |

| CENTRAL REGION | | | | |
|---|---|---|---|---|
| State | Share (%) in | | Indicator of SHG | |
| | Total SHGs | Total Loans | Spread | Finance |
| 1 | 2 | 3 | 4 | 5 |
| Chh'garth | 1.7 | 0.6 | 263 | 23.3 |
| MP | 2.4 | 1.4 | 124 | 36.5 |
| UP | 6.8 | 4.0 | 128 | 37.6 |
| Utt'chal | 0.7 | 0.7 | 265 | 66.5 |

| WESTERN REGION | | | | |
|---|---|---|---|---|
| State | Share (%) in | | Indicator of SHG | |
| | Total SHGs | Total Loans | Spread | Finance |
| 1 | 2 | 3 | 4 | 5 |
| Goa | 0.0 | 0.1 | 101 | 110.4 |
| Gujarat | 1.3 | 1.0 | 84 | 49.4 |
| M'rashtra | 9.4 | 4.8 | 308 | 32.9 |

| SOUTHERN REGION | | | | |
|---|---|---|---|---|
| State | Share (%) in | | Indicator of SHG | |
| | Total SHGs | Total Loans | Spread | Finance |
| 1 | 2 | 3 | 4 | 5 |
| AP | 20.8 | 37.5 | 891 | 115.5 |
| K'taka | 10.0 | 10.0 | 611 | 64.0 |
| Kerala | 4.2 | 4.5 | 435 | 68.2 |
| T'nadu | 13.1 | 19.2 | 695 | 94.1 |
| P'cherry | 0.1 | 0.2 | 231 | 140.4 |

**Note:** 1. Indicator of SHG Spread is taken as number of SHGs per lakh population.
2. Indicator of SHG Finance is taken as average loan (in thousand Rs.) to SHGs.

**Source:** NABARD

## Banking Indicators and SHG Spread

Banks have been the major drivers of the SHG movement so far in the country. Though there does not appear to be a one-to-one correspondence between banking outreach and spread of SHG movement, this is captured by the positive correlation[1] of 0.47 found between SHG spread (measured as number of SHGs per lakh population) and banking network (measured as number of branches of scheduled commercial banks per lakh population). A striking feature observed has been that even with similar banking network, SHG spread varies between Regions and States indicating that other local factors are equally important. For instance, at the regional level, similar banking network in the Northern and Southern Regions does not translate into comparable SHG spread (Table 10). Further, among the States where the SHG spread is better, there is a high variability in the banking network. Illustratively, Andhra Pradesh appears to have a less dense banking network as compared with Kerala when the banking network is seen against total population in the States. Yet, Andhra Pradesh has more than double SHG spread than that in Kerala.

It is found that a positive correlation (0.59) exists between SHG spread and credit-deposit ratio of Scheduled Commercial Banks. The credit-deposit ratio in the Southern Region was significantly higher at 84.4 per cent during March 2006, while the all-India average was 72.4 per cent. The higher credit-deposit ratio of the Southern Region could, *inter alia* be because of the better spread of SHGs in this region,

**Table 10: Region-wise Banking Indicators and SHG Spread**

| Region | Per Capita Income (Rs.) | SHG Spread# | Banking Network@ | C-D Ratio (%) |
|---|---|---|---|---|
| **1** | **2** | **3** | **4** | **5** |
| Northern | 38,938 | 156 | 7.9 | 64.6 |
| North Eastern | 24,104 | 283 | 4.6 | 40.7 |
| Eastern | 21,302 | 274 | 5.0 | 49.2 |
| Central | 18,548 | 142 | 5.0 | 44.2 |
| Western | 44,699 | 229 | 6.7 | 92.0 |
| Southern | 35,437 | 703 | 8.2 | 84.4 |
| **Total** | **29,453** | **310** | **6.3** | **72.4** |

# : SHG spread is measured as number of SHGs per lakh population.

@ : Banking network is measured as number of branches of scheduled commercial banks per lakh population.

**Source:** BSR, NABARD and CSO.

which offers to banks an alternative channel of disbursing loans. SHGs appear to have played the role of conduits for credit disbursed by the banks. This underscores the importance of SHGs in purveying of credit, especially in the rural/semi-urban areas.

## Socio-Economic Indicators and SHG Spread

SHG-Bank linkage programme was started with the objective of extending the outreach of banking to the poor, who mainly comprise the marginal farmers, landless labourers, artisans and craftsmen and others engaged in small businesses such as hawking and vending. In this context, it would be pertinent to see whether the programme has adequately made inroads into the regions where concentration of poverty is higher. During 2004-05, the all-India poverty ratio stood at about 27.6 per cent. While the Northern (15.7 per cent), North-Eastern (19.2 per cent), Southern (19.8 per cent) and Western region (25.8 per cent) had lower than the all-India poverty ratio, Central (35 per cent), and Eastern Region (36.2 per cent) had higher poverty ratios than at the all-India level (Table 11).

The present distribution of the SHG–Bank linkage programme does not appear to have taken cognisance of the extent of poverty. In the Eastern and Central Region, the proportion of total poor in India is significantly higher than the proportion of SHGs linked to banks in these regions (Table 11 and Table 8). While both the regions taken together accounted for 61.1 per cent of the total poor in India, they accounted for only 31.0 per cent of all SHGs linked to banks in India. Further, their share in total loans to SHGs formed only 17.4 per cent.

**Table 11: Distribution of Poverty during 2004-05**

| Region | Poverty Ratio (%) | Proportion of Total Poor |
|---|---|---|
| Northern | 15.7 | 7.4 |
| North Eastern | 19.2 | 2.6 |
| Eastern | 36.2 | 29.0 |
| Central | 35.0 | 32.1 |
| Western | 25.8 | 13.6 |
| Southern | 19.8 | 15.3 |
| **All India** | **27.6** | **100.0** |

**Source:** Planning Commission

On the other hand, Southern Region which accounted for 15.3 per cent of the total poor in India had about 48.2 per cent of all SHGs linked to banks and much higher 71.4 per cent of total loans to SHGs (Chart 5). There is, therefore, a need to intensify the spread of the programme in the States where the poverty is higher.

Loans to SHGs linked to banks in India account for only 1.5 per cent of the total credit outstanding of the scheduled commercial banks. However, there are regional variations. The size of the SHGs in terms of their share in the total bank credit is highest in the Southern Region (4 per cent), followed by North-Eastern (2.4 per cent), Eastern (2 per cent), Central (1.3 per cent), Northern (0.3 per cent) and Western regions (0.2 per cent). Given the relatively small size of the SHG-Bank linkage programme compared to the overall credit disbursed by banks, it cannot be expected to have had any significant impact on poverty reduction at a macro level. Nonetheless, a negative correlation of -0.25 between SHG spread (measured in terms of the number of SHGs per lakh population) and poverty ratio implies that the States where the SHG spread is better are also the States where the poverty ratio is lower. The SHG Bank Linkage has its impact on poverty alleviation through group effort, which emanates from their own savings and timely credit from various institutional agencies. According to a study[2] conducted by NABARD, out of those below

**Chart 5: Regional Disparity in the Bank-SHG Linkage Programme**

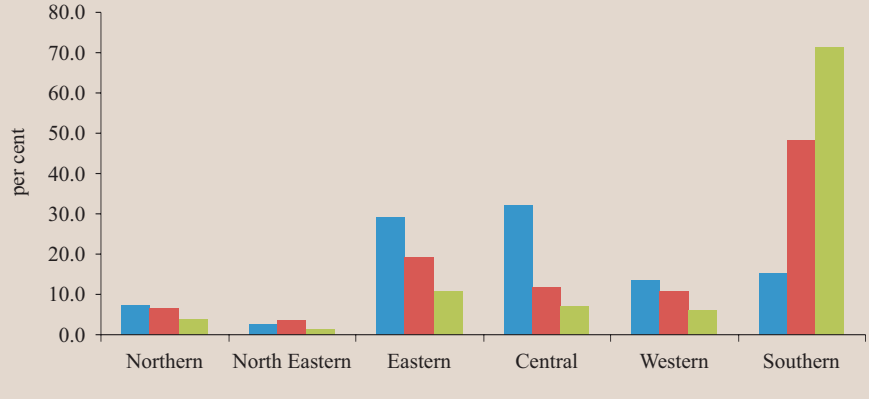


**Table 12: Matrix Mapping States according to Poverty and SHG Spread**

| | | SHG per Lakh Population | | |
|---|---|---|---|---|
| | | <200 | 200-400 | >400 |
| Poverty (in Per cent) | 0-15 | 1. Haryana<br>2. Jammu and Kashmir<br>3. Punjab<br>4. New Delhi<br>5. Goa | 1. Mizoram<br>2. Kerala | 1. Himachal Pradesh |
| | 15-30 | 1. Arunachal Pradesh<br>2. Manipur<br>3. Meghalaya<br>4. Nagaland<br>5. Tripura<br>6. Sikkim<br>7. A & N Islands<br>8. Gujarat | 1. Rajasthan<br>2. Assam<br>3. West Bengal<br>4. Pondicherry | 1. Andhra Pradesh<br>2. Karnataka<br>3. Tamilnadu |
| | >30 | 1. Bihar<br>2. Jharkhand<br>3. Madhya Pradesh<br>4. Uttar Pradesh | 1. Chhattisgarh<br>2. Uttaranchal<br>3. Maharashtra | 1. Orissa |

poverty line in the pre-SHG situation, 15 per cent moved above poverty line.

It is found that a positive correlation (0.31) exists between SHG spread (measured in terms of the number of SHGs per lakh population) and Per Capita Income of States emphasizing the result that SHG spread continues to be lower in the poorer regions of the country. One policy implication that may emerge from the above analysis is that the SHG spread needs to be intensified in the States where the poverty is higher, which is lacking at present. A mapping of SHG spread and poverty has been attempted in Table 12 precisely with an objective to select States, where further efforts are needed.

## Section IV

## Conclusion and Policy Implications

Scheduled commercial banks in India have played a pivotal role in the development and transformation of the rural and agrarian economy. However, their diminishing presence in the rural areas, as

reflected by the reduction in the number of rural branches of SCBs, in the last decade runs contrary to the objective of faster and more inclusive growth set out by the Government for the Eleventh Plan Period. In particular, the shrinking share of smaller credit in total credit disbursed by the SCBs may constrain the objective of financial inclusion, which is to provide financial services and timely and adequate credit needed by vulnerable groups such as weaker sections and low income groups at an affordable cost. These trends indicate that the banking system is still hesitant on various grounds to purvey credit to the poor and low income groups especially in the rural areas.

Spatially, the spread and depth of banking is much higher in the Southern, Western and Northern Regions as compared with their North-Eastern, Central and Eastern counterparts even after accounting for diverse economic growth and development across regions. On top of that, the banking density has deteriorated more in the North-Eastern, Central and Eastern Region, where it was already low, in the decade since 1996. This is expected to constrain access and usage of banking services in these regions. These are also the regions where the concentration of poverty is higher. If it is assumed that a plethora of economic opportunities exist in these states, which may be leveraged with access to basic financial services, then this pattern of banking penetration appears to be a formidable challenge in the way of faster and more inclusive growth.

SHG-Bank linkage programme was conceived to fill the gap existing in the formal financial network and extending the outreach of banking to the poor. The spread of the SHG-Bank Linkage Programme in different regions, however, has been uneven on account of various factors like pro-active role of State Governments, presence of well performing NGOs, socio-cultural factors, better performance of SHGs, etc. The spread of SHG movement has been skewed in favour of the Southern Region especially in terms of the region's share in the total loans to SHGs linked to banks. There is clear evidence of the fact that the SHG movement in India has spread to other regions/States, though not to the same extent as in the Southern States. However, a major concern remains the scale of finance in the

non-southern regions. The average bank loans to the SHGs in the Western, Eastern, Northern, Central and particularly in the North-Eastern Region is much lower than their southern counterparts. Further progress in the SHG-Bank linkage programme needs to reckon these regional variations in the spread of the programme.

When SHG spread is analysed with reference to poverty the glaring differences between regions highlights the need for taking the SHG movement to the lagging regions. In order to reduce the regional imbalances in the spread of the SHG-Bank linkage programme, NABARD identified 13 States – Assam, Bihar, Chhattisgarh, Gujarat, Himachal Pradesh, Jharkhand, Maharashtra, Madhya Pradesh, Orissa, Rajasthan, Uttar Pradesh, Uttarakhand and West Bengal, which have a large population of the poor, for focused attention. Due to the intensified efforts in these states, their share in the total SHGs credit linked increased from 31 per cent in March 2002 to 47 per cent in March 2007. Based on a mapping of SHG spread and poverty ratio, it is suggested that Bihar, Jharkhand, Madhya Pradesh and Uttar Pradesh need priority attention.

Notwithstanding deficiencies, the SHG-Bank linkage programme augurs well for the tasks of financial inclusion, financial equity as well as efficiency. Some policy suggestions emerging from the above analysis are as follows:

- Banking network have a significant influence on the spread of SHG-Bank linkage programme in the States and regions. The number of branches of scheduled commercial banks is lower in the Central, Eastern and North-Eastern regions when seen against the size of their population. It is noticeable that these are also the regions where SHG-Bank linkage movement needs to be intensified, particularly in terms of the disbursement of loans to the SHGs linked to banks. In view of the above, policies should incentivise branch expansion in these regions.
- Banks may have to assume the lead role in taking the financial services to the vast sections of disadvantaged and low income groups through the mechanism of SHG-Bank linkage. Accordingly, banks need to play a more pro-active

role in identification of income generating activities as well as in encouraging NGOs promoting SHGs in the Central, Eastern and North-Eastern regions which could give a fillip to the SHG-bank linkage programme.

- To encourage banks to take keen interest in furthering the SHG movement, perhaps a scheme of performance-linked incentive could be considered. The performance indicator for the banks may be with reference to the credit disbursed under the SHG-Bank linkage programme in the lagging regions. Further, specific funds may be created to address the regional imbalances in the programme.
- SHGs of water users need to be formed and encouraged to take up activities of rural infrastructure building such as construction and renovation of minor irrigation tanks, feeder channels, canals and distributaries. This will have salutary effect on agricultural yields in the rainfed areas. Further efforts should be made towards embedding livelihood activities, micro-insurance and grain banks in the SHG model.
- As on March 31, 2008, the average loan provided to SHGs was Rs. 64,027. On an average, per member loans work out to around Rs. 6,000. It is believed that such loan amounts are not adequate for pursuing any meaningful livelihood activity. The scale of finance needs to be stepped up especially in the non-southern regions, where it is almost half of that at the All-India level.
- As observed by the Committee on Financial Inclusion (Chairman: Dr. C. Rangarajan), in several cases, bankers show unenthusiastic attitude in promoting SHGs. Occasionally, they point out reasons like shortage of staff, time, etc. Special training and awareness programme about the model is needed for the branch officials.
- The Steering Committee on agriculture and allied sectors for formulation of the Eleventh Five Year Plan (2007-2012) has suggested that the share of direct accounts with a credit

limit of Rs. 25,000 in total direct finance may be targeted at a substantially higher level to improve credit flow to the small and marginal farmers. Towards this, efforts may be intensified to form SHGs of small and marginal farmers and credit-linking them with banks, especially in the regions with high level of exclusion.

**Notes**

1. Only those States accounting for at least 34,780 SHGs (or 1 per cent of total SHGs linked with banks in India) have been included in the correlation analysis.
2. SHG-Bank Linkage Programme for Rural Poor-An Impact Assessment (NABARD, 2002).

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## WTO Negotiations on Agriculture and Developing Countries by Anwarul Hoda and Ashok Gulati, Oxford University Press, New Delhi, 2008, ISBN-10: 0-19-569256 X, pages 294, price Rs 595

The General Agreement on Tariffs and Trade (GATT) 1947 marks the starting initiative for the liberalisation of world trade and the industrialised countries made great strides in lowering trade barriers. However, till about 1994, agricultural products remained out of this mainstream view of liberalisation. The Uruguay Round signed in 1994 by 120 countries brought in for the first time the liberalisation of world trade in agriculture. India was one of the leading developing nations which initiated from the very beginning of the Uruguay Round of discussions in 1986 that agriculture should be brought within the purview of GATT. The need for liberalisation in the world trade in agriculture was felt due to extensive subsidisation by the developed countries which led to distortion in the prices of agricultural commodities making it difficult for the poor and developing countries like India to have access to the markets of agricultural products in the developed and developing countries. The Articles of Agreement on Agriculture were laid down to govern trade and production policies on agriculture. The experience with its implementation, however, raised serious doubts on the soundness of the agreement. Actual liberalization remained very meager. While there have been series of meets/talks at World Trade Organisation (WTO) fora, no consensus as such has been arrived on the trade in agriculture related issues.

With agriculture remaining the bone of contention for developed and developing countries, negotiations on the issue are likely to continue for a few more years. Recognising the significant positive impact that the success of these trade negotiations can bring in establishing a fair and harmonious agricultural trading system, the authors of the book have attempted to provide a vivid picture of the issues involved and the prospective strategy for the developing countries. The book that is the result of a collaborative effort of Indian

Council of Research on International Economic Relations (ICRIER) and International Food Policy Research Institute (IFPRI) essentially traces the developments in the WTO negotiations on agriculture till the Geneva meeting of the WTO in July 2006 that ended with a deadlock on account of differences amongst different countries on agricultural issues. Against the backdrop of the pros and cons of the current negotiation strategy, the authors have proposed a revised negotiating strategy for India and have further justified the suitability of this strategy for all developing countries.

The book starts with a detailed presentation of the preexisting rules and practice under GATT 1947 as they evolved from 1947 to 1994. This is then followed by an elaborate analysis of the provisions of the WTO's Agreement on Agriculture and the modalities under which the WTO members undertook specific commitments on the three issues of market access in agriculture, trade distorting domestic support and export competition. The book also examines the implementation experience of key members of the WTO post Uruguay Round. The book observes that economic distortions remained in place in the principal industrialised countries. In the EC, the process of tariffication led to prohibitively high tariffs. In the United States, the Uruguay Round failed to bring any significant reduction in the market access barriers and domestic subsidies for cotton, dairy products, peanuts, and sugar, which were the main products traditionally supported in that country. Furthermore, the Uruguay Round commitments on domestic support did not constrain the United States from enacting the Farm Security and Rural Investment Act of 2002, which greatly increased spending on domestic support.

There has been a growing perception of a major flaw in the design of the Agreement on Agriculture. The agreement was based on the premise that certain support measures have no or minimal distorting effects on trade and production. Decoupled income support whereby payments were not related to production, price or the use of factors of production was considered to belong to this category.

Further, supportive agricultural policies of developing countries including India such as input subsidies and minimum support prices remained unaffected by the disciplines of the Agreement on Agriculture. Also, there were large differences of opinion amongst the various developing countries on the issue of market access. Polarisation of views on agriculture among members was one of the reasons for the failure of the Fifth Ministerial Session at Cancun in September 2003. In July 2006 at the Geneva meet, the impasse was once again due to the lack of concrete progress towards developing the modalities for reduction of domestic support and market access in agricultural negotiations.

The book has observed that developing countries as efficient producers of agricultural products in general, must make all possible efforts to achieve fundamental reform of world agriculture. For them to seek reduction in support and protection by all countries is a better strategy than pursuing the objective of keeping their own market access restrictions at a high level. They can never compete with the major industrialised countries in extending domestic support or granting bounties on exports. It is true that agriculture in developing countries could be threatened by the levels of subsidisation prevailing in the industrialised countries, but the remedy lies in getting the latter to make steep reductions in these levels rather than in asking for the ability to maintain and even raise the high applied tariff levels in developing countries. Importantly, the book has also pointed out that there has to be a fundamental shift in the approach of India and other developing countries in another respect as well. They need to place less emphasis on special and differential (S&D) treatment and more on equal treatment. There was little value in the developing countries, having been allowed in the Uruguay Round to make reductions in tariffs at a lower rate and over a longer period while some developed countries retained the possibility of maintaining tariffs in multiples of 100 percent on some key products. For example, the product-specific support for cereals in the EC was higher than 80 per cent

during the implementation period. In the United States also, while the use of export subsidies declined, it was compensated *via* the use of food aid and export financing support. Furthermore, direct payments (decoupled income support and market loss assistance) substituted for export subsidies. The book has shown that domestic support as a percentage of the free on board price peaked at about 50 percent for wheat, 70 percent for cotton, and over 100 per cent for rice in the United States. Thus, the book brings out very clearly that the Agreement on Agriculture was designed in such a way that the principal industrialised countries retained for themselves more beneficial treatment in many ways, while a lower level of flexibility was given to the developing countries.

Based on India's competitiveness in agriculture and drawing lessons from the negotiations undertaken so far, the authors have framed the main elements that should shape India's negotiating strategy in future and have stated that it could also be the negotiating strategy for all developing countries. Like India, many other developing countries that are not part of the Organization for Economic Co-operation and Development (OECD) are low-cost producers of farm products and earn substantial amounts of foreign exchange from exporting these products. They also have large proportions of the population dependent on agriculture for their livelihood. These countries generally use domestic support and export subsidies on a far lower scale that that of industrialised countries. In fact, most of them do not have the financial resources to subsidise agriculture on a scale comparable to that of the OECD countries. A common feature of the tariff profiles of a large number of developing countries is the large gap between the bound and applied levels of agricultural tariffs. Given these commonalities among most developing countries, they could share similar negotiating strategy so as to strengthen their collective bargaining power.

The authors have further gone ahead to suggest that even the net food-importing developing countries (NFIDCs) and the least

developed countries should support this strategy as it will benefit them in the medium to long run if not in the short run. These countries would experience net welfare loss in the short term due to the price raising effect of a genuine worldwide liberalisation of agriculture. The interests of poor African-Caribbean-Pacific Group countries that receive duty-free access to EC or US markets through the 'Everything But Arms' initiative of the EC or the African Growth and opportunity Act of the US might also loose in the short run as reduction of market access barriers by these developed economics on a nondiscriminatory basis would erode their margin or preference. The book observes that a far more efficient way of assisting the NFIDCs would be to transfer resources to them directly or give them food aid rather than keeping the prices down by continuing with the present illiberal regime in world agriculture. Thus, it is in the mutual interest of all developing and least developed countries to support steep reduction of domestic support in the OECD countries. Hence, the authors feel that all countries, in general, should have equal stakes in ridding the world economy of economic distortions.

With regard to market access, the book suggests that the best way to put pressure on the G10 is for the developing countries not to insist on a higher tariff cap for themselves. Equally important, the developing countries should be willing to accept a common ceiling for sensitive and special products as well. The book suggests that 100 per cent should become the common maximum for sensitive and special products, and for other products, the maximum tariff at the end of the implementation period should be in the range of 60-70 per cent *ad valorem*, for both the developing and the developed countries. The authors have noted that in India, only a few products, such as coconut and rapeseed and the oils derived from them, as well as palm oil, would seem to need a higher tariff ceiling. Further, once agreement is achieved on the maximum level or levels of tariff, the task of settling on a formula for tiered reduction will become easier to address.

The outstanding issues in domestic support include the tiered formulae for overall trade-distorting support (OTDS) as well as for

Total aggregate measurement of support (AMS). The best strategy for the developing countries in this situation is to persevere in taking a stand for steep reduction of the OTDS, squeezing the constituent elements in the process. Nevertheless, in order to apply a double squeeze, the developing countries must pursue proposals for reduction in the Final Bound Total AMS, and Blue Box levels. The simplest and most equitable way of reducing the disparity would have been to require the reduction of the OTDS to a percentage of the total value of agricultural production. The authors have suggested that reduction in OTDS to 5 per cent of the total value of agricultural production would have been consistent with the objective of fundamental reform in world agriculture.

In the arena of export competition, the book has suggested that the developing countries should ask for a substantial reduction in the export subsidies by all in the very first year of the implementation period. In the negotiations on disciplines on export financing support, no S&D treatment should be allowed for developing country exporting STEs. Disciplines on food aid should be imposed so as to improve the quality of such aid by ensuring that supplies increase in times of need when international prices are high and decrease when low prices prevail, not the other way around, as is the current experience. The "safe box" should include only emergencies declared or appeals made by international and regional intergovernmental organizations, including the International Committee of the Red Cross and the International Federation of Red Cross and Red Crescent Societies. No other food aid should be allowed be in-kind.

The authors have gone further ahead in suggesting a more smarter move on the part of developing countries. According to them, a still better strategy would be to propose that developing countries be exempted altogether from the application of a formula for the reduction of tariffs. They could be asked to contribute to tariff reduction on a request-offer basis and respond to market-opening

offers on the basis of strict reciprocity. While suggesting the above negotiating strategy, the authors have also rightly emphasised that during the negotiations and even after their conclusion, developing countries must not lose sight of the need to carry out domestic reforms to strengthen their agriculture by rationalising incentives, investing in research, extension, technology, and rural infrastructure; and carrying out institutional reforms.

On the whole, the authors have offered tough but realistic recommendations regarding tariffs, market access, treatment of sensitive or special products, and other aspects of international trade in agriculture. The authors have also beautifully blended the argument for India as the strategy for the whole of developing countries. WTO and its impact upon Indian Agriculture has been a subject matter of heated debates, extreme views and lack of consensus, both within and outside India. Yet today few would contest the fact that the billion-dollars-a-day subsidy doled out by the industrialised countries, coupled with tariff barriers maintained at very high levels, depresses world prices of temperate-zone agricultural products and severely affects the economies of many developing countries. This envisages the need to have determined efforts to set world agriculture right through appropriate strategies and policies. This book could provide valuable inputs to policy makers in the field. It will be of particular interest to researchers as well as students seeking in-depth knowledge of the recent history of agricultural trade talks.

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## The World Bank: A Critical Primer by Eric Toussaint, Pluto Press, London and Ann Arbor, MI, pp. 314, £16.99

The World Bank – A Critical Primer was originally published in French in 2006 as *Banque mondiale: Le Coup d' Etat permanent.L'Agenda caché du Consensus de Washington*, by CADTM[1]-Syllepse-Cetim,Liège-Paris-Genève. The actual writing of the book commenced in March 2004 and was completed in two years time. The author, Eric Toussaint, has taken a chronological approach in analysing the World Bank from its inception up to 2006. A team of 11 persons worked on this English language translation, which was published in 2008 by Pluto Press. The book, spanning 314 pages, consists of 24 chapters. It contains figures and tables, a World Bank datasheet and a glossary. The stated aim of the book is to reveal the political, economic and strategic motives of the US government with regard to the World Bank. The organisation's policy has been placed in its political and geostrategic context. The author says that issues related to the World Bank's support of the productivist model and its impact on the environment; the Bank's view on poverty and the triumvirate of the World Bank, the International Monetary Fund (IMF) and the World Trade Organization (WTO) would be taken up in a subsequent book.

The book gives a good background to the inception of the World Bank. A plan submitted in 1941 by the then US Treasury Secretary (Harry White) to the then US President (Franklin Roosevelt) bore the idea for the creation of the institution and its twin, the IMF. By the time the Bretton Woods Conference was organised in 1944, three proposals *vis-à-vis* the Bank had been withdrawn from the initial draft. These pertained to the creation of unitas, a currency specific to the World Bank (John Maynard Keynes had suggested bancor around the same time), making stabilisation of commodity prices a mandate

[1] CADTM stands for "the Committee for the Abolition of Third World Debt". The author of the book under review is the President of the CADTM.

of the World Bank and allowing the Bank to advance loans from its own capital. It was decided that the Bank would on-lend the money that it obtained from the private banking sector rather than lend out of its own capital.

The World Bank effectively began operations in 1946. As early as 1949, as mentioned in its fourth annual report, the Bank recognised that political and social tensions caused by poverty and unequal distribution of wealth were obstacles to development, as was poor distribution of land and its twin effects of inefficiency and oppression. The author states that the Bank, however, did nothing to embrace the social dimension evoked in the annual report. In the first sixteen years of its existence, it failed to support any project aimed at redistribution of wealth and granting of land to landless peasants. It was only in the 1960s and 1970s that the Bank supported a small number of projects intended for improvement in health, education and provision of drinking water. The author analyses the projects accepted or rejected by the World Bank. It is deduced that, with a few exceptions, the Bank was unwilling to support industrial projects designed to satisfy the domestic demand of developing countries as that would have resulted in reduced imports from the industrialised countries. The exceptions to the rule were a handful of strategically important countries that possessed real bargaining power.

The book notes that the Bank acted in violation of international law by making the newly independent African states in the 1960s liable for debts incurred by Belgium, France and Great Britain for the purpose of colonising them. These debts are null and void and the states that have been victims of this violation have been exhorted to demand reparations from the World Bank for the same. The book notes that the UN agencies enjoy immunity from the International Court of Justice in The Hague. A suggestion is, however, made that citizens' associations representing the victim nations could seek judicial redressal for these nations. The author mentions qualifiers for the same.

The author has taken great pains to show how the US has near complete domination over the World Bank in terms of its policies, programmes and practices. The IMF, which is the Bretton Woods twin of the World Bank, was created as a result of intense negotiation between the US and the UK, so the US and Europe exercise joint control over it. The Bank was, however, largely an American creation. The World Bank's structure, general policy direction and the manner of granting loans have almost always been determined by its largest shareholder. Though the World Bank is a development institution, it has a voting structure which undermines its effectiveness and legitimacy[2]. Till date, the US remains the only country to have a *de facto* veto right at the World Bank.

When the Bank was created, the US had 35.07 per cent of the voting rights. Following the modification done in 2002, the share of the US is 16.41 per cent. For the first four decades of its existence, the majority required to modify the statutes of the World Bank was 80 per cent, held by at least 60 per cent of the member countries, which gave the US an effective veto. With the wave of newly independent countries in the South, the number of member nations of the World Bank gradually increased and thereby diluted the weight of the US vote. The US, however, took care to preserve its right of veto: in 1966, it had only 25.5 per cent of voting rights but this percentage was still sufficient for the purpose. As the situation began to get untenable, the definition of 'qualified majority' was revised in 1987 such that it favoured the US. Japan negotiated a significant increase in its voting rights with the US, placing it as the second most important country ahead of Germany and Great Britain. The US acceded to a reduction in its voting rights in order to increase the share of Japan, provided that the required majority for amendments

[2] In February 2009, as part of governance reforms, the governing board of the World Bank decided to accord a seat to sub-Saharan Africa on its Executive Board and raise the voting power of developing countries in the Bank to 44 per cent. As a further step, it has been agreed that the World Bank should undertake a comprehensive and intensive work programme to realign Bank shareholdings, moving towards an equitable voting power between developed and developing countries.

was raised to 85 per cent. Thus, while Japan was content, the US was able to retain its *de facto* veto power.

The author has given an entire new spin to the success of South Korea. Now, South Korea is often cited as a shining example and one of the strongest Asian tigers, countries that developed courtesy the export-led model of growth. The book attributes Korea's success to a combination of several factors such as a high degree of intervention from the state, state control of the banking sector, enforcement of authoritarian planning, strict control of currency exchange and capital flows, state-enforced prices for a wide range of products and the protection afforded by the US by allowing Korea to pursue policies that it condemned elsewhere. The US perceived Korea as a strategic military zone to counter the spread of the Communist bloc. The country did not have to resort to external financing from 1945-61. This is because of the grants that it received from the US, totalling more than what Britain, France and the Benelux countries individually received under the Marshall plan. It was also higher than the total loans extended by the World Bank to the newly independent developing countries during the same period. Until 1961, about 71 per cent of the investment by the state in Korea was financed by the aid received from the US. A substantial part of it was devoted to building of roads, bridges and other infrastructural overhead that furthered industrial development. Besides, the orders placed by the US expeditionary corps in Vietnam accounted for 20 per cent of South Korea's exports in the early 1970s. To begin with, the country had adopted an import-substitution model for growth and the changeover to the export-led model happened over a transition period of 25 years.

The author maintains that the World Bank was culpable in bringing on the Mexican debt crisis of 1982. Three factors had induced the crisis. One, the steep hike in federal funds target rate effected by the Federal Reserve of the US in October 1979. Two, the sharp fall in oil prices subsequent to the peaking of the second oil shock in 1980. This impacted Mexico's export earnings as petroleum accounted for

a substantial part of its exports. Third, contraction of unsustainable level of debt by the country. While the first two factors were external, the third factor highlights the role of the World Bank in the Mexican debt crisis. The volume of World Bank loans to Mexico had quadrupled between 1973 and 1981. Mexico also borrowed from private banks with the backing of the World Bank. The volume of loans from private banks to Mexico had increased by six times between 1973 and 1981. In an assessment done in November 1979, the World Bank had noted that there had been an increase in Mexico's external public debt and especially in its debt service ratio, which was estimated to be as high as two-thirds of the country's exports in that year. The Bank, however, did not find that as a cause for alarm. In 1981, a year before the crisis broke out, the World Bank granted Mexico a loan worth US$ 1.1 billion, the largest loan granted by it since 1946.

At a few places in the book, the reader is likely to get confused about what the author is trying to convey. The few errors aside, the basic premise of the book – to highlight what it perceives as shortcomings in democracy, transparency and accountability of the World Bank (the so called "double discourse") – could have been stated more concisely.

The appendix to the book has an interview with the author. Eric Toussaint discusses the structural adjustment programme that is advocated by the Bretton Woods organisations and the after shock therapy. The book should provide sufficient ammunition to those who are fighting for fundamental reform to redress the democratic deficit at the World Bank and give real power to the developing countries.

**Abhilasha***

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