RESERVE BANK OF INDIA

OCCASIONAL PAPERS

VOL. 19 NO. 4 DECEMBER 1998

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VOL. 19 NO. 4 DECEMBER 1998

Published by M.S. Mohanty for the Reserve Bank of India and printed by him at Karnatak Orion Press, 17-18, Prospect Chambers Annexe, Dr. D.N. Road, Fort, Mumbai - 400 001.

Reserve Bank of India Occasional Papers
Vol. 19, No. 4, December, 1998

Recent Divergence between Wholesale and Consumer Prices in India — A Statistical Exploration

G.P. Samanta & Sharmishtha Mitra*

During the recent period, inflation rates based on the CPIIW have been much higher compared to those based on the WPI. On conceptual plane, though a certain degree of mismatch is unavoidable in the movements of two series, at the same time they are also expected to be linked by some stable relationship to ensure inter-linkages between two markets – the wholesale market and the retail market. Empirical results show that since May 1995, divergence between the CPIIW and WPI (after adjusting for increasing level/trend) is widening – indicating a possible distortion in their relationship. For a formal verification, we applied co-integration test (for long-term relationship) and Granger's causality test (for short-run relationship) for two different periods, viz., (i) April 1991 to April 1995 and (ii) May 1995 onwards. It is seen that while data support the existence of a stable long-run relationship (co-integration) between the CPIIW and WPI during April 1991 to April 1995, the relationship is distorted thereafter. Even the short-run relationship is disturbed since May 1995.

Introduction

The widening gap between inflation rates based on the Wholesale Price Index (WPI : base 1981-82=100) and Consumer Price Index for Industrial Workers (CPIIW : base 1982=100) in India in recent periods has raised several issues on the measurement of inflation. For instance, the CPIIW at 429 for the month of December 1998 recorded an annual rise of 15.32 per cent. In contrast, the annual growth in the WPI (356.4) for the same month was only 6.55 per cent.

On a conceptual plane, CPIIW and WPI series differ on many counts, *viz.*, purpose and use, coverage of commodity/service, weighting diagram, the stage at which price quotations are collected, associated market (i.e., wholesale market, retail market), base-year, etc. In India, the importance of both these series for

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policy formulation is well recognised. While the WPI is used for measuring inflation (general price level) and assessing its future prospect, the CPIIW has wide acceptance for wage indexation of a majority of salaried people and wage earners. From the coverage point of view, the dis-similarity in the baskets for CPIIW and WPI is also very prominent. The basket for WPI includes wide-spectrum of raw materials, intermediate and final products, which are traded in wholesale markets even though services are excluded from its scope. On the other hand, CPIIW covers only final products and services consumed by industrial workers in retail market. Obviously, while price quotations for WPI relate to the wholesale level, those for CPIIW pertain to retail prices. If we accede to all these differences - conceptual as well as compilation - it is not surprising that they differ by some extent. However, as we know, consumption being the end use of all economic activities, price changes in wholesale markets represented by WPI are expected to be reflected in price changes in retail markets (CPIIW). Changes in CPIIW may also have some cost-push impact on WPI due to changes in wages through dearness allowances. Thus despite having several differences, conceptually one can expect some cause-and-effect type relationship between these two series.

Therefore, the much faster rise in CPIIW as compared to WPI, particularly in a time when the WPI growth rates have started declining (since December 1998) - not only casts several doubts on the trends in domestic price level but is also a matter of concern to the people, in general, and policy-makers, in particular. In this context, it is important to see how the recent divergence has affected the short-run and long-run relationship between the two series. This constitutes the main theme of the present paper. Accordingly, in Section I, we briefly discuss trends in prices and identify the starting point of recent divergence. The nature of long-term relationship between CPIIW and WPI is dealt with in Section II, while Section III is devoted to study of short-run relationship between these two variables. The possible sources of distortion in the relationship between CPIIW and WPI are identified in Section IV. Section V presents concluding remarks.

Section I

Trends in CPIIW and WPI - The Recent Divergence

In India, Consumer Price Index for Industrial Workers (CPIIW) is compiled and released by the Labour Bureau, Ministry of Labour. The data on the present series (base 1982 = 100) are available at monthly frequency for various centres. The figures for all India level are derived taking the weighted average of these centre specific indices. The weighting diagram is constructed based on the value of consumption of industrial workers. Though these indices are not released for each and every commodity/service included in the basket, they are available for a few broad groups/sub-groups.

The responsibility for compilation and release of data on Wholesale Price Index (WPI) in India is rested on the Ministry of Industry (MI), Government of India. The present series (base 1981-82=100) covering 447 commodities are classified into several groups/sub-groups. Data on WPI for each of these commodities/groups are available at weekly interval. The MI initially calculates the WPI for all these commodities at all India level. These commodity level indices are then converted into weighted averages to arrive at the WPI for various commodity groups/sub-groups/all commodities. The fixed weighting diagram is derived on the basis of value added concept of the end products/commodities. Unlike CPIIW, the centre-wise figures for WPI are not available. Moreover, though WPI data are available at weekly frequency, information on CPIIW is compiled only at monthly frequency. Thus for comparing the behaviour of WPI and CPIIW, one is compelled to consider the monthly data for different commodity group/sub-group at all India level. Monthly data for WPI are calculated by taking the simple average of weekly indices in the corresponding month. In this section we, therefore, identify the starting point of recent divergence based on monthly data on CPIIW and WPI at the aggregate level.

Starting Point of Recent Divergence

For studying the divergence between CPIIW and WPI, the simplest

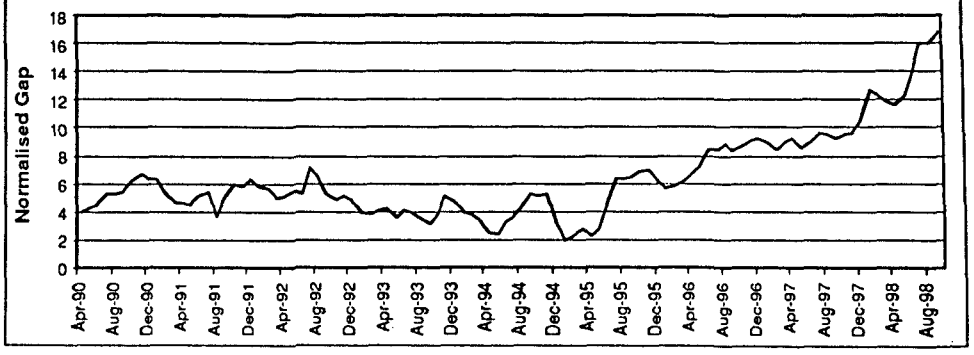
way is to analyse the behaviour of the gap (say, CPIIW - WPI) between two variables. At this stage it is worth noting that some degree of difference between CPIIW and WPI may be unavoidable mainly due to difference in their base years. Therefore, the main concern in this context is that whether the gap is widening significantly or not. This point also deserves some further discussion. When the trends in both WPI and CPIIW are increasing over time, we are not sure whether the widening gap may be considered as a real divergence (i.e., significant). For better understanding we require to normalise the gap after making suitable adjustment for the rising trends in both the series. To clarify the point, let us consider the hypothetical values of WPI and CPIIW to be 100 and 105, respectively, at any particular time point, indicating a gap (i.e., CPIIW - WPI) of 5 points. In a subsequent period let us assume the hypothetical figures for WPI and CPIIW to be 200 and 210, respectively, with a gap of 10 points. To eliminate the level-effect in both situations, we may express the gaps in percentage of WPI (CPIIW) and in such case the normalised gaps are identical at 5 per cent of WPI (CPIIW) in both situations. Similar comparison can also be made by expressing the gap in percentage of trends in CPIIW and/or WPI. Though the estimation of trend component is difficult, such a task has been made somewhat easy by the Hodrick-Prescott (HP) Filter. We derive the normalised gap as follows:

$$Normalised\ Gap\ (in\ \%) = \frac{CPIIW - WPI}{(HCPIIW + HWPI)/2} \times 100,$$

where, HCPIIW and HWPI are estimated trend components (by using HP-Filter) of CPIIW and WPI, respectively. Plot of this normalised gap, NGAP, for the period[1] April 1990 to September 1998, is presented in Figure 1. From this figure it is clear that till April 1995 or so, NGAP was moving around some constant value (or possibly around some mild-declining trend). Thereafter, NGAP exhibits clear increasing trend. Thus, since May 1995 or so, the divergence is widening over time. More particularly, the extent of this divergence is very high in recent periods. We, therefore, fix

May 1995 as the starting point of recent divergence.

Figure1: Plot of Normalised Gap (NGAP) in percentage



Section II

Long-term Relationship between CPIIW and WPI

As pointed out earlier, despite having several dis-similarities in terms of coverage, weighting diagram, etc., CPIIW and WPI are expected to share a stable long-term relationship between them. Some preliminary statistical investigation through HP-filter however, not only indicates widening divergence between the two series since May 1995 but also seems to have raised some questions on the stability of long-term relationship between them. In this context, two propositions need to be investigated. Is the evidence of instability a recurring phenomenon starting from May 1995 or whether it existed even prior to that? Accordingly, we divide the entire sample period into two sub-periods, the first one ending in April 1995 and the second in September 1998.

In the literature, the theory of stable long-term relationship among a number of variables is associated with the technique of co-integration (Engle & Granger 1987, 1991, Johansen 1988, Barman & Samanta 1998, etc.). The preconditions for testing for co-integration is that all underlying variables must be $I(1)^2$. A number of I(1) series are said to be co-integrated if at least a linear combination of those variables is stationary. As we know, any shock in any

I(1) series persists for long and the series has no tendency to come back to the normal path without intervention (either through some policy or other related variables). The existence of co-integration relationship among a number of such series has a great economic implication, in that, shocks to any one or more variables will be absorbed by the system as a whole so that the entire system moves from one equilibrium point to another.

Table 1 : Unit-Root Tests for WPI & CPIIW

Variable	Unit Root Test Method					
	Augmented Dickey-Fuller			Phillips-Perron		
	Optimal Lags	Test Statistics (τ)	t (trend)	Optimal Lags	Test Statistic (z)	t (trend)
Sub-Period : April 1990 to April 1995						
log (WPI)	1 to 3	--2.2251	2.1526	1 to 3	--8.7426	1.8681
log (CPIIW)	1 to 3	--2.4770	2.3578	1 to 3	--8.8019	1.8616
Sub-Period II : May 1995 to September 1998						
log (WPI)	1 to 5	--2.6364	2.7382	1 to 5	--6.9303	1.4100
log (CPIIW)	1 to 3	--1.6390	1.8690	1 to 3	--5.7802	0.9923

Note: (i) τ and z are Test Statistics for testing Null Hypothesis of presence of Unit Root.

(ii) t-trend is the Test Statistic for testing whether the series has any deterministic (trend) component or not.

(iii) None of the test statistics - τ, z and t (trend) are significant at 5% level of significance.

We carried out co-integration tests between CPIIW and WPI separately for both the sub-periods, by making use of the methodology suggested by Johansen (1988). For testing of unit root, we applied the widely used Augmented Dickey-Fuller (ADF) test and Phillips-Perron's (PP) test (Dickey & Fuller, 1979, 1981, Phillips & Perron 1988, Pantula, Gonzalez-Farias & Fuller, 1994, Said & Dickey, 1984, etc.). The results for unit root tests and co-integration tests are given in Table 1 and Table 2, respectively. From Table 1, it may be seen that in both the sub-periods, log(CPIIW) and

log(WPI) do not have any deterministic trend component but have unit root in their levels. Thus both the variables are identified to be I(1) processes, indicating that a shock in any one of these variables will persist for a long time period and the series does not have the tendency to come back to its normal path without intervention. The Johansen (1988) test strongly rejects the null hypothesis of absence of any co-integrating relationship in the first sub-period indicating that WPI and CPIIW had stable long-term relationship during April 1990 to April 1995. In contrast, the null hypothesis of no cointegration is accepted in the second sub-period. Hence, it appears that instability has originated in the more recent period.

Table 2: Johansen (Trace) Co-Integration Test for WPI & CPIIW

Eigen Value	Corresponding Eign Vector (Row Vector)		Null Hypothesis on no. of Cointegrating Vector (r)		
			Null Hypothesis (H_0)	Test Statistic	p-value
Sub-Period I : April 1990 to April 1995					
Variables: log (WPI) & log (CPIIW); Optimal Lag = 1					
0.3225	1.0000	-0.7877	$H_0 : r = 0$	28.7670	0.0023
0.1252	1.0000	0.4562	$H_0 : r \leq 1$	7.3550	0.0057
Sub-Sample II : May 1995 to September 1998					
Variables: log (WPI) & log (CPIIW); Optimal Lags = 1 to 8					
0.5519	1.0000	-0.5600	$H_0 : r = 0$	11.6787	0.3287
0.0310	1.0000	-2.0913	$H_0 : r \leq 1$	0.4404	0.5029

Note : Any test statistics is rejected at α per cent level of significance if the corresponding p-value exceeds $\alpha/100$. In normal practice α is assumed to be either 1 or 5.

Section III

Short-Run Relationship between CPIIW and WPI

The observed disturbances in long-run relationship between CPIIW and WPI since May 1995, lead us to similar inferences for short-run. We performed Granger's causality test separately for both the sub-periods. It is well known that the reliability of results of the Granger's causality test depends on whether the system variables are stable or otherwise. In the earlier section we found that log (CPIIW) and log (WPI) belong to I(1) process during both the sub-periods. Thus though log (CPIIW) and log (WPI) are non-stationary, the following first differenced series are stationary :

$\Delta\log(\text{CPIIW}) = \log(\text{CPIIW}) - \log(\text{CPIIW})_{(-1)}$ and
$\Delta\log(\text{WPI}) = \log(\text{WPI}) - \log(\text{WPI})_{(-1)}$

TABLE 3: Granger's Causality Test for WPI & CPIIW

Dependent Variable	Explanatory Variables		Null Hypothesis & Test Statistics			Remarks
	Regressor	Lags	Null Hypothesis	F-statistic	P-value	
Sub Sample (I) : April 1990 to April 1995						
Δlog (CPIIW)	Constant	—	H_0 : WPI	F (3,42)	0.0005	Bi-directional causality exists between CPIIW and WPI
	Δlog(WPI)	1,10,11	does not Cause CPIIW	= 7.3297		
	Δlog(CPIIW)	5,12				
Δlog(WPI)	Constant	—	H_0: CPIIW	F (4, 39)	0.0004	
	Δlog(WPI)	1,3,4,7, 8,9	does not cause WPI	= 6.4908		
	Δlog(CPIIW)	2,6,7,10				
Sub Sample (II) : May 1995 to September 1998						
Δlog(CPIIW)	Constant	—	H_0: WPI	F (3, 35)	0.0050	WPI causes CPIIW but not the other way.
	Δlog(WPI)	1,10,12	does not cause CPI	= 5.0784		
	Δlog(CPIIW)	9,12				
Δlog(WPI)	Constant	—	H_0: CPI	F (2, 26)	0.0945	
	Δlog(WPI)	1 to 12	does not cause WPI	= 2.5864		
	Δlog(CPIIW)	5,7				

Note: Any test statistics is rejected at α per cent level of significance if the corresponding p-value exceeds α/100. In normal practice α is assumed to be either 1 or 5.

We therefore, applied Granger's causality test on the first difference of the log transformed (Δlog (CPIIW) and Δlog (WPI)) series. The relevant results are presented in Table 3. It may be observed that the data for the first period do not support the null hypothesis of no causality between log (CPIIW) and log (WPI) in either direction. In case of the second period, however, there is evidence of declining causal connection between the two series. The causal effect is detected only from CPIIW to WPI. Thus the short-run causal relationship between CPIIW and WPI has been disturbed during the second period.

Section IV

Sources of Divergence

Against the backdrop of evidences of considerable instability in WPI and CPIIW relationship, the present section aims at identifying possible reasons of this outcome in the recent periods. As the baskets for WPI and CPIIW differ in terms of commodity coverage, weighting diagram, etc., it may be interesting to analyse the nature of relationship between the adjusted WPI and CPIIW series, constructed on the basis of common commodity characteristics. In Table 4 we present common commodity groups[3] in both the baskets with their respective weights.

Above constructions indicate that WPI1 and CPIIW1 are similar in terms of both commodity coverage and weighting diagram (weights being taken from WPI basket). Similarly, WPI2 and CPIIW2 are also similar in terms of both these aspects. In contrast, WPI1 and CPIIW2 are similar only in terms of commodity coverage (they differ with respect to weighting diagrams).

Table 4: Weights of Common Groups in WPI & CPIIW Baskets

WPI		CPIIW	
Group Name	Weight (%)	Group Name	Weight (%)
1. Food Articles & Products (excluding Betelnuts, Tea & Coffee Processing)	27.021	1. Food Items	56.995
2. Beverages, Tobacco & Tobacco Products, Tea & Coffee Processing, Betelnuts	2.536	2. Pan, Supari, Tobacco & Intoxicants	3.155
3. Fuel, Power, Light & Lubricants	10.663	3. Fuel & Light	6.281
4. Textiles, Leather & Leather Products, Rubber & Canvas Footwear	12.671	4. Clothing, Bedding & Footwear	8.540
Total	52.891	Total	74.971

In order to investigate the impact of differences in coverage and weighting diagram on the recent disturbances in the relationship between CPIIW and WPI, we constructed the following adjusted CPIIW and WPI series.

WPI1 = Adjusted WPI based on common items with weights taken from WPI basket

WPI2 = Adjusted WPI based on common items but weights taken from CPI basket

CPIIW1 = Adjusted CPIIW based on common items with weights taken from WPI basket

CPIIW2 = Adjusted CPIIW based on common items but weights taken from CPI basket

Hence, we shift our focus to examine whether adjusted series belong to the class of I(1) processes or not. Results of unit-root tests (Table 5) identify log transformed series of WPI1, WPI2, CPIIW1 and CPIIW2 to be I(1) processes in both the periods under study.

Table 5: Unit-Root Tests for Adjusted WPI & CPIIW

Variable	Unit Root Test Methods					
	Augmented Dickey-Fuller			Phillips-Perron		
	Optimal Lags	Test Statistics (τ)	t (Trend)	Optimal Lags	Test Statistic (z)	t (Trend)
Sub-Period I : April 1990 to April 1995						
log (WPI1)	1 to 3	-2.1565	2.0314	1 to 3	-8.6170	1.8459
log (CPIIW1)	1 to 3	-2.4993	2.3688	1 to 3	-9.0442	2.0298
log (WPI2)	1 to 3	-2.0916	1.9178	1 to 3	-8.6465	1.6522
log (CPIIW2)	1 to 3	-2.5579	2.4222	1 to 3	-9.7048	1.9776
Sub-Period II : May 1995 to September 1998						
log (WPI1)	1 to 6	-3.0259	3.0908	1 to 6	-8.2567	1.8215
log (CPIIW1)	1 to 3	-1.6869	1.8754	1 to 3	-7.9594	1.3376
log (WPI2)	1 to 3	-2.2938	2.5144	1 to 3	-6.0198	1.3645
log (CPIIW2)	1 to 3	-1.3292	1.6197	1 to 3	-5.6206	1.0148

Note: (i) τ and z are Test Statistics for testing null hypothesis of presence of Unit Root.

(ii) t-trend is the test statistic for testing the null hypothesis of no deterministic trend.

(iii) None of the test statistics - τ, z and t (trend) are significant at 5% level of significance.

The Johansen's test for cointegration on different pairs of these variables gives some peculiar results (Table 6). During the first period, CPIIW1 and WPI1 are strongly co-integrated with two possible co-integration vectors. However, the co-integration relationship between (i) CPIIW2 and WPI1 and (ii) CPIIW2 and WPI2 is not so strongly detected. Though the null hypothesis of no co-integration vector is accepted, the null of at most one co-integration vector is rejected at 5-7 per cent level of significance. These results indicate probable existence of co-integration relationship among various pairs of variables during the first period. On the other hand, during the second period, none of the pairs of variables are co-integrated (as at the same level of significance, the null hypothesis of no cointegration as well as at most one co-integration vector are accepted). In this context a comparison of results presented in Table 2 and Table 6 reveals certain interesting facts. It is clear that during the second period, the acceptance of no

co-integration relationship between actual CPIIW and WPI is relatively stronger than the case when the series are adjusted. Therefore, it appears that while correcting for differences in coverage and weighting pattern improves the long-term relationship between CPIIW and WPI, the relationship is still weak. These results point to certain other factors than commodity basket and weighting pattern alone, which may have contributed to growing divergence the between the wholesale and consumer prices in India.

Table 6: Results of Johansen (Trace) Co-Integration Test for Adjusted WPI & CPIIW

Eigen Value	Corresponding Eign Vector (Row Vector)		Null Hypothesis on no. of Cointegrating Vector (r)		
			Null Hypothesis (H_0)	Test Statistic	p-value
Sub-Period I : April 1990 to April 1995					
Variables: log (WPI1) & log (CPIIW2) Optimal Lag = 8					
0.1525	1.0000	-0.4293	$H_0 : r = 0$	8.9122	0.5682
0.0921	1.0000	-0.9821	$H_0 : r \leq 1$	3.2864	0.0657
Variables: log (WPI1) & log (CPIIW1); Optimal Lag = 1					
0.2698	1.0000	-1.0168	$H_0 : r = 0$	24.0586	0.0085
0.1158	1.0000	2.4838	$H_0 : r \leq 1$	6.7667	0.0080
Variables: log (WPI2) & log (CPIIW2); Optimal Lag = 8					
0.2287	1.0000	-1.0706	$H_0 : r = 0$	12.7838	0.2481
0.1097	1.0000	-2.8571	$H_0 : r \leq 1$	3.9524	0.0438
Sub-Period II : May 1995 to September 1998					
Variables: log (WPI1) & log (CPIIW2); Optimal Lag = 8					
0.6326	1.0000	-0.5451	$H_0 : r = 0$	15.6165	0.1105
0.1143	1.0000	0.7328	$H_0 : r \leq 1$	1.6997	0.1882
Variables: log (WPI1) & log (CPIIW1); Optimal Lag = 8					
0.5579	1.0000	-0.7611	$H_0 : r = 0$	12.7314	0.2516
0.0888	1.0000	5.7422	$H_0 : r \leq 1$	1.3027	0.2652
Variables: log (WPI2) & log (CPIIW2); Optimal Lag = 7					
0.5881	1.0000	-0.5554	$H_0 : r = 0$	16.3517	0.0911
0.0721	1.0000	1.2565	$H_0 : r \leq 1$	1.2716	0.2725

Note : Any test statistics is rejected at α per cent level of significance if the corresponding p-value exceeds α/100. In normal practice α is assumed to be either 1 or 5.

The lack of evidences on long-term relationship between CPIIW and WPI, based both on actual and adjusted data, lead to the inference that the recent divergence between wholesale and consumer prices could have been due to certain shocks which affect the short-run behaviour of the series. To be sure, we conducted Granger's causality tests on stationary transformed series (i.e., first differences of logged transformed series) for different pairs of adjusted CPIIW and WPI. The relevant results are presented in Table 7. It is seen that in both the periods bi-directional causality is detected between (i) CPIIW2 & WPI1, (ii) CPIIW1 & WPI1 and (iii) CPIIW2 & WPI2. Thus it appears that the short-term relationship between CPIIW and WPI based on common commodities is not disturbed. Therefore, the recent disturbance in short-run relationship between actual CPIIW and WPI is mostly attributable to some peculiar price behaviour of uncommon items, weighting diagrams, etc.

Table 7: Granger's Causality Test for Adjusted WPI & CPIIW

Dependent Variable	Explanatory Variables		Null Hypothesis & Test Statistics			Remarks
	Regressor	Lags	Null Hypothesis	F-statistic	P-value	
Sub-Period I : April 1990 to April 1995						
Causality Test for WPI1 & CPIIW2						
Δlog (CPIIW2)	Constant	—	H_0 : WPI	F (3,42)	0.0007	Bi-directional causality exists between WPI1 and CPIIW2
	Δlog(WPI)	1,2,5	does not	= 6.8606		
	Δlog(CPIIW2)	3,6,11	cause CPIIW2			
Δlog (WPI1)	Constant	—	H_0: CPIIW2	F (4, 41)	0.0008	
	Δlog(WPI1)	1,3	does not	= 5.9101		
	Δlog(CPIIW2)	2,4,7,12	cause WPI1			
Causality Test for WPI1 & CPIIW1						
Δlog (CPIIW1)	Constant	—	H_0 : WPI1	F (3,42)	0.0014	Bi-directional causality exists between WPI1 and CPIIW1
	Δlog(WPI1)	1,6,11	does not	= 6.1923		
	Δlog(CPIIW1)	6,12	cause CPIIW1			
Δlog (WPI1)	Constant	—	H_0: CPIIW1	F (4, 41)	0.0015	
	Δlog(WPI1)	1,3	does not	= 5.3054		
	Δlog(CPIIW1)	2,4,7,12	cause WPI1			

(Contd....)

Dependent Variable	Explanatory Variables: Regressor	Lags	Null Hypothesis & Test Statistics: Null Hypothesis	F-statistic	P-value	Remarks
Causality Test for WPI2 & CPIIW2						
Δlog (CPIIW2)	Constant	—	H_0 : WPI2	F (2,40)	0.0420	Bi-directional causality exists between CPIIW2 and WPI2.
	Δlog(WPI2)	1,12	does not	= 3.4333		
	Δlog(CPIIW2)	1,3,6,9, 12	cause CPIIW2			
Δlog (WPI2)	Constant	—	H_0: CPIIW2	F (4, 41)	0.0001	
	Δlog(WPI2)	1,7	does not	= 7.4749		
	Δlog(CPIIW2)	4,7,8,12	cause WPI2			
Sub-Period II : May 1995 to September 1998						
Causality Test for WPI1 & CPIIW2						
Δlog (CPIIW2)	Constant	—	H_0 : WPI1	F (3,35)	0.0039	Bi-directional causality exists between WPI1 and CPIIW2
	Δlog(WPI)	1,8,10	does not	= 5.3456		
	Δlog(CPIIW2)	9,12	cause CPIIW2			
Δlog (WPI1)	Constant	—	H_0: CPIIW2	F (1, 38)	0.0064	
	Δlog(WPI1)	6	does not	= 8.3388		
	Δlog(CPIIW2)	7	cause WPI1			
Causality Test for WPI1 & CPIIW1						
Δlog (CPIIW1)	Constant	—	H_0 : WPI1	F (3,35)	0.0035	Bi-directional causality exists between WPI1 and CPIIW1
	Δlog(WPI1)	1,5,8	does not	= 5.4484		
	Δlog(CPIIW1)	7,8	cause CPIIW1			
Δlog (WPI1)	Constant	—	H_0: CPIIW1	F (1, 37)	0.0266	
	Δlog(WPI1)	6,8	does not	= 5.3341		
	Δlog(CPIIW1)	7	cause WPI1			
Causality Test for WPI2 & CPIIW2						
Δlog (CPIIW2)	Constant	—	H_0 : WPI2	F (3,35)	0.0002	Bi-directional causality exists between WPI2 and CPIIW2.
	Δlog(WPI2)	1,8,10	does not	= 8.4579		
	Δlog(CPIIW2)	9,12	cause CPIIW2			
Δlog (WPI2)	Constant	—	H_0: CPIIW2	F (4, 35)	0.0221	
	Δlog(WPI2)	1	does not	= 3.2764		
	Δlog(CPIIW2)	2,3,7,9	cause WPI2			

Note : Any test statistics is rejected at α per cent level of significance if the corresponding p-value exceeds α/100. In normal practice α is assumed to be either 1 or 5.

Section V

Concluding Observations

The results of this study indicate that there has been some strong evidence of growing divergence between the wholesale and consumer prices in India since May 1995. While a part of this divergence is explained by the differences in commodity basket and weighting pattern inherent in two price indices, there are also other factors which are at work in giving rise to this outcome. Empirical results indicate that while removal of these sources of divergence improves the short-run relationship between CPIIW and WPI, the improvement is not so impressive for the long-term relationship. This points to other factors, such as price quotations, differences in market behaviours, etc., which may have been playing a significant role in the recent divergence in the relationship between CPIIW and WPI. Quantification of those impacts is, however, difficult in absence of appropriate dis-aggregated data. While the price setting process in both the markets is undoubtedly different and is subject to dynamic shocks, the recent growing divergence between the wholesale and consumer prices calls for a detailed survey of the behaviour of individual commodity prices in both the market segments and how far this behaviour has undergone a change to merit a revision of base period, commodity baskets and their relative weights in the respective price indices.

Notes

1. At the time of doing the econometric exercises included in this study, we had detailed data till September 1998. Though by this time, data are available for about another couple of months, the nature of divergence between CPIIW and WPI has broadly remained unchanged. Therefore, we believe that the inclusion of those extra data points will not change the qualitative nature of the relevant results.

2. A non-stationary variable with no deterministic component is said to be integrated of order d, denoted by I(d), if d-th order differencing on the original series produces a stationary series.

3. The task of identifying common commodity groups is really very difficult mainly due to the fact that detail commodity coverage in CPIIW basket is not readily available. In this study taking the major groups of CPIIW as the standard, relevant items from WPI basket have been chosen to construct a comparable WPI series.

Obviously, a bit of arbitrariness is involved in this type of heuristic approach. However, we hope that the results based on the present groupings would not have deviated much from a rigorous and full-proof classification.

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Integration of Financial Markets in India: An Empirical Evaluation

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This paper attempts to empirically evaluate the extent of integration of India's financial markets in the post-liberalisation period. The major findings of the paper are the following: a) although fully competitive environment is yet to emerge, several segments of the financial market have achieved operational efficiency; b) the 91-day Treasury Bill rate has the potential to emerge as a reference rate in the Indian context; c) India's financial markets are getting increasingly integrated at the short-end of the market, such as, money market, credit market, Government securities market since April 1993. However, capital market is least integrated with the rest of the financial sector; d) there are early indications about integration of money market and forex market. However, integration of domestic and overseas financial markets is not robust.

Introduction

India's financial sector was regulated for a long period. Interest rates were administered. Deployment of credit was largely directed by the authorities. Banks were the captive subscribers to the Government securities under statutory arrangement. The secondary market of Government securities was dormant. Both the money and capital markets were underdeveloped. Foreign exchange market was extremely thin, mainly due to stringent restrictions under Foreign Exchange Regulation Act (FERA). Moreover, the basket-linked exchange rate was administered and the financial markets stood segmented. Although financial sector grew considerably in the regulated environment, it could not achieve the desired level of efficiency. The weaknesses of India's financial markets were recognised in the *Report of the Committee to Review the Working of the Monetary System* (Chairman, S. Chakravarty, 1985). Subsequently, Vaghul Working Group (1987) examined in detail the

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problems of Indian money market and recommended several remedial measures.

A comprehensive package of reform measures recommended by the Narasimham Committee in 1991[1] became the starting point of gradual deregulation of the financial sector. The reform process since then has rolled forward in several directions. An important objective of reform has been to develop the various segments of the financial market into an integrated one, so that their inter-linkages can reduce arbitrage opportunities, help achieve higher level of efficiency in market operation and increase the effectiveness of monetary policy in the economy. Some of the precise policy reforms pursuing these objectives have been the gradual process of dismantling of various price and non-price controls in the financial system, developing and strengthening an active market for government securities, and putting in place an appropriate institutional and legal system that would supervise various segments of financial market operations. During the past six years, significant progress has been achieved in terms of policy and institutional reforms. A question that needs to be addressed is: how far have these initiatives resulted in narrowing the inter-market divergences and achieved a reasonable degree of market integration? This paper looks at the issue from an empirical perspective and attempts to provide some evidence on market integration in India.

The rest of the paper is structured as follows: Section I deals with certain conceptual issues relating to the integration of financial markets and factors contributing to such integration. Section II outlines the design of the empirical analysis. Section III examines the behaviour of interest rates/returns pertaining to the alternative markets, and draws inferences on the efficiency of each segment. The extent of market integration is studied in Section IV. Section V offers concluding observations.

Section I

Conceptual Issues

Financial sector plays a crucial role in promoting overall growth of the economy. This has been recognised extensively in the literature since the early 1970s[2]. Precisely, a well-developed financial sector performs the following important functions:

(a) it promotes overall savings of the economy by providing alternative instruments;

(b) it allocates resources efficiently among the sectors; and

(c) it provides an effective channel for the transmission of policy impulses.

While the first two issues relating to promotion of savings and allocative efficiency are important, given the scope of this study, we, however, concentrate on the third issue. The financial sector can be used as an effective channel for the transmission of policy impulses provided the financial markets are competitive, efficient and integrated. A typical competitive financial market has the following characteristics:

(a) there should be large number of buyers and sellers of the financial product;

(b) the price of the product is determined by the market forces of demand and supply;

(c) there should be a secondary market for the instrument;

(d) turnover of the instruments in both primary and secondary markets should be fairly large; and

(e) agencies involved in the process of intermediation between buyers and sellers should provide intermediation services at a minimum spread.

The efficiency of a market has been discussed in the literature at various levels of sophistication. In simple language, a market is said to be efficient if the rate prevailing at any point of time contains all information about the market. If the realised rate contains all information, then the future rate cannot be appropriately predicted. In fact, the future rate may move either way; it can go up, remain steady, or it can go down depending on the information that would be available at that point of time. In other words, the future rates may adapt a path of *random walk*. There are several technical methods of studying the random walk hypothesis which are not discussed here[3]. However, one can verify the random walk hypothesis simply by plotting the changes in the rate against time. If the rate variables follow random walk, one would expect the changes in rate variables to move around zero over a period of time. In other words, changes in the interest rates are stationary around a mean, which may be zero or close to zero.

Apart from efficiency of individual markets, effective integration of financial markets depends on a few characteristics such as:

(a) financial markets are efficient and the rates are market determined;

(b) across-the-board differences in returns on the financial products are based on the risk and maturity profile of the instruments;

(c) the rates or returns are related to a benchmark-rate or a reference rate;

(d) there is free flow of resources from one segment of the market to the other and thereby the arbitrage opportunity is wiped out; and

(e) the rates of various segments of the financial sector move in tandem.

If a financial market is competitive, it is also efficient but an efficient market may not necessarily be competitive. Moreover, if all

the segments of a financial sector are competitive, there is a greater probability that they are fairly integrated. It may be difficult to achieve competitive conditions in all the segments at a particular point of time. Nevertheless, there could be high degree of integration among the segments provided the markets are at least efficient.

Since an integrated financial market facilitates monetary transmission process (Vasudevan and Menon 1978), several developing countries have undertaken reform measures especially to remove government-induced controls on allocation of credit and interest rate variables. In India too, a large number of measures have been undertaken in the process of financial liberalisation during the 1990s[4]. The overall package of structural reforms in India has been designed to enhance the productivity and efficiency of the economy as a whole and thereby make the economy internationally competitive. It is, therefore, logical to expect that the whole gamut of structural reform measures have contributed directly or indirectly to the reduction of market segmentation in India. These reforms include, *inter alia*, deregulation of interest rate; reduction of pre-emptions of resources from the banks through CRR and SLR; issue of government securities at market related rates; increasing reliance on the indirect method of monetary control; participation of the same set of players in the alternative markets; move towards universal banking; development of secondary markets for several instruments, particularly Government securities; dilution of Foreign Exchange Regulation Act (FERA); convertibility of rupee in the current account; cross-border movement of capital and world-wide acceptance of the flexible exchange rate; and investors' protection and curbing of speculative activities through wide ranging reforms in the capital market.

Section II

Design of the Empirical Analysis

India's financial sector can be broadly divided into organised and unorganised markets. Due to paucity of reliable data/information, it is not possible to study the behaviour of the unorganised

financial markets in India. There is, however, a general belief that activities in the unorganised markets are on the decline. It is also claimed that the activities in the unorganised sector may shrink further if a high degree of integration of the organised financial markets is achieved.

Organised financial markets can be further classified into two categories - short-term and long-term. The notable segments within the short-term category are: (a) Money Market; (b) Credit Market; (c) Gilt Market and (d) Forex Market. Within the long-term category, the important segments are: (i) Equity and Term Lending Markets; (ii) Corporate Debt Market; (iii) Pension Funds Market; (iv) Insurance Market; (v) Housing Finance Market, (vi) Mutual Funds Market and (vii) Hire Purchase and Leasing Finance Market. It is, however, difficult to obtain high frequency data on several of these markets and particularly term lending, PSU bonds/debenture, insurance funds, pension funds, hire purchase and leasing and mutual funds. On the basis of data availability, we identify Money Market, Credit Market, Government Securities Market, Capital Market and Forex Market for the purpose of testing of market integration hypothesis.

The instruments available for transaction in both the short-term and long-term markets are given in Table 1. On the basis of the availability of monthly data, we have chosen at least two rates from each market. The set of variables includes call money rate (CMR), certificates of deposits rate (CDR), commercial paper rate (CPR), deposit rate (DRT), lending rate (LRT), 91-day Treasury bill rate (G91), 364-day Treasury bill rate (G364), return on capital (RE) consisting of capital gains and dividend yields, price-earning ratio (PERN) of 100-scrip National Index, 3-month forward premium (FRWD3), 6-month forward premium (FRWD6) of the US dollar and the US Treasury bill rate (USTB). The paper examines the movement of monthly rates/returns covering 60 months from April 1993 to March 1998 which excludes first two years of reforms i.e., 1991-92 and 1992-93 due to extreme volatility of rates noticed during those two years on account of problems related to transition. We conduct various tests, including time series analysis to collate evidence on the inter-linkages among various markets and examine whether there could exist significant degree of integration among these markets.

Table 1: List of Instruments

A: Short-term Instruments (Up to one-year maturity)

1. Call Money / Notice Money / Term Money
2. Certificates of Deposit
3. Commercial Papers
4. Participation Certificates
5. Money Market Mutual Fund Units
6. Credit Market: Deposit & Credit
7. Treasury Bills of various maturities
8. Repurchase Agreements
9. Forex Trading Instruments: Spot, Swap

B: Long-term Instruments (More than one-year maturity)

1. Dated securities of Central & State Governments
2. Special Government securities like Zero Coupon Bonds, Deep Discount Bonds, Tap Stocks, Partly Paid Stocks, Floating Rate Bonds, Capital Index Bond, etc.
3. PSU Bonds
4. UTI Units
5. Mutual Fund units under various Schemes
6. Equities
7. Preference Shares
8. Debentures (convertible, partly convertible, non-convertible)
9. Special instruments, such as, Zero Coupon Bonds, Deep Discount Bonds, Floating Rate Notes, etc., issued by PSUs and Private Sector Units
10. Fiscal incentive induced instruments, such as, NSC, NSS, Indira Vikas Patra, PF, Tax Free PSU Bonds, etc.

Section III

Market Efficiency and Reference Rate Analysis

Most of the empirical studies on integration of financial markets focus on the operating efficiency rather than the allocative efficiency indicator of the financial market [Cole *et al.* 1997]. In the case of operating efficiency, the basic line of argument is whether interest rates of important money market instruments move together with a reference rate. There are several alternative empirical approaches to quantify the operating efficiency. The elementary way of addressing such an issue is the simple measure of correlation coefficient. However, the statistical correlation coefficient as a measure of market efficiency has been rejected recently in view of non-stationary nature of rate variables. In this context, the time series tools, especially unit root test and co-integration analysis, have proved to be an important framework for analysing market efficiency.

The empirical cointegration exercise entails that one should first identify a reference rate. Theoretically, a reference rate is defined as the price of a short-term low risk instrument in a free liquid market. Usually, a reference rate is chosen among the class of short term interest rates prevailing in the money or gilt market. In addition to these characteristics, it should be statistically well behaving and satisfy certain regularity conditions consistent with the theoretical implications. First, it should follow a random walk process that is consistent with the efficient market hypothesis. In an efficient market, all relevant information pertaining to demand and supply conditions prevailing in the market are supposed to be fully utilised and thus the rate variable follows a random walk process. Secondly, the first difference of the reference rate should exhibit a pattern similar to Gausian distribution i.e., independently and identicallly distributed (i.i.d.) process. This criterion is very important in determining a reference rate when several rate variables are characterised by unit root, and their first differences are also stationary process. Indeed, in practice, a number of statistical properties of interest rates including unit root, and a set of stylised facts i.e., mean, standard deviation, skewness and kurtosis measures are simultaneously taken into consideration while identifying a reference rate.

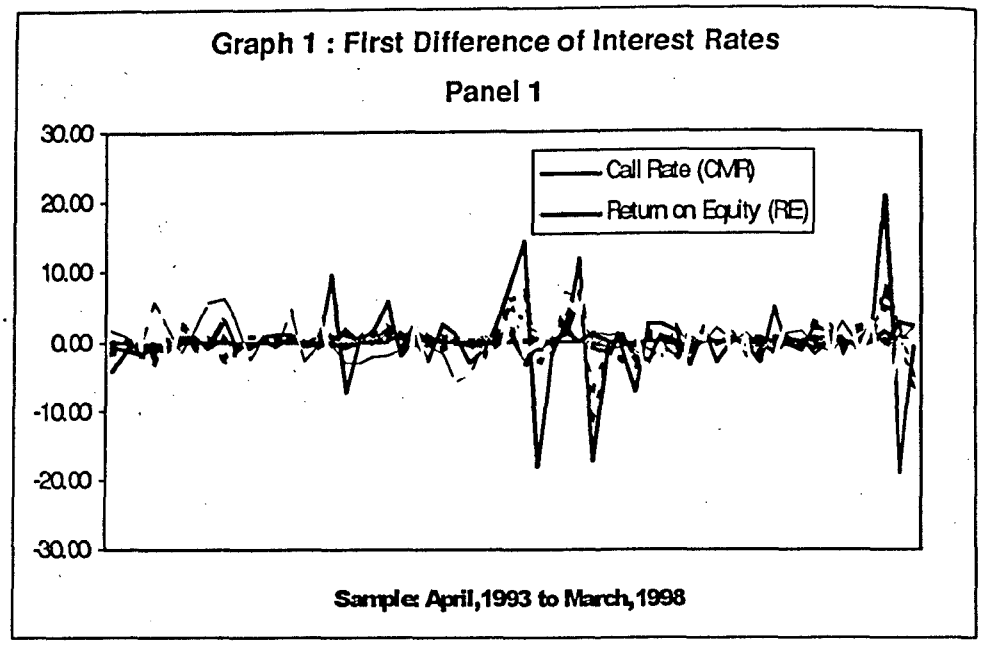
Market Efficiency

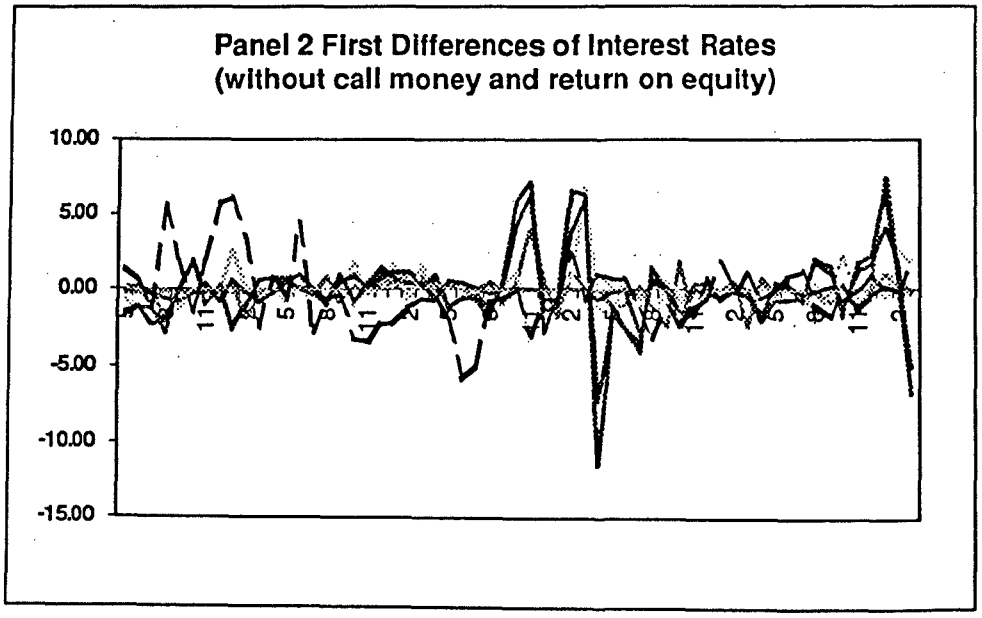
One simple and convenient way to analyse market efficiency is to plot the first difference of the rate variables. Graph 1 shows the changes in interest rates under consideration. Most of the rates moved around zero mean, except return on capital, price-earning ratio and to some extent call rate (Panel 1). The mean cannot be close to zero for these variables. Hence, capital market and call money market seem to have not achieved desired level of efficiency. If these rates are dropped (as shown in Panel 2), the variations in other rates move around zero thus supporting the efficient market hypothesis. These evidences, however, need to be put to more rigorous tests. We conduct Phillips-Perron test to verify if the rates have unit roots (Table 2). The results from Phillips and Perron (PP) unit root test indicate that interest rate variables (excluding call rate) are, indeed, non-stationary and have unit root. Given the fact that call rate has exhibited large volatility, we used a 3-month moving average series of call rate (CMR3) which is found to be an I(1) series.

Table 2 : Phillips-Perron Unit Root Test

Variables	Level Form (-2.86)	First Difference (-3.41)
G91	-1.05	-8.04
G364	-0.4	-7.24
CDR	-1.94	-7.64
CPR	-2.61	-7.08
CMR	-4.15	-12.33
CMR3	-1.72	-12.33
DRT	-2.16	-8.32
LRT	-2.29	-7.23
PERN	-0.53	-4.89
PERS	-0.63	-5.48
RE	-1.81	-4.05
RDR	0.31	-6.68
FR3	-2.37	-6.13
FR6	-2.03	-6.02
USTB	-2.16	-5.32

Note : Figures in brackets indicate critical value at 5 per cent level of significance.





In order to ascertain whether any short-term rate has the potentiality to emerge as a reference rate, the basic statistics of various rates in their first difference form have been analysed in Table 3.

Table 3 : Basic Statistics of Various Rates (First Difference)

Series	Mean	SD	SK	Kts	JB
G91	-0.04 (0.01)	0.75 (0.63)	-1.17 (-0.45)*	2.95 (0.75)*	34.28 (0.00)
G364	-0.06 (-0.02)	0.45 (0.28)	-2.80 (-0.92)	13.98 (3.88)	557.55 (41.60.)
CMR	0.01	6.25	-0.30	-3.95	39.24
CMR3	0.10 (0.17)	2.28 (1.70)	0.84 (1.71)	4.15 (5.74)	49.28 (114.00)
CDR	0.06	1.44	2.56	11.68	399.82
CPR	-0.04	1.48	1.72	7.33	161.17
DRT	-0.01	0.55	0.86	9.49	228.67
LRT	-0.05	0.43	-0.20	2.88	20.17
RDR	0.13	0.56	-0.01	6.57	106.11
FRWD3	0.14	2.83	-0.34	4.84	58.72
FRWD6	0.12	2.15	0.26	2.89	21.20
RE	0.57	8.69	-0.37	0.25	1.50
PERN	-0.26	2.33	0.66	1.24	8.06

Note : Figures in the brackets refer to summary statistics after 1 per cent trimming of the series.
In case of G91, the skewness (SK) and kurtosis (Kts.) measures are not significantly different from zero.

Going by the basic features of a typical reference rate, the choice of reference rate boils down to the choice between G91and G364. Table 3 shows that standard deviation of G364 is somewhat smaller than G91. However, in terms of skewness and kurtosis measures, G91 has an edge over the G364. The JB test statistics based on skewness and kurtosis measures of first difference series indicates that none of the series could pass through normality assumption i.e., the series could not be approximated as an independently and identically distributed (i.i.d.) process. Interestingly, the JB

tests carried out on the basis of skewness and kurtosis measures after adjusting the series for extreme values (trimmed by 1 per cent) indicate that G91 is an i.i.d. process but not G364. In the case of G364, the extreme values need to be trimmed by as much as 10 per cent so as to arrive at an i.i.d. process. Thus, G91 could qualify as a reference rate[5].

Causal Analysis

Although some of the stylized statistics enable us to identify a reference rate among a class of short-term rates, this is not a sufficient condition to derive meaningful inferences on the integration of financial markets. The sufficient condition requires that the chosen reference rate should substantially induce changes in several other rate variables. In other words, the causal relationship and the size of long-run elasticity are important facts for any meaningful study of integration of different segments of the financial market. Accordingly, Granger's causal analysis was carried out within a bivariate framework. The results of 'F' tests as reported in Table 4 indicate that there is bi-directional causality between G91 on the one hand and money market rates (CDR, CPR and CMR3) on the other. The bi-directional causality can be established between call rate (CMR3) and CDR. Between call money rate and commercial paper (CPR), a unidirectional causality is identified, but this occurs at a higher level of significance. Between CDR and CPR, the unidirectional causality runs from CDR to CPR implying that the banks treat certificate of deposits as cost of funds while investing in CPR.

In the credit market, bi-directional causality could be established between DRT and LRT, although, at a 10 per cent level of significance. The causality between gilts and credit market revealed that G91 causes DRT uni-directionally. The causality between LRT and G91 is, however bi-directional. When call rate is taken, it causes DRT and LRT uni-directionally.

In case of exchange market, causal link runs bi-directionally between call rate and forward premia. The same pattern of causal

link could also exist between gilts and forward premia but at a higher level of significance. Finally, no causal link could be established between capital market and money and credit market.

Table 4 Granger's Causality

	F TEST	SIGNIFICANCE LEVEL
CDR-G91	3.45	A
G91-CDR	2.81	B
CPR-G91	5.92	A
G91-CPR	3.98	A
CMR3-G91	5.52	A
G91-CMR3	4.82	A
G364-G91	7.36	A
G91-G364	2.89	A
FRWD3-G91	2.58	B
G91-FRWD3	2.18	B
FRWD6-G91	2.58	B
G91-FRWD6	2.21	B
DRT-G91	5.11	A
G91-DRT	1.26	NS
LRT-G91	3.28	A
G91-LRT	2.45	B
DRT-LRT	2.10	B
LRT-DRT	2.33	B
CPR-CDR	1.98	B
CDR-CPR	0.15	NS
CDR-CMR3	13.10	A
CMR3-CDR	3.91	A
CPR-CMR3	7.30	A
CMR3-CPR	1.39	NS
DRT-CMR3	3.26	A
CMR3-DRT	0.48	NS
LRT-CMR3	2.36	B
CMR3-LRT	0.90	NS

Note : 'A' & 'B' indicate level of significance at 5 per cent and 10 per cent, respectively. 'NS' is not significant at the usual 1 or 5 per cent levels.

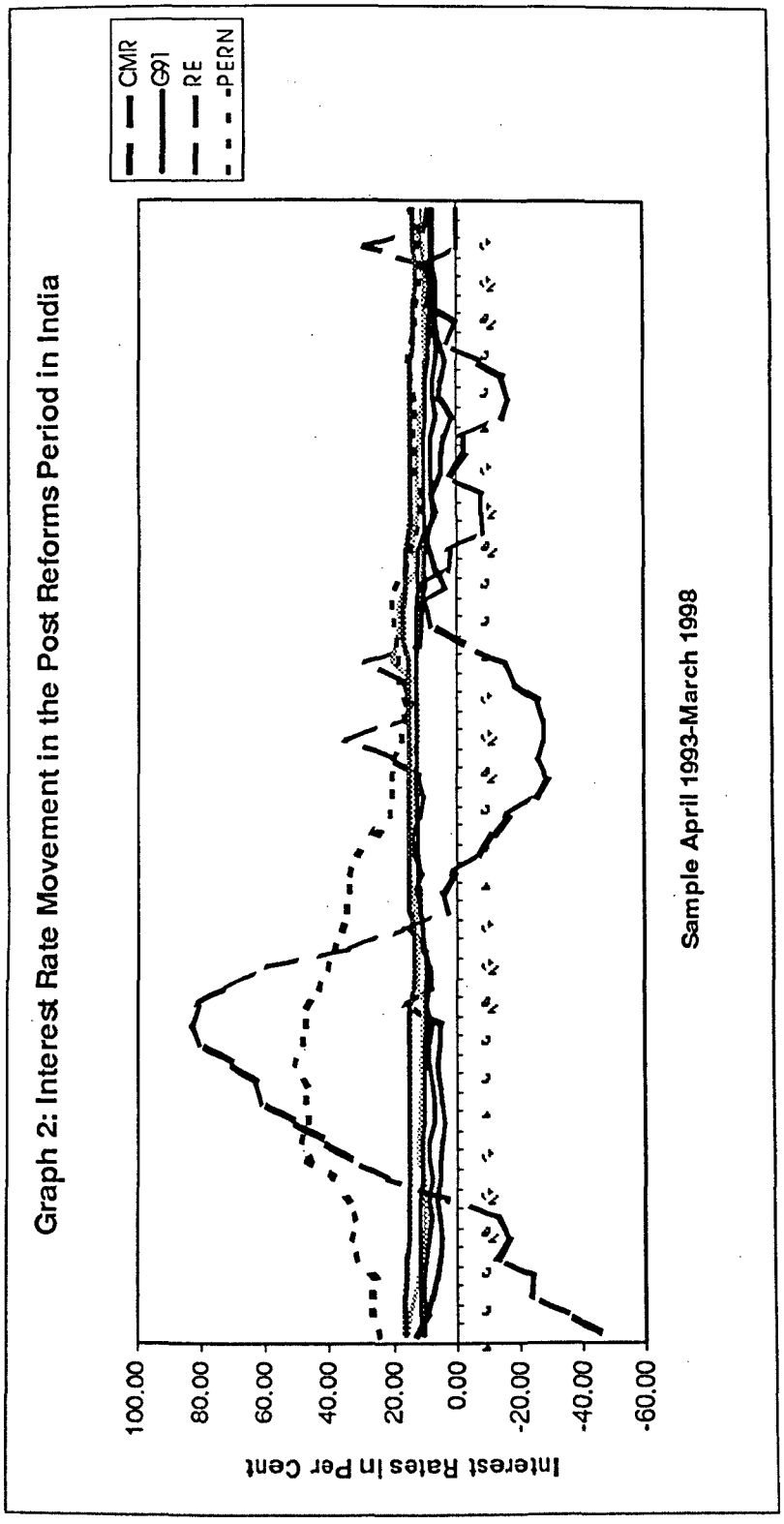
Section IV

Integration of Markets

The overall integration of the financial markets can be seen from Graph 2. Excepting return on capital, price-earning ratios and (to some extent) call money rate, all other rates under consideration moved in tandem. The degree of co-movement seems to have increased since 1996. *Prima facie*, one can expect that capital market is least integrated with the other segments. The variability of the series under consideration measured by standard deviation as shown in Table 5 supports this observation. It is evident from the Table that the variability is the highest in the case of return on capital, followed by price earning ratio and call money rate. Thus, the two extreme ends of the financial markets i.e., the long and the short ends are relatively more volatile.

Table 5: Mean and Standard Deviation of Various Rates

Series	Mean	Standard Deviation
1	2	3
CALL	9.55	6.06
CDR	12.38	2.28
CPR	12.83	2.45
DRT	10.66	1.00
LRT	15.21	0.80
G91	9.69	2.17
G364	11.06	1.46
RE	6.45	33.26
PERN	27.20	12.71
FRWD3	6.67	5.17
FRWD6	6.93	4.61


Graph 2: Interest Rate Movement in the Post Reforms Period in India
CMR
G91
RE
PERN
100.00
80.00
60.00
40.00
20.00
0.00
-20.00
-40.00
-60.00
Interest Rates In Per Cent
Sample April 1993-March 1998

Another way of looking at the integration of financial markets is to examine the cross-correlation coefficients (Table 6). Broadly speaking, the cross correlation coefficients give us the degree of association of various rates. As is evident from Table 6, return on capital and price earning ratios are moving almost in the opposite direction compared to those for other rate variables. All other rates display positive correlation among them, indicating varying levels of co-movement.

Table 6: Cross-Correlation Coefficients

	Call	CDR	CPR	DRT	LRT	G91	G364	RE	PERN	FRWD3	FRWD6
Call	1	0.58	0.39	0.57	0.15	0.62	0.40	-0.27	-0.16	0.70	0.65
CDR		1	0.59	0.69	0.54	0.60	0.59	-0.57	-0.47	0.82	0.85
CPR			1	0.70	0.61	0.75	0.71	-0.25	-0.10	0.53	0.59
DRT				1	0.64	0.85	0.80	-0.44	-0.20	0.54	0.58
LRT					1	0.61	0.77	-0.28	0.09	0.19	0.26
G91						1	0.89	-0.35	-0.05	0.49	0.52
G364							1	-0.46	-0.21	0.62	0.65
RE								1	0.77	-0.49	-0.50
PERN									1	-0.53	-0.58
FRWD3										1	0.99
FRWD6											1

Partial Adjustment Analysis

The most conventional analysis of degree and speed of integration of different segments of financial market is the partial adjustment model that enables us to derive the long-run elasticity and mean lag response of the rate variables with respect to a reference rate. In the partial adjustment model, the size of the lagged dependent variable indicates the speed of market adjustment and the long-run elasticity and mean lag response indicates the nature of comovement between the rate variables. The estimated results are reported in Table 7. The estimates of long-run elasticity measure (F1) indicate that most of the money market rates have high elasticity with respect to G91 as compared to CMR3. The mean lag

Table 7.1 : Partial Adjustment Model
Y = F[Y{1}, G91, G91{1}]

REGRESSORS	CDR	REGRESSORS	CPR	REGRESSORS	CMR
CONSTANT	1.38 (1.92)	CONSTANT	1.79 (2.31)	CONSTANT	0.81 (0.54)
CDR(-1)	0.56 (7.51)	CPR(-1)	.61 (4.92)	CMR3(-1)	0.89 (9.78)
G91	-0.062 (-0.34)	G91	0.37 (2.93)	G91	0.65 (2.18)
G91(-1)	0.48 (2.415)	G91(-1)	-0.05 (-0.24)	G91(-1)	-0.61 (-1.90)
$\bar{R}^2$ / DW	0.84, 1.91	$\bar{R}^2$ / DW	0.73, 1.90	$\bar{R}^2$ / DW	0.82, 1.54
F1	0.93 (6.59)		0.86 (4.30)		1.31 (2.70)
F2	2.40 (4.36)		1.40 (1.81)		0.50 (1.85)
F2=0, F2=1	43.40, 0.21		18.44, 0.53		5.23, 0.31

REGRESSOR	DRT		LRT		FRWD3	FRWD6
CONSTANT	4.08 (4.67)	CONS- TANT	2.57 (2.92)	CONS- TANT	-1.49 (-0.65)	-0.73 (-0.53)
DRT(-1)	0.42 (3.56)	LRT(-1)	.77 (11.57)	FRWD 3/6(-1)	0.65 (6.40)	0.85 (16.40)
G91	0.14 (1.74)	G91	0.11 (1.63)	G91	0.86 (1.85)	0.74 (2.84)
G91(-1)	0.08 (0.91)	G91(-1)	-0.02 (-0.30)	G91(-1)	-0.45 (-0.93)	-0.55 (-2.12)
$\bar{R}^2$ / DW	0.79, 1.83	$\bar{R}^2$ / DW	0.84, 2.01	$\bar{R}^2$ / DW	0.75, 1.85	0.80, 1.66
F1	0.39 (8.35)		0.39 (3.71)		1.20 (1.76)	NS
F2	1.08 (2.49)		3.09 (2.73)		0.80 (0.56)	NS
F2=0, F2=1	69.071,176.78		13.77, 33.11		3.11, 0.09	NS

Note: Figures in the brackets indicate 't' values. Y is dependent variable.
The models were checked for residual autocorrelation in terms of Durbin's h statistics. In such cases, the models were corrected for serial correlation by using maximum likelyhood method.

Table 7.2 Partial Adjustement Model
Y = F [Y{1}, CMR, CMR{1}]

REGRESSORS	CDR	REGRESSORS	CPR	REGRESSORS	G91
CONSTANT	1.84 (2.43)	CONSTANT	2.51 (2.71)	CONSTANT	0.60 (1.45)
CDR(-1)	0.72 (10.56)	CPR(-1)	0.72 (9.25)	G91 (-1)	0.88 (16.38)
CMR3	0.14 (5.37)	CMR3	0.05 (1.54)	CMR	0.06 (3.34)
CMR3(-1)	0.04 (1.22)	CMR3(-1)	0.06 (1.73)	CMR(-1)	-0.01 (-0.64)
$\bar{R}^2$ / DW	0.84, 2.15	$\bar{R}^2$ / DW	0.72, 1.88, 0.56	$\bar{R}^2$ / DW	0.91, 2.17
F1	0.62 (4.65)		0.38 (3.04)		0.40 (2.61)
F2	2.80 (3.46)		3.07 (3.20)		7.42 (1.94)
F2=0, F2=1	21.63, 8.33		9.26, 24.03		6.83, 14.89

REGRESSOR	DRT		LRT		FRWD3	FRWD6
CONSTANT	2.72 (3.38)	CONS- TANT	1.76 (2.12)	CONS- TANT	-0.85 (-1.66)	-0.70 (-1.65)
DRT(-1)	0.70 (8.5)	LRT(-1)	0.86 (15.62)	FRWD 3/6(-1)	0.76 (11.15)	0.78 (13.83)
CMR3	0.03 (2.37)	CMR3	0.02 (1.82)	CMR3	0.39 (8.30)	0.28 (7.69)
CMR3(-1)	0.01 (1.11)	CMR3(-1)	0.01 (0.91)	CMR (-1)	-0.12 (-2.06)	-0.05 (-1.10)
$\bar{R}^2$ / DW	0.76, 2.10	$\bar{R}^2$ / DW	0.83, 2.03	$\bar{R}^2$ / DW	0.87, 1.94	0.90, 2.02
F1	0.15 (3.61)		0.19 (1.95)		1.09 (4.73)	1.08 (4.75)
F2	2.71 (2.98)		6.62 (2.29)		2.63 (2.77)	3.40 (2.14)
F2=0, F2=1	13.02, 437.16		3.81, 69.91		22.36, 0.14	22.55, 0.14

Note : Figures in the brackets indicate 't' values. The models were checked for residual autocorrelation in terms of Durbin's h statistics. In such cases, the models were corrected for serial correlation by using maximum likelihood method.

response (F2) varies from 1 to 3 months when G91 is taken as independent variable compared to 3 to 6 months in case of call rate, thus indicating fairly quick speed of adjustment with respect to G91. In all the cases, the Wald restriction of zero elasticity can be rejected. However, unit elasticity of money market rates, CDR and CPR, with respect to G91 could not be rejected. In case of call rate, although the long-run elasticity coefficient seems to be high or close to unity, the Wald restriction, however, rejects this hypothesis. Thus, most of the short term rates have substantial relationship with the G91. The value of the lagged dependent variable of the partial adjustment model turned significantly different from zero and reflected the low degree of adjustment in the market. The estimated coefficient indicated that, on an average, interest rates in other markets adjust about 30 per cent within a month with reference to call rate and about 40 per cent with reference to G91. Thus, the speed of adjustment is not very high in the Indian context.

Co-integration Analysis

When several rate variables are characterised by integrated processes i.e, I(1) series, the appropriate way of looking at the integration of financial markets is to examine whether there exists co-integrating relationship between different segments of the market. However, in order to draw meaningful policy implications, it would be necessary to see if a co-integrating relationship exists between the reference rate on the one hand and several money market rates on the other.

Money Market and Gilt Markets

The co-integration analysis requires that the set of variables should be integrated of the same order, in particular, I(1) process and their linear combination must be stationary. Within a bi-variate framework, the residuals emerging from various short-term rates as the dependent variable and the G91 as an explanatory variable must be stationary process. Following Johansen (1988), the co-integrating

Table 8.1 : COINTEGARTION RESULT: MONEY MARKET

(a) CPR = F (CONSTANT, CMR3)

REGRESSORS	OLS	RESIDUAL	JJ–LR VECTOR K=4, r=1*
CONSTANT	10.39 (17.11)	ADF (3)	9.15
CMR3	0.23 (4.10)		0.37
$\bar{R}^2$ / DW	0.23, 0.47		
CMR3 = 1.0			24.15 (a)**
CMR3 = 0.0			24.32 (a)

(b) CDR = F (CONSTANT, CMR3)

REGRESSORS	OLS	RESIDUAL	JJ–LR VECTOR K=3, r=1
CONSTANT	9.40 (17.40)	DF	9.87
CMR3	0.30 (6.16)		0.27
$\bar{R}^2$ / DW	0.39, 0.56		
CMR3 = 1.0			4.72 b
CMR3 = 0.0			1.27 NS

(c) CPR = F (CONSTANT, CDR)

REGRESSORS	OLS	RESIDUAL	JJ–LR VECTOR K=4, r =1
CONSTANT	5.39 (9.15)	DF ADF (1)	3.90
CDR	0.58 (5.73)		0.72
$\bar{R}^2$ / DW	0.35, 0.75		
CDR = 1.0			2.59 (c)
CDR = 0.0			8.48 (a)

Note: * k and r indicate lags and number of cointegrating relations, respectively.
** χ^2 statistics, a for 5% level, b for 10% and c for 15% level of significance and NS - not significant.

vector(s) could be estimated within a vector error correction framework after setting an appropriate lag order. The appropriate lag order was chosen in terms of AIC criterion. The AIC values suggested that a maximum of 3 to 4 months lag order could be chosen.

The co-integration results are summarised in Table 8. While Tables 8.1 and 8.2 present the bi-variate results, 8.3 shows the results relating to multivariate specification. Moreover, Table 8.1 depicts the relationship among rates in the money market while Table 8.2 allows interaction between money and gilt markets.

In case of money market, three pairs are found to be cointegrated. They are CPR-CMR3, CDR-CMR3 and CPR-CDR. Between money and gilt markets (Table 8.2) the long-run elasticity of CPR with respect to G91 turned out to be 0.74 whereas the elasticity of CDR with respect to G91 was somewhat low at 0.56. The homogenous restrictions of zero and unit elasticity are rejected for CPR and CDR. In case of call money rate, its long-run elasticity with respect to G91 is estimated at 1.52. Both the zero and unit restrictions are rejected. The long-run elasticity of CPR and CDR with respect to CMR3 (Table 8.1) was estimated around 0.30 i.e., nearly half the effect of G91, although, both zero and unit restrictions could be rejected.

Table 8.2 : COINTEGRATION RESULT: MONEY MARKET AND GILT MARKET

(a) CPR = F (CONSTANT, G91)

REGRESSORS	OLS	RESIDUAL	JJ-LR VECTOR K=3, r=1
CONSTANT	5.31 (5.46)	ADF (1)	5.58
G91	0.78 (7.80)		0.74
$\bar{R}^2$ / DW	0.50, 0.70		
G91 = 1.0			3.51 (a)
G91 = 0.0			9.06 (a)

(b)CDR = F (CONSTANT, G91)

REGRESSORS	OLS	RESIDUAL	JJ-LR VECTOR K=3, r=1
CONSTANT	5.67 (5.59)	DF	6.71
G91	0.61 (4.93)		0.56
$\bar{R}^2$ / DW	0.28, 0.50		
G91 = 1.0			9.49 (a)
G91 = 0.0			6.84 (a)

(c) CMR3 = F (CONSTANT, G91)

REGRESSORS	OLS	RESIDUAL	JJ-LR VECTOR K=1, r=1
CONSTANT	-6.08 (-3.00)	DF ADF (1)	-5.28
G91	1.67 (8.00)		1.52
$\bar{R}^2$ / DW	0.52, 0.46		
CDR = 1.0			2.56 (NS)
CDR = 0.0			8.48 (a)

When the model was extended to multivariate three-variable framework, results were interesting for the two alternative combinations i.e., CPR,CDR and G91 and CPR, CDR and CMR3. In case of the former, the long-run coefficient of G91 was estimated at 0.52 whereas the coefficient of CMR3 was 0.16 in the later model (Table 8.3). Thus, G91 has a substantial effect on the long-run movement of the money market rates.

Table 8.3 : MULTIVARIATE COINTEGRATION RESULT

(a) CPR = F (CONSTANT, CDR, CMR3)

REGRESSORS	OLS	RESIDUAL	JJ–LR VECTOR K=1, r=1
CONSTANT	4.61 (2.91)	ADF (3)	-2.94
CDR	0.64 (4.19)		1.12
CMR3	0.02 (0.26)		0.16
$\bar{R}^2$ / DW	0.40, 0.68		

(b) CPR = F (CONSTANT, CDR, G91)

REGRESSORS	OLS	RESIDUAL	JJ–LR VECTOR K=1, r = 1
CONSTANT	3.38 (2.94)	DF, ADF (1)	1.81
CDR	0.29 (2.94)		0.29
G91	0.60 (5.36)		0.69
$\bar{R}^2$ / DW	0.56, 0.87		

Table 9 : COINTEGARTION RESULT: CREDIT MARKET AND MONEY MARKET

(a) LRT = F (CONSTANT, DRT)

REGRESSORS	OLS	RESIDUAL	JJ–LR VECTOR K=3, r =1
CONSTANT	8.54 (8.02)	ADF (2)	8.78
DRT	0.61 (6.13)		0.59
$\bar{R}^2$ / DW	0.38, 0.23		
DRT= 1.0			7.46 (a)
DRT = 0.0			11.35 (a)

(b) DRT = F (CONSTANT, CMR3)

REGRESSORS	OLS	RESIDUAL	JJ–LR VECTOR K=2, r =1
CONSTANT	9.38 (45.74)	ADF(1)	9.01
CMR3	0.13 (6.93)		0.17
$\bar{R}^2$ / DW	0.46, .70		
F1=0			10.43
F1=1			12.21

(c) LRT = F (CONSTANT, CMR3)

REGRESSORS	OLS	RESIDUAL	JJ–LR VECTOR K=1, r = 1
CONSTANT	14.84 (69.92)	ADF (2)	14.05
CMR3	0.04 (1.98)		0.09
$\bar{R}^2$ / DW	0.07, 0.33		F1=0: 2.47(NS) F1=1 : 7.87

NS: X^2 statistics *is not* significant at 5 per cent level.

(d) LRT = F(constant, G91)

REGRESSORS	OLS	RESIDUAL	JJ-LR VECTOR K=3, r =1
CONSTANT	12.65 (29.47)	ADF(2)	12.31
G91	0.25 (5.71)		0.27
$\bar{R}^2$ / DW	0.36, 0.30		
F1=0			12.42
F1=1			19.91

(e) DRT = F (constant, G91)

REGRESSORS	OLS	RESIDUAL	JJ–LR VECTOR K=2, r =1
CONSTANT	7.17 (24.65)	DF ADF(1)	7.02
G91	0.37 (12.23)		0.38
$\bar{R}^2$ / DW	0.72, 1.20		
F1=0			15.39
F1=1			17.11

(f) CDR = F (CONSTANT, DRT)

REGRESSORS	OLS	RESIDUAL	JJ–LR VECTOR K=3, r =1
CONSTANT	-5.86 (-2.15)	DF	-12.12
DRT	1.72 (6.75)		1.87**
$\bar{R}^2$ / DW	0.43, 0.67	F1=1	4.56

Credit Market

The results of cointegration among credit market rates, summarised in Table 9, indicated that deposit and lending rates are co-integrated. The long-run elasticity of lending rate LRT with respect to DRT is the order of 0.59. The residual from OLS model of DRT and CMR3 did not yield a stationary series, thus ruling out possibility of long-run association between the two rates. Although, a co-integrating relationship could be established between LRT and CMR3, the long-run elasticity of the former with respect to the latter could not pass through zero restriction. On the contrary, DRT and LRT have cointegrating relationship with G91. The long-run elasticity was, however, low at 0.30 but statistically different from zero. There was a strong long-run relationship between the two deposit rates, CDR and DRT. The long-run elasticity indicates that one percentage point increase in DRT would trigger 1.7 percentage point increase in CDR.

Capital Markets

The CD and CP rates together with return on capital and price-earning ratio of 100-Scrip National Index were considered for testing of capital market integration with money market rate. A mere casual look at the trends in these rates rules out a strong long-run relation among them. However, if we consider price-earning ratio alone, there is some evidence of convergence since 1996. The cross correlation coefficients also point to negative association of these rates. It is not surprising to have a negative correlation as Indian stock indices have often moved in opposite direction to the fundamentals of the economy. No co-integration could be established among these rates[6].

Money and Forex Markets

There is a high degree of co-movement among the call rate and forward premia of the US dollar for 3 and 6-months. The correlation coefficients shown in Table 6 further vindicate the view that money and forex markets are integrated. Under the partial adjustment model (Table 7.2), the long-run elasticity of forward premia with respect to changes in the call rate is close to unity

and Wald restriction also could not reject this hypothesis. The mean lag response is about two to three months. However, the speed of adjustment was not high on an average. The availability of arbitrage opportunities between call and forex markets, is in fact, an important factor for integration of both these markets.

In terms of co-integration analysis, the long run elasticity of three months forward premia in response to call money rate was close to unity (Table 10). The LR test also could not reject such a hypothesis. These results remain largely unaltered for six months forward premia. Thus, the domestic money market and forward exchange market seem to be integrated to a great extent.

Table 10 : Cointegration Result: Forward Premia and Inter Bank Rate

(a) Frwd3 = F(Constant, CMR)

REGRESSORS	OLS	RESIDUAL	JJ-LR VECTOR K=1, r =1
CONSTANT	-.23 (-0.22)	DF	7.52
CMR3	0.74 (7.83)		0.93
$\bar{R}^2$ / DW	0.52, 0.46		
b2=1, b2=0			0.08, 7.02

(b) Frwd6 = F(Constant, CMR)

REGRESSORS	OLS	RESIDUAL	JJ-LR VECTOR K=1, r =1
CONSTANT	-0.05 (-0.24)	DF	7.58
CMR3	0.73 (7.79)		0.91
$\bar{R}^2$ / DW	0.53, 0.48		
b2=1, b2=0			0.08, 6.98

Note : b2 is long run coefficient of right hand side variable.

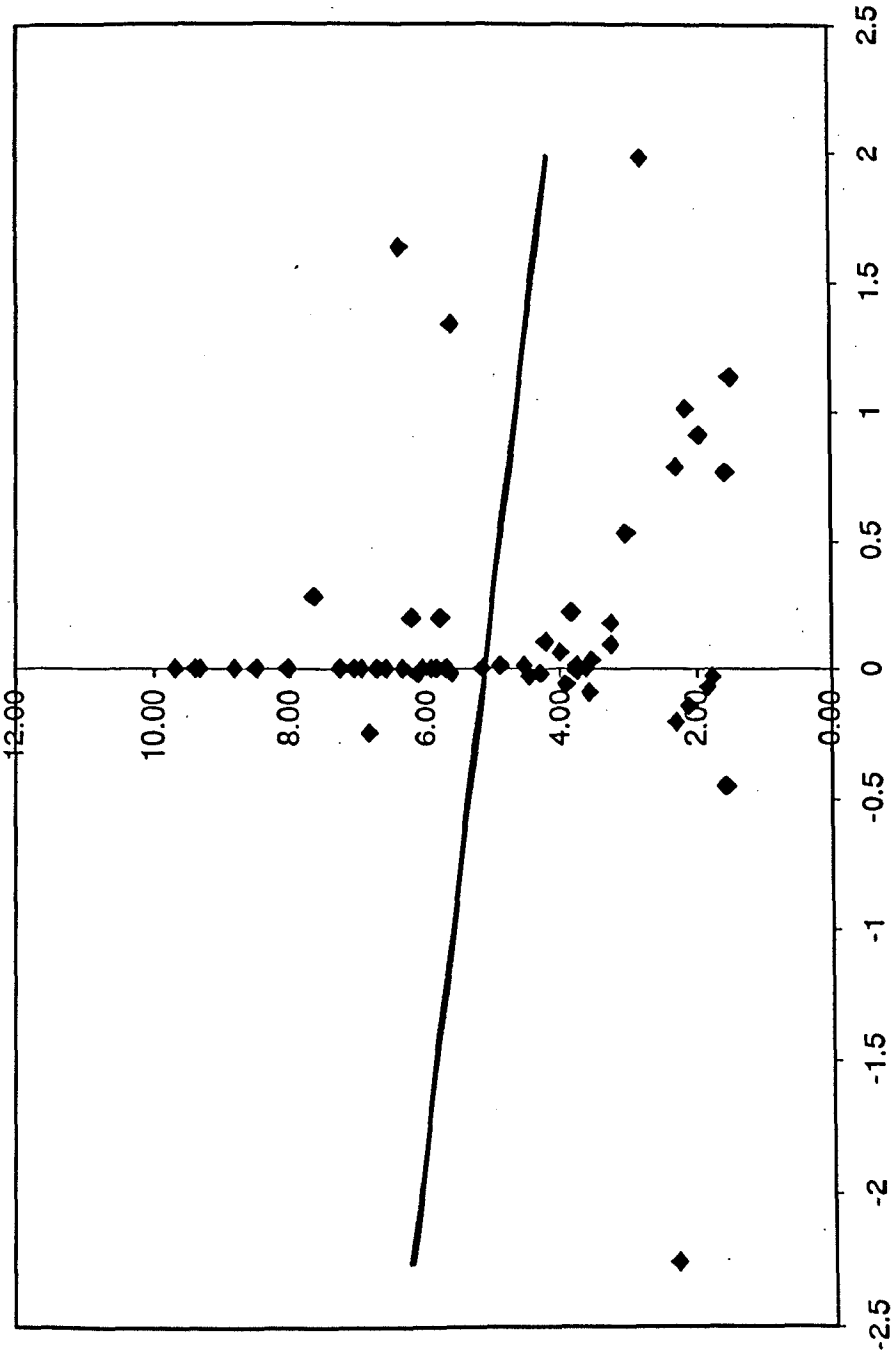
Degree of Integration between Domestic and Overseas Markets

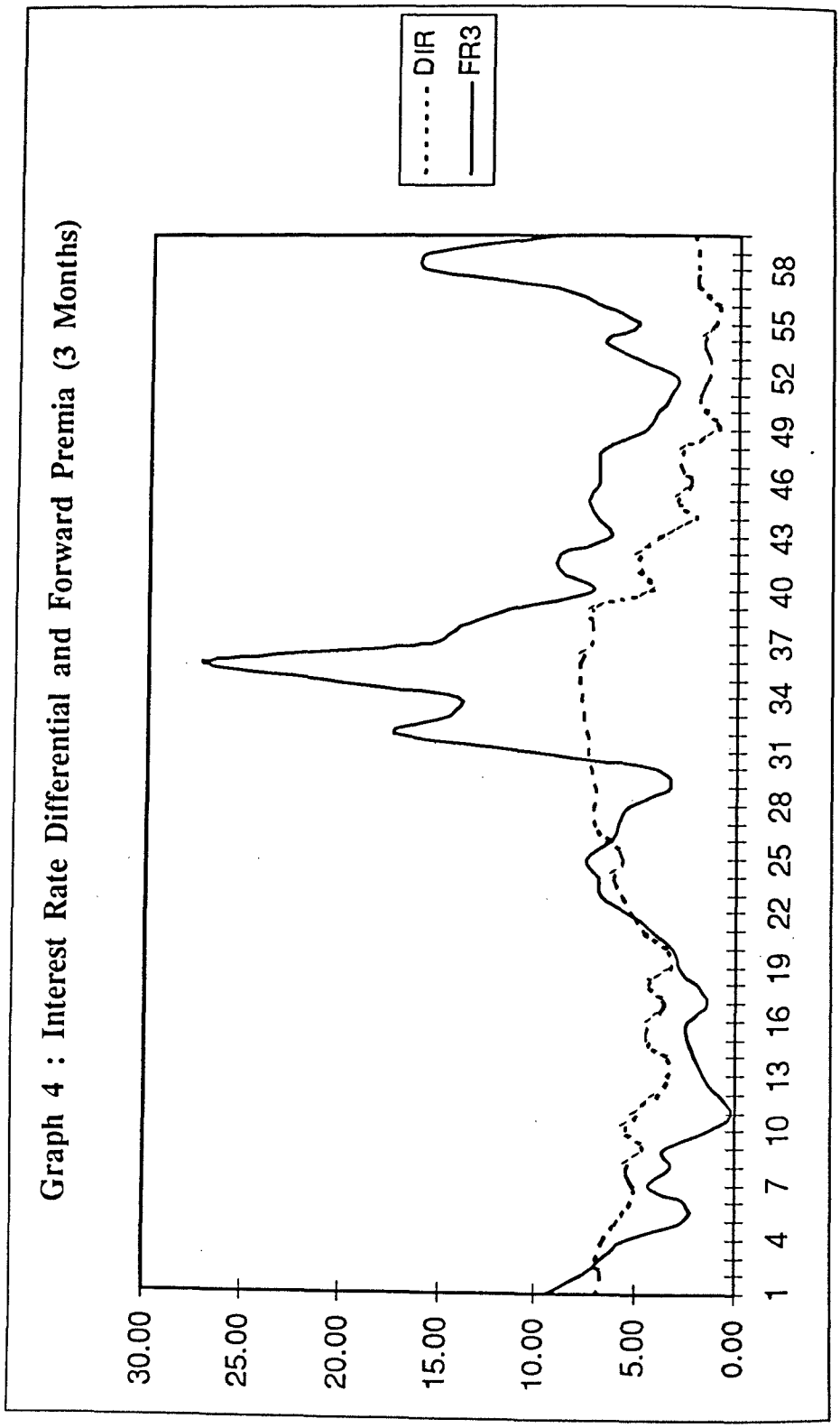
Integration of domestic and overseas markets needs rigorous investigation. For these markets to be integrated, the following conditions must be satisfied. First, the Purchasing Power Parity (PPP) condition should hold, so that same price prevail for identical products in both the markets. In such cases, the real effective exchange rate would remain steady. Secondly, according to Fisher's condition, if the real interest rates remain same in both the markets, then inflation rate differential will be exactly same as the nominal interest rate differential. Thirdly, nominal interest rate differential should be reflected in the forward premia under what is known as covered interest parity. When forward premium are the best predictor of the future spot rate, market is said to be efficient and integrated (Frankel, 1993).

None of these conditions seems to be satisfied in respect of Indian markets. The spot exchange rate is determined by the demand and supply conditions at any particular time. Besides, capital inflows and central bank intervention may lead to a situation where forward rates considerably diverge from future spot rates. Above all, rupee is not convertible in the capital account for domestic residents. On the empirical plane also inflation rate and interest rate differential do not seem to have strong impacts on the spot and forward rates in India. As a test case, inflation rate differential between India and the USA and expected change of rupee-dollar rate are plotted in Graph 3. When inflation rate differential rises, the rupee-dollar rate is expected to rise indicating depreciation of Rupee. If depreciation of Rupee completely offsets the inflation rate differentials, then the slope of the PPP curve should be positive and inclined at 45°. Obviously, this does not seem to be the case in India as revealed by the Graph. A large divergence is noticed between the interest rate differential and the forward premia (Graph 4).

At the empirical level, a large number of studies have found evidence of unbiased forward premium (UFP) in country specific situations.

Graph 3 : Inflation Differential and Exchange Rate Depreciation




Graph 4 : Interest Rate Differential and Forward Premia (3 Months)
DIR
FR3
30.00
25.00
20.00
15.00
10.00
5.00
0.00
1 4 7 10 13 16 19 22 25 28 31 34 37 40 43 46 49 52 55 58

The UFP in the formal form is given by:

$$S_{t+k} - S_t = a + b\ (F_{k,t} - S_t)$$

where, 'S_{t+k}' is future spot rate, 'S_t' is current spot rate and '$F_{k,t}$' is forward exchange rate. If the restriction on the parameters i.e., a = 0, and b = 1 holds, then forward premium is an unbiased predictor of future spot rate. In view of expectation errors involved with parametric estimation techniques, there have been some attempts to use non-parametric tests to collect evidence on UIP.

Let 'I(t)' is defined such that it takes a value of unity when ($S_{t+k} - S_t$) and ($F_{k,t} - S_t$) have same sign and zero otherwise. Then the Fisher's sign test, defined as $S = \Sigma\ I(t)$, follows a binomial distribution. The corresponding 'Z' statistics, in the limit as 't' tends to infinity, is defined as :

$$Z = (S - p*T)/[p(1-p)*1/2]$$

with null probability 'p' at 0.5. The forward premium is unbiased when 'z' is statistically significant.

The regression result reported in Table 11 indicates that coefficient of forward exchange rate is close to unity and statistically significant. The constant term is not significantly different from zero. The Wald test on the joint hypothesis that a = 0 and b = 1 with χ^2 statistics at 3.24 could not be rejected. However, further post estimation diagnostics of the regression model indicated that there is serial auto-correlation problem in the residuals. Interestingly, when the regression model was corrected for the first order serial correlation of residuals, the constant term turned out to be statistically different from zero. On the contrary, the coefficient of the forward rate drastically decreased to 0.22, although it remained statistically different from zero at 5 per cent level of significance. The Wald test could reject the joint hypothesis that a = 0 and b = 1. Similarly, the non-parametric approach yielded the estimate of 'Z' at 1.19 which is not significant at 5 per cent level. These evidences show that forward premium is not an unbiased predictor of future spot rate in the Indian situation.

The second part of the empirical exercise is related to covered and uncovered interest rate parity condition or informational efficiency of the market. The uncovered interest rate parity condition implies that the expected depreciation or appreciation of exchange rate (ΔS^e) is fully covered in the interest rate differential. On the other hand, the covered interest rate parity relates interest rate differential to forward premia.

$(r_{d,t} - r_{f,t}) = a + b\ (\Delta S^e)$

$(r_{d,t} - r_{f,t}) = a + b\ (FRWD3)$

Where, '$r_{d,t}$' is domestic interest rate and '$r_{f,t}$' foreign interest rate on similar instruments, preferably the interbank rate. If the joint hypothesis on parameters a = 0 and b = 1 holds, then interest rate parity condition prevails in the forex market. The crux of empirical testing depends upon the measure of expected depreciation of exchange rate. Several studies have used actual depreciation as an indicator of expected depreciation. In the Indian case, the regression results reported in Table 12(a) indicate the relationship between interest rate differential between domestic interest rate G91 and foreign inter-bank rate i.e. federal funds rate and actual depreciation of currency i.e. $(S_t-S_{t-3})/S_{t-3}$ adjusted to annual rate in per cent. The results point out that the constant term is highly significant and different from zero. But the coefficient of depreciation (DS) is not statistically different from zero. The regression model suffers from auto-correlation of residuals. The coefficient of the DS term (0.56) turned significantly different from zero after the residuals were corrected for the first order auto-correlation. The Wald test rejected uncovered interest rate parity hypothesis.

Table 11 : Unbiased Forward Premium :LRDR = a + b LFRDR

Regressors	OLS	AR1
Constant	0.26 (1.34)*	2.76 (6.35)
LFRDR	0.92 (16.87)	0.22 (1.84)
$\bar{R}^2$ / DW	0.84, 0.48	0.95,1.55
Wald Test χ^2 (2) a=0, b=1	3.24**	41.57*

Table 12 (a) : Uncovered Interest Rate Parity: DIR = a + b DS

Regressor	OLS	AR1(ML)
Constant	4.35 (5.30)	4.01 (2.44)
DS	0.17 (0.64)	0.56 (1.93)
$\bar{R}^2$ / DW	0.01, 0.76	0.38, 2.01
Wald Test χ^2 (2) a=0, b =1	28.30*	6.98 *

Table 12 (b) : Covered Interest Rate Parity: DIR = a + b FRWD3

Regressor	OLS	AR1(ML)
Constant	-0.62 (-0.63)	-2.23 (-1.45)
FRWD3	0.78 (6.79)	1.01 (6.33)
$\bar{R}^2$ / DW	045, 1.19	0.55, 2.26
Wald Test χ^2 (2) a=0, b =1	18.28*	4.77**

Notes: * significant about 5%, ** about 10% and *** not significant.

On the contrary, the coefficient of the forward premium taken as a proxy for the expected depreciation of currency is close to unity and statistically significant at 5 per cent level of significance as shown in Table 12(b). The constant term, however, could not be statistically different from zero. The low Durbin-Watson (DW) statistics at 1.19 pointed to the serial correlation of residuals. The Wald test yielding χ^2 statistics at 18.28 could reject the covered interest parity hypothesis. However, after correcting for first order serial correlation of residuals, the Wald test χ^2 statistics at 4.77 do not reject covered interest rate parity hypothesis at 5 per cent level of significance.

These results lead to two major findings. First, there is some evidence of covered interest parity in the Indian case. However, as the forward premium is not an unbiased predictor of future spot rate, the uncovered interest parity condition does not hold and the domestic and international markets show divergent behaviour.

Section V

Concluding Observations

The attempt to find convergence of various financial markets in the study has yielded mixed results. While there exists a fair degree of convergence of interest rates among the short term markets – money, credit and gilt markets — the capital market exhibits fairly isolated behaviour. Given the current stage of development of financial market and the sensitivity of individual markets to tax regime, institutional setting in the form of restriction to entry, and notably, investors preference for non-price features of certain financial products, the low degree of price convergence in Indian financial market is not very much unexpected. The movement of various interest rates in uniform directions, nevertheless shows an encouraging sign of the growing maturity of the financial markets and their sensitivity to monetary policy. This has significant implications for the transmission of monetary policy, in so far as the quantum channel is becoming increasingly obsolete in view of the rising importance of interest rate and asset price channels. Since the degree of integration of domestic market is dependent on policy and institutional setting facing such market segments, the ongoing financial reform programme needs to be accelerated to further widen and deepen various markets towards achieving a higher degree of convergence.

Notes :

1. In 1991, the Union government had set up a *Committee on the Financial System* headed by Shri M. Narasimham. On the basis of the recommendations of the Narasimham committee (1991), wide-ranging reforms of the financial sector have been implemnted. On December 26, 1997, the government once again set up a *Committee on Banking Sector Reform* under the Chairmanship of Shri M. Narasimham to make a review of the progress made on financial sector reforms and recommend second phase of banking sector reform. The Committee has since submitted their report in April 1998 which is under consideration.

2. The role of financial sector in promoting economic growth has been emphasised by several authors, prominent among them being McKinnon (1973, 1976).

3. Random walk hypothesis owes its origin to Irving Fisher (1907). Since our analysis is done within a bivariate VAR framework, it reflects weak efficiency.

4. For a comprehensive survey of reform measures one can refer to Trend and Progress of Banking (1996-97), and Reddy (1998).

5. Ideally, a reference rate should emerge from the secondary market. As SGL transactions on 91-day Treasury bills are available from September 1994, we relied upon the cut off yield on 91-day auction Treasury bills. For the period for which both cut off yields and secondary market yields are available, their corelation coefficient was found to be as high as 0.96 and therefore, cut off yield could be a good substitute of secondary market yield.

6. A comprehensive survey of the weakness of Indian capital market is available in L.C. Gupta (1998).

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Reserve Bank of India Occasional Papers
Vol. 19, No. 4, December, 1998

Liquidity Effects on The Term Structure of Government Securities Market in India

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An empirical examination of the term structure of interest rates in the Indian economy suggests cointegration (or long run stable relationship) among interest rates but existence of multiple common trends. The absence of unique common trend implies that long run movements of any one interest rate are not dominated by the movements of other interest rates. The presence of cointegration, however, suggests a long run interlocking of interest rates across markets and a possibility of their common response to changes in expectations about future monetary policy and/or economic fundamentals. Finally, the results also suggest that structural policies pursued by the Central Bank could be of crucial importance in facilitating market integration.

Introduction

The process of deregulation of interest rates in Government securities market which began in 1992 has culminated into a full fledged market mechanism providing the much needed space for effective conduct of monetary and internal debt management policies in the Indian economy. Market determined interest rates were made applicable to government borrowings in gradual succession beginning with the auctions of 364 day Treasury Bills in April 1992, government of India (GOI) dated securities in June 1992 and 91 day Treasury Bills in January 1993. Later, as the primary market acquired greater depth, new instruments such as funded Treasury Bills, Zero Coupon bonds, Tap Stocks and Partly Paid Stocks, 14 days Treasury Bills and Capital Indexed Bonds were also introduced in keeping with the market's appetite. The changes in the scheme of financing of Government deficits have had important but mixed implications such as desirable reductions in monetized deficits, on the one hand, and an upward pressure on interest rates

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resulting in fiscal strains, on the other. Moreover, the introduction of several such instruments of different maturities meant the emergence of multiplicity of yields, resulting in rather complex term structure of interest rates. The problems associated with sharp variability of interest rates in the post reform period provide yet another dimension of the transition from a controlled system to a market regime.

The coupon rate on GOI securities of various maturities increased from the range of 10.50-11.50 in 1990-91 to 13.25-14.00 percent in 1995-96, but declined thereafter to the range of 10.85-12.15 percent in 1997-98. As a result, the weighted average interest rate on government dated securities moved in tandem from 11.41 per cent in 1990-91 to 13.75 per cent in 1995-96, and to 11.82 per cent in 1997-98. At the shorter end, 91 day Treasury Bills also showed considerable fluctuations, with the yield rate rising from 4.6 per cent in 1991-92 to an average of 12.67 per cent in 1995-96 but coming down sharply over the next two years to 6.83 per cent by 1997-98. A comparison of the yields on the short and the long ends in the government securities market reveals that the difference between the average yield of the 364 day Treasury Bill and 10 year government bond increased to 3.69 percentage points in 1997-98 from 2.18 percentage points in 1996-97 and 1.13 percentage points in 1995-96.

The changing differences of yields among different maturities appear to arise not only from usual term premia but also from the asymmetric expectations over the short and long horizons. Yields on dated government securities in India are also influenced by call money rates or short term liquidity considerations in the money market (Rangarajan, 1997 and Reddy, 1998). Notwithstanding their sources the temporal variability and divergence among interest rates of different maturities are a potential cause of asset-liability imbalances and unexpected portfolio losses for market participants. Again, to the extent that the term structure remains unstable, it becomes difficult for the Central Bank to extract market signals and use them for conducting forward looking monetary policy strategies. Keeping these aspects in view, this paper attempts to undertake an empirical assessment of the term structure of interest

rates in the Indian economy in order to identify the possible regularities of relationship among various interest rates in government securities market. In doing this, the paper employs the well known cointegration and common trends analysis proposed by Granger and Gonzalo (1995). The technique allows for the identification of the reference rate underlying the movement of the overall term structure in the market. The common trends methodology has been in extensive use for analyzing the term structure in developed economies but rarely so in developing countries. In their original paper, Granger and Gonzalo (1995) provided an interesting analysis of the term structure of the US and Canadian securities and concluded the presence of one common factor in each country; both of which were themselves cointegrated thereby admitting a single common permanent component for the whole system. Some of the other notable applications are by Karfakis and Moschos (1990) and Hafer and Kutan (1994) who examined the long run relationship among short term nominal interest rates in the European Monetary Union (EMU) countries. More recently, Hafer, Kutan and Zhou (1997) analyzed the relationship between the long and short term interest rates for the EMU countries and concluded that even though common trends moved together in time, the German trend was hardly dominating.

The rest of the paper is schematized in four sections. Section I provides a brief review of the notion of term structure of interest rates and discusses certain aspects related to the Indian economy. Section II gives a discussion on the data used in the study and the econometric methodology. Section III discusses empirical results. Finally, Section IV presents some concluding observations.

Section I

Term Structure of Interest Rates : Indian Experience in the Post Reform Period

The term structure of interest rates or the yield curve is the relationship between the redemption dates of various securities and their rates of return. Given the increased price risk inherent in long

term securities, risk return analysis suggests that return should monotonically increase with the term to maturity. Expectations of market participants play an important role in shaping the term structure of interest rates in a financial market. Thus, if the investors are risk averse, and the interest rates on an average are expected to remain the same, longer dated securities will command higher rates of return than shorter dated ones. Conversely, the shape of the yield curve is reversed if interest rates are expected to fall with maturity (Hicks, 1939 and Malkiel, 1966). Equally integral to the evolution of the term structure is the expectation about the future rates of inflation as held in the classic study by Fama (1981) which argued that movements in interest rates essentially reflected fluctuations in expected rate of inflation. Fama's (1981) results were similar to those reported earlier by Nelson and Schwert (1977) and later by Mishkin (1981), Fama and Gibbons (1982) and Huizinga and Mishkin (1986) in the context of the post war US economy, except over 1979-82 when the Federal Reserve changed its operating procedures itself. Quite aside from expectations, investor preferences are also important in determining the shape of the term structure. Most investors, for instance, like to hold short term assets unless there exists a likable liquidity premium on long term investments. This is owing to preference for liquidity and *ex ante* assessment of risks by investors which are related to expected future changes in the nominal value of their investments (Hicks, 1939). This aspect was recently empirically investigated in the context of the US economy by Shen and Starr (1998) who concluded that the bid-ask spread (which reflects liquidity of the instrument) on Treasury Bills is priced in the bill market and accounts for a substantial portion of the term premium, sometimes to the exclusion of a risk premium in the term structure. Yet another theory of the term structure is based on the concept of 'preferred habitat' which maintains that although liquidity preference may not be the only guiding principle for all classes of investors, the investor's choice of maturity depends upon the his/her asset-liability management constraints. In this sense, while pension funds and insurance companies require long term, those such as banks would prefer to hold short term assets (Modigliani and Sutch, 1966). In practice, however, the term premia has been

found to behave quite differently from what has been proposed by standard theories. Term premiums often behave irregularly on account of such factors as seasonalities, news and other unexpected changes in the economy. Subsequent research has considered factors ranging from expectations and risk preference to investment alternatives and individual preferences (Cox *et.al*,1985).

Thus in light of the somewhat unclear position regarding the state of the yield curve theory, we propose to explore the nature of the link between the money market rates and yields in the Government securities in India. This is because exogenous/policy induced changes in liquidity are often seen to be driving Government bond yields.[1] For instance, comfortable liquidity situation in 1992-93 as a consequence of significant reductions in the CRR helped the RBI to raise Government borrowings at reasonable costs at a cut off yield of 11-11.42 percent on 364 day Treasury Bills and with a maximum coupon of 13.0 percent on dated GOI securities. Easiness in liquidity and call rates was also observed in 1993-94 which was reflected in the stability of cut off yields on Treasury Bills and coupons on dated GOI securities. However, in 1994-95 high call money rates reflecting tightening of liquidity resulting from asset liability mismatches in the wake of high demand for credit led to an across the board increase in coupon rates/cut off yields of government securities. Starting 1996-97, however, the yields began to soften owing to easing of call money rates as a result of the inflow of funds into the banking sector, aided partly by the spot forex purchases by the Reserve Bank of India and reduction in the statutory cash reserve ratio. A similar trend continued to prevail in 1997-98. Prima facie, there is therefore a significant link between the term structure of interest rates and changes in money market conditions.

Section II

Methodology

In order to elicit the long-run common link between interest rates in a term structure, we intend to follow the approach suggested by

Gonzalo and Granger (1995). It is well known that if a given set of interest rate series are cointegrated then there exists an underlying nonstationary common long memory component. A term structure can have one or more common factors which can drive the complete range of interest rates under consideration. However, if the common factor is unique, then the reference interest rate can be easily identified. Even though the identification of this common factor will be the one of the key objectives of this exercise, it is also proposed to decompose each interest rate series into its permanent and transitory components and to study the interrelationships among them. In order to do this, we choose the following term structure of interest rates (i) very short term inter-bank call money rate or CALL (ii) cut off yield on short term 91 day Treasury Bills or TB91 (iii) cut off yield on medium term 364 day Treasury Bills or TB364 and, (iv) redemption yield on long term GOI dated securities or YTMGOV. The selection of interest rate on different Government securities as part of our term structure is dictated by the fact that all of these are not only market determined but represent the major chunk of trade in wholesale debt market (WDM). Government securities market then sets the tone for pricing in other debt markets. The analysis pertains to the period from January 1993 to February 1998.

According to Gonzolo and Granger (1995), if a given set of time series are constrained by cointegration then it implies the presence of a non stationary common factor which is unobservable but can be recovered. It is this common factor which drives long run movements in the time series, thus resulting in cointegration. Symbolically, the common factor representation can be described as follows

$$[y_t, x_t]' = [A, 1]' f_t + [\hat{y}_t, \hat{x}_t]'$$

where $[x_t, y_t]$ is a pair of integrated time series, $(1,-A)$ is the cointegrating vector and $[\hat{y}_t, \hat{x}_t]$ is the stationary error process and f_t is the common factor as discussed above. *Proposition 2* in Gonzolo and Granger (1995) states that the common factors f_t are sufficiently identified if they are linear combinations of $[y_t, x_t]$

and $A_t f_t$ and $[\hat{y}_t, \hat{x}_t]$ form a permanent-temporary (P-T) decomposition. For a p variable system, the estimation of common factors proceeds with the tests of unit roots and setting up of a standard Johansen's (1988) VECM for testing cointegration. Let

$$Y_t = \mu + \sum_{i=1}^{k-1} \pi_i Y_{t-i} + \pi_k Y_{t-k} + \varepsilon_t$$

be a VAR (k) with n variables in vector Y, a constant μ and white noise process ε_t. The matrix π_k contains long run information with rank $m<n-1$ and can be decomposed into two $n \times m$ matrices α and β such that $\pi_k = \alpha\beta'$.

While the matrix β consists of m linear cointegrating vectors, α is the matrix of error correction parameters. The maximum likelihood estimate of β is obtained by computing residuals R_{0t} and R_{kt} by regressing δY_t and Y_{t-k} on $\delta Y_{t-1}, \ldots\ldots, \delta Y_{t-k+1}$, computing the residual product matrices

$$S_{ij} = T^{-1} \sum_{t=1}^{T} R_{it} R'_{jt} \quad (i,j = o,k)$$

and finally solving the following eigenvalue problem

$$| \lambda S_{kk} - S_{k0} S_{00}^{-1} S_{0k} | = 0$$

for eigenvalues $\lambda_1 > \ldots\ldots > \lambda_k$ and eigenvectors $V = (v_1, \ldots\ldots, v_n)$. The estimates of α and β are given by $\alpha = S_{0k} \beta$ and $\beta = (v_1, \ldots\ldots, v_m)$, the eigenvectors associated with m largest eigenvalues. The LR test for the presence of at least m cointegrating vectors is given by

$$\text{Trace} = -T \sum_{j=m+1}^{n} \ln (1 - \lambda_j)$$

As cointegration is established, Y_t can be decomposed into its P-T constituents by first solving the following eigenvalue system

$$| \lambda S_{00} - S_{0k} S_{kk}^{-1} S_{k0} | = 0$$

where an estimate of the orthogonal complement $\alpha\perp$ is derived as the eigenvectors $Q = (q_{m+1},...,q_n)$ associated with the *n-m+1* smallest eigenvalues. Given the estimate of $\alpha\perp$ the P-T decomposition then can be obtained by computing the following expression

$$Y_t = \beta\perp(\alpha'\perp\beta\perp)^{-1} Z_t + \alpha(\beta'\alpha)^{-1} X_t$$

where $Z_t = \alpha'\perp Y_t$ is the non stationary common trend and $X_t = \beta' Y_t$ is the stationary or transitory component. As stated by Gonzolo and Granger (1995) the utility of their method of decomposition of time series is evident in situations when the complete set of variables appears either quite complex or the macrosystem is very large. In the first case, long run behavior can be comfortably analyzed by using only a small set of common long memory factors. Similarly, in the second case, the macrosystem can be studied by first finding the common factors in every subdivision of the system and then studying cointegration among them.

Section III

Empirical Results

It is customary to begin the analysis by recording the time series properties of the interest rates chosen to represent our term structure. Test statistics produced by the augmented Dickey-Fuller (ADF) unit root tests are presented in the Table below.

Unit Root Test Statistics based on ADF Regressions

Interest Rate	Levels	First Difference
YTMGOV	-2.40	-6.64*
TB364	-1.16	-3.73*
TB91	-1.36	-5.82*
CALL	-1.62	-7.82*

Notes to Table :

(i) The tests pertain to models with a constant but no time trend.

(ii) A * denotes significance at the 5% level using the critical values of Fuller (1976).

The unit root test statistics in the table indicate that all four interest rates are random walk or I(1) and, hence, amenable to cointegration. The empirical estimates of *trace* and *maximum eigenvalue* test statistics for testing the possible number of cointegrating vectors obtained from Johansen's (1988) procedure are presented in table below.

Trace and Maximum Eigen-value Test Statistics for testing Cointegration Rank

Number of Co-integrating vectors	Trace (estimated)	Table value Trace (5%)	Maximum Eigen value (estimated)	Maximum Eigen value (5%)
r = 0	106.43*	53.3	70.62*	28.1
r ≤ 1	35.82*	35.1	17.07	21.9
r ≤ 2	18.74	20.2	14.11	15.7
r ≤ 3	4.63	9.1	4.63	9.1

Notes to Table :

(i) The statistics are obtained for a model without a linear trend in the non stationary part of the process.

(ii) *denotes significance at 5%.

(iii) The Table values of the test statistics are the 95 percent quantile of the asymptotic distribution of the test statistics.

(iv) The diagnostics for the residuals from Johansen's VAR are as follows BP-Q(6) = 13.17, 6.93, 8.89, 8.68; ARCH(6) = 5.43, 4.22, 1.14, 3.26; J-B Normality = 0.067, 0.004, 13.626, 0.893.

In the table although the estimated trace statistic suggests the presence of at least two cointegrating vectors, the maximum eigenvalue statistic suggests the presence of only one cointegrating vector at the customary 5% significance level. Both the estimated statistics, therefore, establish cointegration among the sample interest rates. In the table below we present a detailed account of the cointegration structure including the estimates of cointegrating vectors and the orthogonal complement $\alpha\perp$ which form the basis for linear combinations of Y_t that define the permanent or common trends in the process.

The Profile of Cointegration Among Interest Rates

	Eigenvectors $\hat{V}$			
YTMGOV	0.53	-0.40	-0.35	-0.29
TB364	-3.97	-7.12	-5.03	3.81
TB91	5.89	6.31	4.61	-2.64
CALL	-1.19	-0.52	-0.79	0.15
	Eigenvectors $\hat{Q}$			
YTMGOV	-0.35	0.65	-0.81	-0.49
TB364	0.27	0.03	-0.51	-0.21
TB91	-0.57	0.14	-0.51	3.02
CALL	0.68	0.24	0.70	-2.57

Notes to Table :

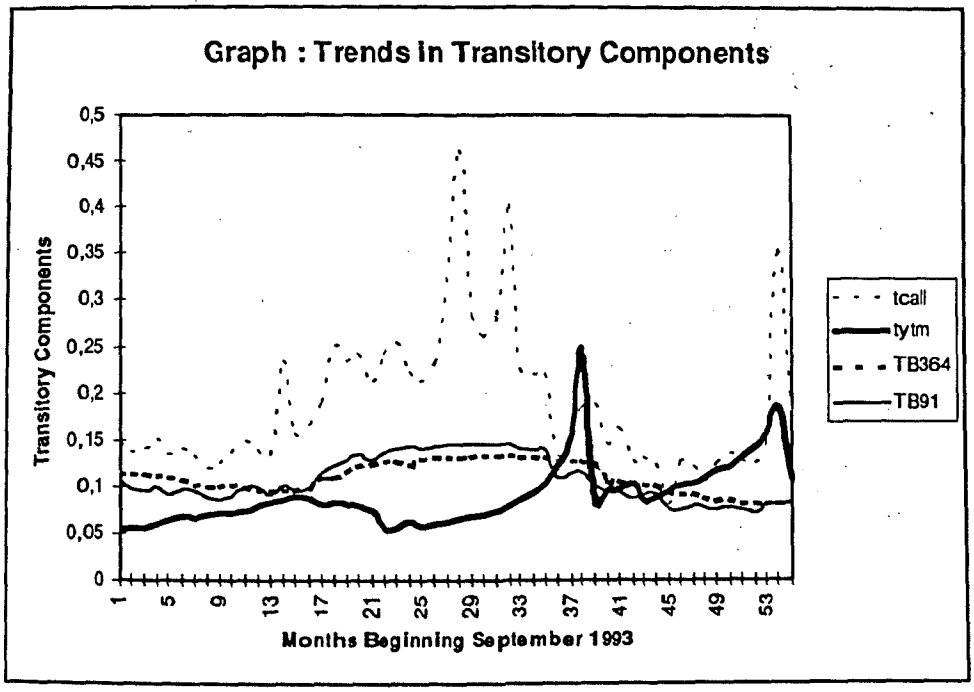
(i) The eignevectors $\hat{Q}$ is the estimated orthogonal complement $\alpha\perp$.

(ii) The common trends can be estimated as the linear combinations of the coefficients in the last 3 columns of the matrix $\hat{Q}$ since $f_t = \alpha'\perp Y_t$.

Of interest is the plot of the transitory components of interest rate series that comprise the term structure depicted in the Graph. The movements of the transitory components in the Graph suggests that although components related to Treasury Bills were moving by and large in correspondence with that of the call money rate across the full range of sample, close interlinkages of yields on dated securities with the latter became distinct only since the middle of the calendar year 1996. Notably, peak to peak overlaps were clearly distinguished twice during September and January of the financial year 1996-97 when call money rates rose sharply owing to money market stringencies arising from quarterly advance tax payments (RBI, 1996-97).

Eventually, a related question from the policy point of view is the extent to which liquidity management policy can actually influence

the yields on Government securities. Contemporaneous OLS regressions between the transitory components of yields on securities and the call money rate suggest that a one percentage point rise in the latter can raise the yields in the range of 0.3 to 0.1 percentage point. More specifically, one percentage point average rise in the call money rate raises the yield on dated securities by 0.31 perentage point, TB 364 by 0.13 percentage point and TB 91 by 0.24 percentage point. All of these elasticities are statistically significant at 5% level. The explanatory power in the case of 91 TB equation (R^2=0.54) is higher than that in the case of 364 TB equation (R^2=0.32) and GOI dated securities (R^2=0.15).



Section IV

Concluding Observations

Although the long, medium and short term interest rates representing the term structure of interest rates in this study are found to share a long run stable relationship, the absence of a unique common trend makes it impossible to identify a specific reference rate

which may be expected to drive the overall spectrum of interest rates over the long horizon. It may thus, probably, be useful to enlarge the scope of analysis so as to include other interest rates, especially, those in other public and private debt markets for a comprehensive review of interest rates dynamics in the Indian financial markets.[2] On the other hand, the presence of cointegration among these interest rates is reassuring because it implies that interest rates in different markets and across various maturities are integrated and respond similarly to changes in expectations about economic policies and fundamentals. The empirical results presented in the study reveal that policy induced effects are readily transmitted across different markets in the short run. For instance, monetary relaxation has been quick to find its way to the yields on Treasury Bills. However, a similar correspondence between the yields on dated securities and the money market conditions became visible only after the first half of 1996 which coincided with several institutional developments such as the increase in the number of primary dealers in the call money market and their access to short-term funds. These policy initiatives seem to have promoted a higher degree of reactivity between the two markets thus underscoring the importance of structural policies in enhancing integration among various segments of the financial market. As the degree of integration in financial markets strengthens, the focus of monetary policy would shift to careful management of day to day liquidity in the money markets for ensuring stability in interest rates.

Notes

1. In the most conventional model of monetary transmission, a shift in policy leads to a change in the money supply that, for a given money demand, leads to a change in money market interest rates. A key issue in this channel of transmission is how the changes in the interbank rate are spread to the entire spectrum of interest rate, in particular the long term interest rate pertaining to bonds. The effect is economically important because of changes that it brings about in bond prices and on the net-worth and debt to asset ratios of entities holding these bonds. For example, a restrictive monetary policy can depress asset prices and create cash flow and debt repayment problems leading to financial distress (Kamin et.al, 1998).

2. It may be mentioned that in this context, serious efforts will have to be undertaken for recording/collating high quality/frequency information from the concerned markets and their subsequent processing on a uniform basis, especially, developing appropriate weighted average rates for different transactions for purposes of decisive econometric analysis.

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Vol. 19, No. 4, December, 1998

NOTES

The Economics of Amartya Sen — A Review

Sunando Roy*

Introduction

The economics of Amartya Sen envelopes diverse aspects of economic inquiry ranging from social choice theory to issues relating to poverty and inequality, dimensions of human development and the role of State and social action in enhancing the quality of life. It represents a distinctive approach which cannot be easily bracketed within convenient compartmentalisation of contemporary economic research. This amazing ability to transcend the contours of specialization in the late 20th century academic world sets Prof. Amartya Sen apart from the rest. The awards of the Nobel Prize and Bharat Ratna to this outstanding economist provides an opportunity to explore his diverse world which represents a judicious mix of theoretical insight and empirical evidence, making his research a composite whole.

This review, containing five sections, attempts to provide an overview of Prof. Amartya Sen's major contributions to economic literature. The first section looks into his work in welfare economics and social choice theory. Section II deals with Amartya Sen's concern regarding economic inequality. Section III analyses Sen's contributions in the fields of poverty, famines and hunger, while Section IV deals with Prof. Sen's concept of development and draws attention to his views on economic reforms and liberalization. The final section provides some concluding observations.

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Section I

Amartya Sen and Economics of Welfare

Modern public choice theory, a study of the political mechanism and institutions that arrive at collective choice from individual preferences, deals with the decision process inherent in situations where markets fail to provide the best outcome. Modern public choice theory rests on the theoretical underpinnings of Bergson-Samuelson social welfare function and Arrow's impossibility theorem. Kenneth Arrow in his 'Social Choice and Individual Values' presented a pessimistic attitude by demonstrating the inherent instability of collection decisions. Sen's works in the field of welfare economics in the earlier years was profoundly influenced by Kenneth Arrow and his 'Impossibility Theorem' in social choice theory (Arrow,1951). In simple terms, the theorem states that under certain reasonable conditions, it is impossible for society to logically arrive at a collective choice from individual preferences. Sen, like many other welfare theorists, worked with various dimensions of the 'Impossibility Theorem'. In one of his early works, "A Possibility Theorem on Majority Decisions", published in Econometrica in 1966, Sen tried to arrive at a social ordering from individual preferences, by producing more general conditions regarding individual orderings. Later in 1969, in a joint work with Prasanta Pattanaik published in the Journal of Economic Theory titled "Necessary and Sufficient Conditions for Rational Choice under Majority Decisions", he shifted his focus from social ordering to rational choice which does not require the assumption of transitivity. Within the framework of relational collective choice rules, they showed that if the assumption of transitivity is relaxed by replacing the transitivity condition (xRy & yRz → xRz, where R means 'at least as good as' and x,y,z are alternative social choices society can make) by a weaker condition of quasi transitivity (xPy, yPz → zPx or even a weaker xPy, yPz → xRz, where P means 'preferred to') then the Arrow Impossibility result does not hold. In his influential *Collective Choice and Social Welfare* (1970), Sen showed the process through which we can arrive at some collective decision if we relax some of the restrictive assumptions of Arrow. This certainly

leads to a loss of generality, but Sen feels that such purity of Arrow's Impossibility Theorem is not required in reality. In Sen's own words : "It is worth emphasizing that pure systems of collective choice tend to be more appealing for theoretical studies than in social decisions,..... While purity is an uncomplicated virtue for olive oil, sea air and heroines of folk tales, it is not so for systems of collective choice" [Sen (1970)]. His idea of social choice, unlike Arrow, was elegant not only in terms of theory, but also in providing a more practical solution to the decision makers. In Sen's own words, "The central issue (in social choice) is how far we can go on the basis of widely agreed judgements to arrive at some policy guidance, and it is this problem of practical reason that has to be our basic concern." [Sen (1970)].

Readers should not get a false notion that Sen's primary contribution to welfare economics was to redefine the Arrow barrier and suggesting ways to transcend it. The departure from a 'social welfare function' to a 'functional collective choice' rule was indeed an important step. But Sen's contribution to welfare economies after 1970 is equally important. It is all too well known that welfare economics was dominated for long by one particular economic approach called Utilitarianism, advocated by Jeremy Bentham, John Stuart Mill, Francis Edgeworth, Henry Sidgwick, Alfred Marshall and A.C. Pigou. Utilitarianism uses the utility function to analyse social states. Policy actions based on utilitarian consideration however, leads to negligence of the rights and liberties of people, which, to Sen was fundamental to the problem of social choice and welfare in an economy. Thus, Sen's contributions to welfare economics since his publication of *Collective Choice and Social Welfare* (1970) has tended to focus on personal liberty and rights. Utilitarianism, being dependent on summation of individual utilities imposes 'informational constraints' on social choice (Sen, 1970c). Such informational deficiencies of utilitarianism became a hindrance to the growth of welfare economics as a subject. Sen and Williams (1982) in their brilliant work showed how utilitarianism hindered the use of rights, liberties and freedoms of people in social choice.

The development of welfare economics since the 1970s, in

which Sen was actively involved, adopted two different approaches to rights, *i.e.* independent rights and integrated rights. In an influential paper "The Impossibility of a Paretian Liberal" published in the Journal of Political Economy in 1970, Sen demonstrated that there is a very basic conflict between the rights of people and the fundamental principle of welfare economics, the Principle of Pareto Optimality. The theory of independent rights attempts to move out of the dilemma by giving liberal rights priority over social choice. The theory of independent rights looks at rights as desired elements but not in competition with other things that may be judged socially 'good'. The 'rightness' of rights in this case takes precedence over its 'goodness'. An example of this is Nozick's (1974) entitlement theory, where rights are side constraints which cannot be violated. As Nozick (1974) pointed out :

"Individual rights are co-possible; each person may exercise his rights as he chooses. The exercise of these rights fixes some features of the world. Within the constraints of these fixed features, a choice can be made by a social choice mechanism based upon a social ordering ..... Rights do not determine the social ordering but instead set the constraints within which a social choice is to be made"[1]

Such independent rights may include the fundamental rights of citizens in a country – right to religious practices, right to live anywhere in the country, right to the basic necessities of life and so on.

In contrast, the integrated approach to rights looks at rights as socially important. There are different rights in societies which may conflict at times with each other leading to possible 'trade-offs' between them. Sen's approach has largely moved towards the 'integrated' direction. Sen has written extensively to highlight the advantages of a framework of 'rights inclusive social choice theory' that sees beyond utilitarianism by including the fulfillment and violation of rights as parts of the emerging states of affairs. The strength of such an analysis lies in : (a) making the need for political value judgements open and explicit, (b) providing a frame-

work for expressing relative weights on rights of different types, (c) acknowledging the interdependence of different persons rights and their fulfillment, and (d) finally, moving towards a more acceptable integrated framework of overall assessment.

Section II

The Economics of Inequality

Prof. Amartya Sen's analysis of the dimensions of economic inequality has enriched the understanding of the concept of economic inequality. Starting with the measurement problems of inequality in *On Economic Inequality* in 1973, Sen exposed the limitations of earlier theories which equated the concept of inequality with income and asset distribution. In his Tanner lecture on Human Values on 'Equality of What?' in 1980 which provided a penetrating ethical analysis of the idea of equality, Sen observed that while economists agree on the view that equality is a desirable objective, they have tended to emphasise different indicators of economic equality. John Rawls in his *The Theory of Justice* (1971) and in his article 'Reply to Sen' (1988) emphasised the need for equality in the distribution of primary goods or essential commodities, Ronald Dworkin's *Taking Rights Seriously* (1981) highlighted 'treatment as equals' and 'equality of resources'. Other works in this field concentrated on some other focal variables. Harsyani (1982), Hare (1982) put equal weights to equal interests of all parties, Atkinson [(1975), (1983)] emphasised the need for pushing the economy to a situation where it ensures the maximisation of social welfare. More recently, there have been attempts at developing an unified indicator of equality by constructing a Human Development Index (HDI) to judge the relative progress made by different countries in the sphere of social welfare. To cover additional dimensions, since 1991, attempt has been made to construct a Human Freedom Index (HFI) based on the work of Charles Humana by incorporating political instability as an additional parameter. Sen, in *his Inequality Reexamined* (1992) emphasised that discussions of inequality is influenced by the choice of a focal variable. The appropriate measure, to Sen, will be some sort of a quality of life

measure, like the Human Development Index, which relates to the actual conditions of the people. This has widened the scope of inquiry considerably and helped in the formulation of a meaningful development strategy.

Another dimension of extreme inequality and injustice, emphasised by Sen is the concept of gender bias in a household and in a society. This, to Sen, is important, as "the persistence of extraordinarily high levels of gender inequality and female deprivation are among India's most serious social failures".[2] His interests in issues relating to female deprivation began to be manifested in his writings in the early 1980s, where Sen explored the reasons for the adverse female-male ratios in the developing countries. In his article 'How is India Doing?' in the New York Review of Books in 1982, and in subsequent essays, Sen dealt with issues of sharp 'deficit' of women and the relative neglect of health and well being of women. Quite interestingly, Sen observed that even a conservative estimates of the number of 'missing' women in India is around 37 million, who would have survived longer if their survival disadvantages were removed. Sen and Sengupta (1983) presented direct evidence on neglect of female children in terms of health care, nutrition and related needs in north India. In fact, Sen and others have been vocal to point out that while stories of female infanticide make headlines in the newspapers, social practices that result in excess female mortality and that are far more subtle and widespread have been rarely focussed by the media. The benefits of economic development have disproportionately occurred to men than women. Female deprivation and backwardness have been related to the intensity of patriarchy and caste hierarchy which include female infanticide, child marriage, seclusion, dowry, sati, polygamy and other patriarchal practices. Kynch and Sen (1983) show that the extent of gender bias is substantially reduced by various influences that give women more voice and agency within the family. Crucial among them are, basic education to all, higher female literacy rate and women's ability to earn an independent income. The positive link between gainful female employment and the status of women also improve the quality of life of the female child, leading to inter-generational transfer of female opportunities.

Prof. Amartya Sen's pioneering contribution to the search for positive influences of women's agency and empowerment has resulted in a number of studies on the factors influencing the quality of life of women in developing countries. Dreze and Sen (1988) provide a competent survey of these studies. Murty, Guio and Dreze (1995) suggested certain crucial linkages that enhance the quality of life of women. Their study with district level data provided empirical evidence that greater female labour force participation results in lower under-five mortality. Similarly, higher female literacy rate was found to be strongly linked to a lower infant mortality rate and under-five mortality rate, the effect being larger on the girl child than the male child.

Sen also argues that the well-being of women is closely interlinked to population policy and how it brings about a change in the fertility pattern. While there is an imperative need for reduction in birth rates, Sen is against the use of forced birth control, as has been practiced in China or in India during the emergency in the seventies. Sen believes that in a democracy, coercion has a huge political cost, not to forget the fact that forced birth control programmes can negatively hurt the existing voluntary birth control programme by alienating people. This explains why birth rates continued to be high in these countries in the presence of forced sterilization. Kerala and Tamil Nadu, on the other hand, have birth rates even lower than China's, which is due to their much higher levels of female literacy.[3] As a matter of fact, Sen argues that states which have experienced rapid progress in health indicators are those where women play an important social and economic role. On the other hand, persistence of high level of gender inequality and female deprivation are observed in states which have not done well in economic terms. Gender inequality and deprivation, according to Sen are among the crucial social failures in India, causing other social and economic failures.

Section III

Poverty and Famines

Prof. Amartya Sen's contributions to the study of poverty and famines were the outcome of his concern for the poorer sections of society. Rein's (1971) view on poverty may be placed as a contrast : "People must not be allowed to become so poor that they offend or are hurtful to society. It is not so much the misery and plight of the poor but the discomfort and cost to the community which is crucial to this view of poverty". He objected to this view of poverty being uncomfortable to the non-poor, which looks at human beings as 'means' and not 'ends'. Sen thus asks who should be the focus of our concern? Sen argues that while there may be externalities in poverty, they are not the fundamental focus of poverty eradication. Poverty is an ethical issue, and the capabilities and functioning of the poor are the major concerns related to poverty. Sen has also stressed the need for an appropriate measure of poverty, since both head count ratio and income gap measure suffer from certain limitations. Head count ratio will give misleading signals if people just below the poverty line are helped out of poverty by the state. On the other hand, income gap alone will give no indication of the number of poor. To overcome these limitations, Sen provided a measure of poverty –

$$P = H\,[I + (1 - I)\,G]$$

Where P = Sen's Poverty Index
H = Head Count Ratio
I = Poverty Gap Ratio
G = Gini-Coefficient of the Distribution of Income of the Poor

Sen showed that P satisfied several desirable properties : it is sensitive to fall in income of a poor person and it is insensitive to increase in income of non-poor; and it increases when income is transferred from the poor to non-poor.

Sen's work in poverty measurement led to a spate of research in this field, and new measures were developed following Sen's

ideas. The most widely used of these measures seems to be the Foster-Greer-Thorbecke Index. While analysing poverty and distribution, Sen focussed his attention to starvation. This led to his research on famines in developing countries. Traditional approach to famines have explained this phenomenon as a sharp reduction in food supply in a particular area resulting in hunger, starvation and death. Sen challenged this conventional wisdom by pointing out that starvation is a situation when some people do not have enough food to eat, which does not necessarily imply shortage of food. Analysing the Great Bengal Famine of 1943, Sen refuted the Famine Inquiry Commission's assertion that the primary cause of famine was a serious shortage in food supply. Empirically, Sen showed (Sen 1981, 1981a) that food production in 1943 was higher than in 1941 even in per capita terms. Similar exercise for Ethiopian famine of 1973 and Bangladesh famine of 1973 revealed that famines can take place without a steep decline in food availability and can even occur in an overall boom condition (Sen 1981 : 194). Sen stressed that famines were the result of market failures or 'entitlement failures' and there is a need for state intervention in correcting inefficiencies in the market mechanism.

Section IV

Towards a Meaningful Development Strategy

Over the years, development economics had come to assign overriding importance to growth of per capita GNP with the implicit assumption that other features of development such as health, education, life expectancy and so on go with it. Thus, income level and its distribution were the cornerstones of development economics for a long time. Sen immensely broadened the scope of development economics by pointing out that "supplementary data on GNP per capita by income distributional information is quite inadequate to meet the challenge of development analysis" (Sen, 1983). Before 1980s or so, Sen's ideas on development largely revolved around the conventional thinking but focussed more on the institutional complexities of the underdeveloped economies. By 1980s, his views on development have altered radically towards redefining the concept of development on a more realistic basis.

In his early years, Sen's work on Choice of Techniques(1960) reflects his perceptions on how developing economies can maximise their growth potential. The paradigms of the work was firmly embedded in the institutional complexities and imperfections of these economies. Also to be noticed that Sen's analysis in the earlier years was dynamic and the question of choice rested on intertemporal behaviour of economic variables in the macro-economy. The so-called Roy-Sen model (Sen and Roy, 1959, 1961) investigated the optimal use of investible resources within such a temporal framework.

Sen's research in agricultural economics also reflected the search for rational choice in the context of developing countries. In the early sixties, there was an extensive debate on how to develop the agricultural economy in India. During that time, economists were puzzled by the inverse relation between size of farm and productivity. The debate was of importance to Indian policymakers who were still in two minds as to whether to opt for collective farming or let the market forces operate. The inverse relationship between size and productivity seemed to suggest a preference for the latter and vindicated the new agicultural strategy of the sixties. Sen, however, questioned the validity of such a generalisation by delving deep into the behavioural foundations of Indian farming practices. His findings revealed that a sizable segment of the Indian farmers are driven by a different rationality, a rationality of survival, which forces them to produce at higher than optimal levels. This rationality and not the efficiency of smaller firms explained the higher productivity of small farms. Thus, by extending the debate to the rationality of agriculture in underdeveloped countries [Sen (1962)], Sen observed that if family inputs are imputed at market prices, a substantial proportion of Indian peasant farms which operated at a loss. Such valuable contribution apart, Sen's classic work on peasant economy (Sen, 1966) analysed the peasant family in equilibrium and contrasted equilibrium with home consumption with equilibrium with a combination of home consumption and market sales and helped in clarifying a large number of issues relating to the behaviour of cultivators in underdeveloped countries, the impact of technological changes on efficiency of agriculture and

the respective roles of State and market in Indian agricultural development.

Sen's thought on the role of state and market in developing countries is perhaps the most influential among his ideas. In his article on the isolation paradox (Sen, 1967), Sen, in the game theoretic framework, showed that if each individual had a strictly dominant strategy, this leads to a Pareto-inferior social outcome. This analytical structure suggested the role of state in social decisions and posed a fundamental question to the efficiency of the market mechanism. Later, in another article "The Profit Motive", he discussed the influential paper by Fredrich Von Hayek on "The Result of Human Action but not of Human Design", where Hayek argued against the alleged virtues of development planning [Sen (1983a)]. In his critique of the Austrian School, Sen argued that the "invisible hand" of the market is based on the assumption of 'harmony of interests' and did not account for the possibility of conflict of interests in society. Market failures can occur due to conflict of individual interests and therefore profit motive and self-interest based action may be self defeating.

The contributions of Prof. Amartya Sen to the debate on optimal growth path and capital theory are rich and varied. One of his interesting pieces addressed the intricacies in measurement of capital through a conversation between Buddha and his disciple Subhuti (Sen 1974). Mention must also be made of his early works on investment decisions in Indian iron and steel industries (Sen, 1965), requirement of working capital in Indian economy (Sen, 1964), trade policy and structural unemployment (Sen, 1960a), pricing process in the Indian Civil Aviation Industry (Sen, 1961) and labour and capital cost [Sen (1956), (1956a), (1956b), (1956c), (1957), (1957a)]. Sen's concern for efficient policy for promoting development can be traced back to some of these early contributions.

Sen started a new wave in development economics with his seminal contribution on the basic needs approach to foster development, which began with the publication of his celebrated book

Poverty and Famines: An Essay on entitlements and Deprivations in 1981 and his paper "Public Action and the Quality of Life in Developing Countries" in the Oxford Bulletin of Economics and Statistics in the same year. In *Poverty and Famines,* Sen emphasised that State in developing societies should introduce social security measures like subsidised food distribution schemes, health care networks and so on to contain the adverse effects of 'entitlement failures'. In *Hunger and Public Action* (1988), Sen alongwith Jean Drefe highlighted two alternative approaches before the developing nations - the 'growth mediated security strategy' and 'support led security strategy'. While the former approach is based on the 'trickle down effect' the latter relies on direct intervention by the state in an economy for making public provision of basic necessities. Sen argued that the support led security strategy is more efficient than the growth-mediated security strategy because the latter creates unintentional affluence in society. As explained by Dreze and Sen:

> "A strategy of 'growth mediated' security is not at all the same thing as the pursuit of economic growth *tout court*, ...The former need not conflict with the satisfaction of basic needs - indeed it is an approach to their satisfaction. Conversely, support led security does not imply surrendering the goal of economic growth. The interconnections and contrasts between the two strategies are more extensive and more complex than would be captured in the simple dichotomy between growth and basic needs".[4]

Sen, nevertheless, recognised that direct intervention by state in providing public welfare services, could involve some trade-off with growth in some productive sectors. The support led security strategy will come into question, if and only if, there exists a remarkably powerful negative trade-off between public support measures and economic growth.

One important message from Amartya Sen's work on development economics is the imperative need to educate people. Sen argues that expansion of education, especially at the most basic level, can act as a major force in the direction of generating economic equality, in addition to its immediate role in enhancing educational equality itself.[5] Sen's stress on education as a tool of self defence

and empowerment of the masses underscores the importance of choosing the right means to foster social change. Sen observes that low average literacy rate, low female literacy rate, inequalities in educational attainment among states, persistence of endemic illiteracy among younger age groups, high drop out rate from schools in India are the outcomes of prevailing inconsistencies in educational policy, widespread use of child labour, distorted expenditure priorities and stress on higher education. He argues that in the context of economic reforms in India, educational attainment of the masses must be seen as an essential means of ensuring greater participation of people in the reform process.

Sen's work on development economics is heavily influenced by achievement and failures of several developing economies. Citing the examples of China, South Korea and Sri Lanka, he has highlighted the critical importance of enabling conditions in enhancing the quality of life in a nation. He is, however, against replicating some features of the success-stories such as privatization and extreme version of liberalization.As he argues :

> "To understand what happened in these countries, it is necessary to take a fairly comprehensive view of their economic and social conditions, rather than just proposing to initiate a specific aspect of their performance, namely, their use of market based incentives. Learning from an integrated experience has to be distinguished from simply copying some particular features of it." (Sen,1995)

The views of Prof. Amartya Sen on economic reform and liberalisation represents a typical blend of markets and government. While markets have to function well and this needs reducing distortions arising from government restrictions, controls and regulations, in order that reforms enlarge economic opportunities for the economy, government intervention in certain desired areas has to deepen and made more effective. Sen has been critical of India's reform programme, because of its lack of emphasis on factors which improve the basic capabilities of people. Sen argues that a major flaw of Indian reform came not from "the correction of government over-activity in some fields" but from "the need to correct government under-activity in other areas" [Aluwalia and Little (1998)].

Section V

Unifying Forces in Amartya Sen's Work

While the vastness of Sen's canvas represent years of relentless research in diverse directions, there is an astonishing unity among diversity in his thought. This coherence and continuity is the hallmark of Sen's research. It is possible to discern certain crucial threads that unite the diverse world of Amartya Sen.

The first is his uncompromising concern for egalitarianism. This is in evidence if one looks at Sen's theoretical forays and empirical investigations on inequality, poverty, famines, hunger, deprivation, illiteracy and lack of basic needs. His contribution to the issue of productivity of Indian agriculture, measurement of inequality, poverty and famines and the role of state intervention to meet the basic needs of the people reflect this concern.

The second strand that encompasses Sen's work is his abiding concern for humanity and the centrality of human freedom. Here, Sen is firmly led by the belief that the poor are not passive recipients of social grants but are active agents of social change. Sen's emphasis on education, gender equality, health care and nutrition reflect his thinking on the centrality of people in development programmes. Here, Sen has been considerably influenced by John Rawls, approach of moral philosophy and Rabindranath Tagore's views on education and social upliftment [Sen (1995b)].

A third distinctive aspect of Sen's thinking is his strong belief in a democratic State. Sen believes in the positive role of the checks and balances of a democratic State. He is convinced that with proper monitoring, democracy can contribute a lot to economic development. In a recent article, Sen writes – "one of the remarkable facts in the terrible history of famine is that no substantial famine has ever occurred in a country with a democratic form of government and a relatively free press... famines have never afflicted any country that is independent, that goes to elections regularly, that has opposition parties to voice criticisms, that permits

newspapers to report freely and to question the wisdom of government policies without extensive censorship".[6]

Fourthly, Amartya Sen's forceful advocacy of the positive role of diverse cultural factors - education, media and collective action brings him much more closer to modern social thinkers like Michael Foucault, Jaques Derrida and Jurgen Habermas[7], all of whom have emphasised the power of discourse in modern societies and have addressed the role of cultural institutions in the formation of ideology of a society. This transition of Sen's economics from a subject looking at society as embedded in social injustice to an arena of subtle power struggles is also crucial in understanding the gradual evolution of his socio-economic analysis.

Viewed from this perspective, the fitting tribute of the Nobel Committee to Prof. Amartya Sen's economics, is an explicit recognition of this unity in diversity. The citation of the Royal Swedish Academy of Sciences for the award of the Bank of Sweden Prize in Economic Sciences in memory of Alfred Noble for the year 1998 reads:

"Amartya Sen has made several key contributions to the research on fundamental problems in welfare. His contributions range from axiomatic theory of social choice, over definitions of welfare and poverty indexes, to empirical studies of famine. They are tied closely together by a general interest in distributional issues and a particular interest in the most impoverished members of the society ..... By combining tools from economics and philosophy, he has restored an ethical dimension to the vital economic problems"[8].

The Nobel Citation also discusses Prof. Sen's contributions to economics in three categories, *viz.*, Individual values and collective decisions, indexes of welfare and poverty and welfare of the poorest and brings out the relevance of Prof. Sen's economic analysis in the context of the new development perspective based on the growing evidence of sustainable economic development in countries where the State has been forthright in addressing the basic needs of the weaker sections, for instance, in China and East Asia.

In retrospect, Prof. Amartya Sen's economic analysis can be viewed as a bridge between the present and the past. His work is almost invariably replete with references of Adam Smith, David Ricardo, Alfred Marshall, Jeremy Bentham, Condorcet, David Hume not to mention the old Sanskrit scholars of India. In the context of contemporary economic science, Prof. Amartya Sen has contributed profoundly to the reduction of tension among different schools of thought in economics, by pointing out the strengths and weaknesses of many of them and by making an effort to assimilate and suggest a reasonable path towards progress and prosperity of the human race.

Notes :

1. Nozick,R, Anarchy, *State and Utopia*, 1974, pp.165-166.

2. *India : Economic Development and Social Opportunity* , 1995, with Jean Dreze.

3. Amartya Sen (1995) : *Population Policy : Authoritarianism Versus Cooperation*, No.63, DERP, STICERD, London School of Economics & Political Science, September.

4. Jean Dreze and Amartya Sen (1988), *Hunger and Public Action*, page 183.

5. Amartya Sen (1997) : *What's the Point of a Development Strategy*, DERP No.3, STICERD, London School of Economics, p.18.

6. Quoted from "To End Famines, Try Democracy and a Free Press", Editorials/ opinion, International Herald Tribune, Friday, October 16, 1998. I sincerely thank Mr. Leo van Houtven of the International Monetory Fund for sending this article to me.

7. See for instance Michael Foucault, *Power/Knowledge*, Jaques Derrida, Of Grammatology and Jurgen Habermas, *Law and Modernity*.

8. Quoted from Press Release : The Bank of Sweden Prize in Economic Sciences in Memory of Alfred Nobel, 1998.

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Reserve Bank of India Occasional Papers
Vol. 19, No. 4, December, 1998

Managing Financial Risks in India — A Note

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While financial markets have been fairly developed, there still remains a large extent of segmentation in the market and non-level playing field among participants, which contributes to volatility in asset prices. This volatility is exacerbated by the lack of liquidity in the secondary markets. In the above setting, the note examines the importance of a risk management exercise for the market participants and preconditions required to promote risk management practices. The note explores various alternative options for the market participants to manage risks and provides some suggestions for developing a market for derivatives in India.

Since 1992, significant changes have been introduced in the Indian financial system. These changes have infused an element of competition in the financial system, marking the gradual end of financial repression characterised by price and non-price controls in the process of financial intermediation. While financial markets have been fairly developed, there still remains a large extent of segmentation of markets and non-level playing field among participants, which contribute to volatility in asset prices. This volatility is exacerbated by the lack of liquidity in the secondary markets. The purpose of this paper is to highlight the need for the regulator and market participants to recognise the risks in the financial system, the pro-ducts available to hedge risks and the instruments, including derivatives that are required to be developed/introduced in the Indian system.

The financial sector serves the economic function of intermediation by ensuring efficient allocation of resources in the economy. Financial intermediation is enabled through a four-pronged

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transformation mechanism consisting of liability-asset transformation, size transformation, maturity transformation and risk transformation.

Risk is inherent in the very act of transformation. However, prior to reform of 1991-92, banks were not exposed to diverse financial risks mainly because interest rates were regulated, financial asset prices moved within a narrow band and the roles of different categories of intermediaries were clearly defined. Credit risk was the major risk for which banks adopted certain appraisal standards.

Several structural changes have taken place in the financial sector since 1992. The operating environment has undergone a vast change bringing to fore the critical importance of managing a whole range of financial risks. The key elements of this transformation process have been the deregulation of coupon rate on Government securities, substantial liberalisation of bank deposit and lending rates, a gradual trend towards disintermediation in the financial system in the wake of increased access of corporates to capital markets, blurring of distinction between activities of financial institutions, greater integration among the various segments of financial markets and their increased order of globalisation, diversification of ownership of public sector banks and emergence of new private sector banks and other financial institutions, and the rapid advancement of technology in the financial system.

Thus, risks to financial markets in India have arisen mainly out of the process of deregulation of interest rates, disintermediation, integration of different segments of markets and initiation of globalisation process. How have the market participants in India internalised these changes? What risk perceptions do they have? What are the avenues available for managing risks? While addressing these issues, this note is divided into three sections. Section I deals with the challenges facing the Indian financial institutions in terms of managing various types of risks. Section II discusses the products currently available for Asset-Liability Management (ALM) including derivatives – their stage of development, present structure and architecture in the context of risk management. Section III explores some policy issues.

Section I

Managing Risks in Indian Financial System

There are essentially four types of financial risks that market participants have to cope with on a regular basis. First, there is a credit risk in that a party to a contract may default. Second, there is a market risk resulting from unfavourable market movements. Third, there is an interest rate risk arising from adverse movements in interest rates. Fourth, there is a liquidity risk, which arises from the inability to sell in the secondary market.

There are three different but related ways of managing financial risks. The first is to purchase insurance. This is a viable option only for management of certain types of financial risks such as credit risk. The second approach refers to ALM. This involves careful balancing of assets and liabilities so as to eliminate net value changes. ALM is an excercise towards minimising exposure to risks by holding the appropriate combination of assets and liabilities so as to meet certain objectives of the firm (such as achieving targeted earnings, while simultaneously minimising risk). The third approach, which can be used either in isolation or in conjunction with the first two options, is hedging. Hedging is similar to ALM, but while ALM involves on-balance sheet positions, hedging involves off-balance sheet positions. The most basic derivative products used for hedging are forwards, futures, swaps and options.

For many Indian banks, investment in securities represents a strategy of deployment of liabilities. In the absence of a variety of products, flexibility for ALM is reduced and banks tend to book profits or show losses on the securities portfolio regardless of the underlying liability. While Floating rate bonds are not popular in the absence of proper benchmarks, the repo market is still in the nascent stage. Moreover, short selling of securities is not permitted and revolving underwriting facility is hindered by certain regulatory constraints. Further, the provision that banks can have only one prime lending rate (PLR) and another long-term PLR constrains effective application of ALM.

Repos

One of the most important factors that investors take into consideration is liquidity. In thinly traded markets, investors pay a significant cost for entry and exit if they require liquidity for short periods. Currently, only banks and PDs can create liquidity in Government securities through repos. Repos in PSU and corporate bonds is still a non-starter. This leaves out many participants who may have large surpluses on average but are liquidity strapped in the short-term. Further, the only type of repo prevalent in India is buy/sell back repo between two parties, although international markets are used to a variety of repos, which provide greater flexibility to market participants. It is imperative now that the demat process is hastened, so that a greater number of players can borrow and lend through repos.

Short Positions

The Indian bond market is one-sided. Activity in the market increases when interest rates are expected to come down and falls when interest rates are expected to increase. Market participants are not permitted to short-sell securities in view of the prohibition of forward trading in securities since June 1969 through a Government notification. Repeal of this Notification will require the formalisation of the respective regulatory roles of RBI and SEBI in the debt markets. One of the possibilities could be to allow controlled short-selling initially by PDs with adequate safeguards. For instance, the maximum amount that can be shorted can be specified. Once short-selling of securities is permitted, investors can hedge their positions without having to offload securities in the market.

Term Structure of Prime Lending Rate

Currently, banks are permitted to announce one PLR and another term PLR for maturity over three years. This creates inflexibility in ALM due to duration mismatches. Permitting banks to fix and announce PLRs across the term will allow them the flexibility of offering floating interest rates on deposits and give them the option of pegging their PLR to deposit rates.

Another important factor that accentuates interest rate mismatches of banks is that while a large portion of the deposits of public sector banks are term deposits carrying fixed rates of interest, banks are not permitted to charge fixed rate of interest to their borrowers. Thus, six months after sanction of say a one-year term loan at PLR, if a bank reduces its PLR, it will have to correspondingly reduce the interest rate on the loan for the remaining period of the loan. Freedom to extend fixed rate loan to borrowers could be desirable for facilitating ALM of banks and also from the borrowers point of view, particularly for projects involving infrastructure financing. Eventually, banks should be given the freedom to fix their own lending rates without any PLR prescriptions.

Revolving Underwriting Facility (RUF)

RUF is a medium term commitment on the part of a bank to underwrite continuous issue of short-term notes by a corporate. RUF is a flexible product enabling the corporate to raise resources at a favourable rate as compared to its normal borrowing rate. While RUF will obviously attenuate the process of disintermediation, it provides an avenue for banks to generate fee-based income in addition to providing an additional tool for its ALM. Of course, there are risks involved for a bank which provides the underwriting facility. These are the credit risk and liquidity risk.

There is a need to review existing regulations to permit banks to offer RUF subject to capital adequacy and all other prudential norms as applicable to loans. The existing ceiling of 15 per cent of an issue for underwriting etc. can be dispensed with for RUF and the facility be brought within the overall single and group borrower limit.

Section II

Financial Derivatives and Risk Management

Derivatives are financial instruments that derive its cash flows and, therefore, its value by reference to an underlying instrument,

index or reference rate. Derivative instruments can be classified as asset-liability based instruments, forward based contracts, swaps, options or some combination of the above. Such combinations may create synthetic financial instruments whereby the combined characteristics mirror those of another financial instrument. Further, derivatives may be classified as exchange-traded or over the counter. Exchange traded derivatives tend to be more standardised and offer greater liquidity than OTC contracts, which are negotiated between counterparties and tailored to meet each other party's needs.

Asset Liability Based Derivatives

Certain derivatives can be structured from existing assets or liabilities. For example, cash flows from certain assets can be disaggregated and repackaged into derivative securities designed to meet specific investor needs. These securities are often referred to as 'strips' for bond transactions and tranches for mortgage or loan related products. In addition, a wide variety of structured debt products with embedded options have been offered in the OTC market. Two of the more common asset liability based derivatives that could be introduced or developed in the Indian markets are Asset Backed Securitisation and Strips.

Asset Backed Securitisation

There are two broad definitions of securitisation. The first is the usage in connection with replacement of traditional bank lending by securities in the capital market. It is also used in the narrower sense to refer to the issuance of asset backed securities, which are tradable instruments supported by a pool of loans or other financial assets. The interest and principal payments on the loans provide the cash flows required to pay interest and principal to investors. Securitisation has many advantages.

First, Asset Backed Securitisation provides the issuer with a more flexible, cheaper and rapid means of managing the fluctuating stock of underlying assets. Second, it removes the assets from the

balance sheet of the originator, thus liberating capital or other liabilities for other uses such as expansion of assets, etc. Certain conditions, however, are required to be satisfied to qualify for off-balance sheet treatment in the absence of which the assets concerned will be consolidated with the seller's balance sheet for risk asset ratio purpose. Third, securitisation replaces receivables with funds. Fourth, the transformation of previously illiquid assets into tradable securities enables originating institutions to make more flexible use of their balance sheets. In particular, greater liquidity of traded assets permits better management of credit risk through reduction of excessive concentration in particular areas or diversification of exposure into sectors with more attractive risk/return profiles. Fifth, asset backed securitisation enables originators to remove the market risk resulting from interest rate mismatches by transferring it to investors.

The most widely used assets in off-balance sheet securitisation are housing loans, consumer and trade receivables, student loans, automobile loans and credit card receivables. Banks, financial institutions, non-bank finance companies and housing finance companies are usually sellers of asset backed securities. Internationally, mutual funds, insurance companies, pension funds and corporates are buyers of this product.

There is a vast scope for asset backed securitisation in India. Already, quite a few deals have been concluded with respect to residential mortgages, auto loans and trade/bills receivables in India. Credit enhancement has been in the form of cash collateral in a designated bank account in favour of the trustee of the transaction. A few short-term transactions in trade/bills receivables were originated by NBFCs. Credit enhancements have been in the form of letters of credit from select banks which undertake to pay in the event of default on the underlying asset.

Prohibitive stamp duties, lukewarm investor participation and inadequate foreclosure laws have hindered the growth of this market in India. Internationally, insurance companies, trusts and mutual funds are major investors in asset backed securities. In

India, while insurance companies and trusts are not allowed to invest in securitised paper, there are restrictions on investments of mutual funds. Inadequate foreclosure laws increase the risk in respect of mortgage backed securities in case of default. Stamp duties on sale of assets vary across states. High stamp duties on sale of assets have resulted in all such securities deals being structured in the form of transfer of beneficial interest in the asset and not the title. Stamp duties are also an issue in the case of securitisation of mortgage and other secured loans. A question that needs to be answered is whether transfer of beneficial interest construes true sale, with legal transfer of assets to be affected only in the event of bankruptcy of the seller and the special purpose vehicle having recourse to the same remedies against borrowers as the originators. Finally, asset backed securitisation will gain momentum only if there is a liquid secondary market for debt. It is also necessary to clarify certain matters from the regulatory angle particularly from the viewpoint of capital adequacy where the transaction cannot be construed as a "true" sale. Treatment of credit enhancement provided by financial institutions' transactions need also be addressed from this consideration. Credit enhancement in certain circumstances may have to be deducted from capital or treated as a guarantee.

Strips

Strips, an acronym for separate trading of registered interest and principal of securities are the different components of a conventional bond separated and traded as distinct securities. A 10-year gilt, for example is strippable into 20 half-yearly coupons and one final redemption. The end result is a series of 21 zero coupon securities, with maturities of 6, 12, 18 months and so on. Strips are very useful instruments for participants in the financial markets. Paradoxically, they can offer safety and stability to one type of investor and be highly speculative for others. Unlike bonds that pay annual or half-yearly dividends, the total return on a strip is known at the time of purchase. Thus, strips give certainty of return, by removing reinvestment risk, but are much more sensitive to changes in yield. While the attractiveness of Strips to speculators arises

from their greater leverage, the certainty component of Strips is attractive to those with long-term investment horizons. Through investment in a portfolio of strips, an investor could thus, in principle, achieve more easily a desired pattern of cash flows.

A major advantage of strips is that it helps development of a a zero coupon risk-free yield curve. This could be used as a benchmark for pricing floaters and other derivative instruments. For banks, strips offer the special advantage of a trading instrument and an instrument for duration management. The Government Securities market in India has the necessary size to make Strips a success. There are, however, several structural issues that need to be addressed before introducing strips.

First, currently there are too many issuances of Government Securities in a year with no uniformity in coupons and interest payment dates. Second, the issuance of various maturities of Government Securities need to be standardised so that coupon payment and redemption dates fall due on a certain fixed dates in a year. This will allow for fungibility of coupons and provide necessary liquidity to the market. Third, a lot depends on the pricing of Strips. This would entail changes in the present auction system so that the coupon is preannounced and the price is determined at the cut-off yield. Finally, the infrastructure needed to facilitate strips and the clearing and settlement process need to be sorted out.

Credit Derivatives

A number of traditional methods (such as operational limits on credit lines, loan provisioning, portfolio diversification and collateralisation) and innovative methods (such as loan securitisation and separately capitalised derivatives) are already available internationally to manage credit risk. These are considered to be significantly less flexible on their own than the techniques available in the area of market risk. Capital adequacy guidelines have also encouraged financial institutions to put greater emphasis on the risk and return characteristics of their assets and liabilities. Credit derivatives, make

it possible to evaluate and trade credit risk without liquidating the original product. They enhance flexibility and reduce costs. They allow banks to hedge the credit risk of a loan without having to assign the loan and with no risk to deteriorate the relationship. Credit derivatives, therefore, offer banks the advantage of improving the flexibility of their credit structures without imposing constraints on their client relations. This enhances efficient balance sheet management and adds to traditional hedging instruments.

Credit derivatives are a new market segment in the area of financial derivatives. They are financial products which transfer either specific or all the inherent risks of a credit position from one partner in the transaction *viz.*, the risk seller, to another *viz.*, the risk buyer, against payment of a premium. They are a new management tool, which facilitates evaluation and transfer of credit risk. Credit derivatives thus serve to evaluate and separate risks and to make them fungible. The areas of application are the traditional credit and bond business as well as risk and portfolio management. Credit derivatives deal with credit risk or risk of debtor default as pure debtor risk and not general market risk. The hedge refers directly to a particular debtor. The credit risk is typically debtor specific. The focus is placed on individual solutions designed to fulfil customer-specific wishes with an eye on their balance sheets. The products are hardly standardised, and there is practically no secondary market trade, even in the USA. Internationally, capital treatment has yet to be clarified and standardised documentation is not available for most of the products

Credit derivatives fall into two basic categories - swap-based (i.e. created on the basis of swap structures) and option-based. The swap-based versions include credit-swaps, basket credit swaps or notes and total return swaps. The option-based versions include spread options and sovereign risk options.

In sum, a bank can reduce credit risk without straining its relationship with a client or losing him altogether. However, in the Indian context, it may be feasible to experiment with credit default swap to begin with. By doing credit swaps, it is possible to take

on additional credit lines. Credit swaps make it possible to take over risk without having to grant a loan. Under Indian conditions, credit swaps provide a mechanism for an institution like IDFC to take on the credit risks of banks. The market for credit derivatives is attractive for banks as well as institutional investors. Creditors can eliminate credit risk in part or entirely without documentating this to the market. At the same time, other institutional investors can gain access to credit markets, which would otherwise not be open to them.

Before this, the credit market will get a fillip if existing instructions on banks giving guarantees are reviewed. Scheduled commercial banks cannot currently give guarantees on debt instruments or give a loan/credit facility based on the guarantee of another bank or financial institution. The rationale is that the institution taking the credit risk should also fund the loan. There is an apprehension that the bank giving the loan will rely on the guarantee rather than on the viability of the project. There is need for a rethinking on the issue as a financial guarantee separates the credit risk from funding risk. It enables sound banks particularly international banks operating in India with skills to appraise projects, particularly infrastructure projects, but not in a position to fund these projects due to lack of rupee resources. Banks with resources that do not have the risk appetite for such project can invest in these guaranteed instruments. Financial institutions are giving such guarantees but banks are unable to do so. Banks can be permitted with certain prudential regulations such as treating these guarantees on par with loans for purposes of capital adequacy and exposure norm. Similarly, each bank could lay down a limit on the total amount of such guarantees issued to ensure that it does not over-extend itself.

Derivatives for Interest Rate Risk Management

In the absence of MIS and slow pace of computerisation, the RBI has suggested traditional gap analysis as a suitable method to measure interest rate risk. The analysis begins with constructing a maturity gap report. This report categorises assets and liabilities

according to the time remaining to their repricing or maturity in specific time periods known as 'repricing' buckets. The time buckets range from one month and beyond one year. Categorising assets and liabilities lacking definite time frames into specific time periods (buckets) varies according to institution. RBI guidelines permit banks to make reasonable assumptions while categorising these items.

The maturity gap approach enables a bank to measure for each time period or bucket the positive gap or the negative gap. A positive gap (asset sensitive) indicates that more assets than liabilities will reprice in a given time period. In this case earnings tend to increase as interest rates increase because more assets than liabilities reprice at higher rates. A negative gap indicates (liability sensitive) that more liabilities than assets will reprice in a given time period. If rates increase, earnings will be adversely affected. However, the gap approach does not adequately address the rate sensitivity of longer term fixed rate instruments, the value of which can change dramatically without affecting short term interest income. Duration analysis can complement gap analysis and can be used to analyse the financial condition of a bank with a complicated series of repricing mismatches. Duration analysis can add significant insights into the interest rate risk exposure of an institution. However, a caveat will be in order. Duration analysis presupposes the existence of a parallel yield curve.

Interest rate risk is an aspect of normal banking operations that has become increasingly important since the deregulation of interest rates. Interest rate exposure associated with a mismatching of asset and liability maturity or duration gap can be controlled using a variety of techniques, which fall into the general classification of direct and synthetic methods. Direct restructuring of the balance sheet relies on changing the contractual characteristics of assets and liabilities to achieve a particular duration or maturity gap. On the other hand, the synthetic method relies on instruments such as futures, options, interest rate swap and customised agreements to alter balance sheet exposure. Since direct restructuring may not always be possible, the availability of synthetic methods adds a

certain degree of flexibility to the asset/liability gap management process. This flexibility can be further enhanced if new financial instruments used to hedge or profit from interest rate changes are allowed to be introduced in the Indian market.

In the absence of exchanges, derivative products which are widely used overseas in managing interest rate risk are forward rate agreements and interest rate swaps.

Forward Rate Agreements

The forward rate agreement is an off balance sheet contract between two parties under which one party agrees on the start date (or trade date) that on a specified future date (the settlement date) that party will lodge a notional deposit with the other for a specified sum of money for a specified period of time (the FRA period) at a specified rate of interest (the contract rate). The party that has agreed to make the notional deposit has thus sold the FRA to the other party who has bought it. On the settlement date, a cash settlement is made by one party with the other calculated by reference to the difference between the contract rate and the 'settlement rate'. The settlement rate is the market rate of interest prevailing on the settlement date for the FRA. The instrument has been developed out of the forward cash market. The advantage of FRAs over the forward cash market is that no principal sums are transferred on the settlement date and thus banks can easily adjust their interest rate profiles without the credit risk associated with a cash deposit or having to affect their liquidity positions.

Since the payment is made at the beginning of the FRA period rather than the end (which is the normal basis on which interest rates are quoted), the actual cash settlement is computed as the present value of the amount that would normally be received at the end of the period. This present value is calculated according to a formula agreed at the outset of the contract and is normally the end of period amount discounted for the FRA period at the settlement rate.

FRAs can be used for risk management or for trading. FRAs allow a borrower or lender to 'lock in' an interest rate for a period that begins in the future thus effectively extending the maturity of its liabilities or assets. Banks can use FRAs as an integral part of their management of interest rate risk with a typical FRA book consisting of a portfolio of FRAs of varying periods and currencies. FRAs are an important product that banks can market to their corporate customers as part of a cash management service. When a customer takes out a FRA, the bank will be left with an open interest rate position that it can close with an FRA in the inter-bank market or carry against its existing interest rate profile.

There are risks associated with FRAs. Banks are exposed to credit risk if the counterparty fails before settlement date for the replacement cost of the FRA. There is also the risk of the counterparty failing to deliver on settlement date. The potential loss in this case is the ultimate profit of the FRA. The principal sum being a notional sum is not at risk. The direction and amount of the FRA settlement are determined by interest rate movements. The bank is, therefore, exposed to market risk if the instrument is not fully matched. The market risk can generally be managed by including the interest rate positions within a financial institution's overall system for measuring and controlling interest rate exposure. As for credit risk, banks can mitigate the credit risks by taking margins.

The pricing of FRAs reflects the costs of alternative ways of constructing a similar hedge. For example, the price of a six against nine-month FRA will depend in particular on interest rates on six and nine month deposits. They are usually priced from the inter-bank yield curve.

As per Forward Rate Agreement, British Banks Association Rules, the cash settlement of the profit & loss is computed as follows :

$$\text{Profit/Loss} = \text{Notional Amount} \times \frac{\frac{(Rfx - R)}{100} \times \frac{Gap}{Basis}}{\frac{1+Rfx}{100} \times \frac{Gap}{Basis}}$$

Where,

R is the dealt rate
R fx is the fixing rate

Gap is the number of days applying to the FRA period. 'Basis' is the relevant money market rate basis (360/365 days). The fixing rate is usually the official fixing of a money market period and internationally the most commonly used benchmark is the LIBOR.

FRAs can be most easily priced from a zero coupon yield curve. From the zero curve one can derive the zero coupon rate at settlement of the FRA. The seller of FRA notionally places deposit or gives loan at a certain rate of interest. The seller seeks protection against downward slide in the interest rates. The buyer of FRA notionally accepts deposits or borrows at a certain rate of interest in order to obtain protection against upward movement in interest rates.

Indian banks may use FRA under different circumstances. For example, if Gap analysis shows that in a particular bucket (say within one year during which interest rate risk is actively managed) risk sensitive assets (RSA) are greater than risk sensitive liabilities (RSL) and a bank expects downward movement in interest rate (which will squeeze its net interest income (NII)), it can sell FRA for RSA-RSL corresponding to the time bucket. If interest rates fall, the squeeze in NII will be approximately compensated due to FRA. On the other hand, if RSL>RSA and the bank expects interest rates to rise, it can buy FRA for RSL-RSA for the corresponding time bucket. Depending upon the RSA and RSL patterns in different time buckets and a view on interest rate movements a set of FRAs can be put in place to hedge against interest rate risk. A bank may also use FRA to lock in return or its borrowing

cost. There may be occasions when a bank expects substantial inflow in 3 months from its recovery drive but does not expect loan demand to pick for another 6 months. In such a scenario, in order to lock in a targeted return, the bank may sell FRAs. Similarly, a bank which is funding longer-term loans by rolling over shorter-term liabilities may buy FRAs to lock in borrowing cost.

A bank, which has liabilities of longer duration, but due to capital adequacy or other considerations lends a certain amount of its liabilities in the inter-bank market for three months, can use FRAs to cover its exposure, to movements in short-term rates. To hedge its exposure this bank can sell a series of FRAs so as to match its liabilities and lock in to a spread. Similarly, another bank which has limited access to funds with maturities greater than six months and has relatively longer term assets can prefer a contract for a six against twelve month FRA and thus, increase the extent to which it can match asset and liability maturities from an interest rate perspective. In both these situations, the banks can choose to buy some FRAs depending on their market views and their perception of periods of uncertainty.

Corporates too can make use of FRAs. A company which is a big issuer of commercial paper with a tendency to roll over the CPs on maturity can at a particular point, when interest rates are low, buy a series of FRAs to hedge its funding cost.

Interest Rate Swaps

Interest rate swaps are over-the-counter (OTC) contracts between two counterparties for exchanging interest payments for a specified period based on a notional principal amount. The notional principal is used to calculate interest payments but is not exchanged; only interest rate payments are exchanged.

An interest rate swap can achieve any of the following:

a) alter the cost of existing or generally available borrowing from fixed to floating rate or *vice versa*.

b) convert the rate of return on an asset from fixed to floating or *vice versa.*

c) generate a profit (or a loss) from interest rate fluctuations (if the swap is not matched with an asset or borrowing.)

The principal uses to which swaps are put flow from these three specific uses. The swap market has thus seen development of many types of swap and swap related products. Each product can be tailored to the needs of the institutions that seek to use swaps to alter the interest and currency profiles of portfolios and balance sheets. The two basic forms of IRS are the fixed-versus floating swap and the basis swap.

Banks and other financial intermediaries enter into swap transactions for trading purposes or for hedging purposes. When it acts as an intermediary for other parties, a bank arranges and administers the swap transaction. The bank acts as the principal to both sides of the swap and thus both sides rely on the bank rather than each other for performance of the deal. A bank may use swap transactions for trading purposes by taking a view on the future interest rates. A bank that expects interest rates to increase might enter into a swap deal to pay a fixed rate of interest and to receive variable amounts.

Indian banks use swaps as an integral part of their management of interest rate risk. A bank can use an interest rate swap to achieve a closer match between its interest income and interest expense, thereby reducing its interest rate risk. The decision to use swaps will depend on the needs of customers and the size of the open interest rate position that it is prepared to run. A bank may use swap transactions to hedge existing assets and liabilities. If a bank finds itself with a preponderance of fixed rate assets and variable rate liabilities, an increase in interest rates could have a significant negative impact on earnings. To hedge against this possibility, the bank might enter into a series of swap contracts so as to effectively convert its variable rate liabilities into fixed rate obligations. The swaps will be profitable

if the interest rates go up and will be unprofitable if they go down; however its overall earnings will be stable regardless of the direction in which rates move. Although banks tend to manage their swap portfolios on a deal by deal basis, larger banks often engage in portfolio hedging or management.

The market convention for pricing interest swaps is to quote the fixed-rate in terms of a basis point spread over the Treasury rate for receiving the floating interest rate index flat (no basis points are added to or subtracted from the floating rate). Swaps are so priced that at origination the expected present value of the fixed-rate payments equals that of the floating rate payments. Therefore, an upfront cash payment is not necessary.

Banks are exposed to both interest rate risk and credit risk in swap transactions. The payments and receipts in a swap transaction are determined by interest rate movements. Therefore, if not fully matched, the swap creates an interest rate risk. If the counterparty fails during the life of the contract, the bank is at risk for the replacement cost of the swap. There is also a liquidity risk associated with opening a position because the market is illiquid and hence difficult to close out.

A variety of interest products may also be included in the swap portfolio such as swaps with embedded options, cancelable or extendible swaps, interest rate caps and floors and other products. In contrast to a futures hedge, which fixes a specific interest rate, an options hedge, is similar to the purchase of interest rate insurance. For the price of the option, the buyer is protected against an adverse movement in interest rates while preserving the benefits of a favorable movement in rates. Different options will provide different types of insurance. If the future cash position is certain, the best hedge will typically involve use of the futures contract/FRA. If the cash flow is less certain, the options hedge will be less risky and likely to be preferred. An options hedge is generally more expensive than a futures hedge but retains some of the benefits of a favourable movement in the cash market.

When interest rate swaps/FRAs are introduced in India, banks/ FIs/NBFCs should be required to maintain capital on the basis of current exposure method prescribed in the guidelines. Similarly, capital adequacy for market risks including interest rate risks will also have to be gradually introduced. The standardised approach can be adopted as a transitional measure. As the market develops, a supervisory framework for obtaining information will become necessary. The following are some of the other dimensions :

(i) It is necessary that banks and other participants having positions in these products mark them to market on a daily basis in due course. Banks should internally fix prudential limits on unmatched positions, which should be reported to RBI.

(ii) Capital allocation for such products should be a function of both the credit exposure as well as volatility of the underlying asset.

(iii) Prudential norms are required to regulate the extent of leverage that such products provide.

(iv) Certain taxation issues arise such as whether the swap payments and receipts are treated as other income or interest income, and the tax implications if transactions are gross settled or net settled.

Section III

Issues and Implications

Risk management has become an integral part of financial activities of banks and other market participants. These risks cannot be ignored and have to be managed by market participants as part of ALM or hedged. In this context, creating an environment that promotes risk management assumes critical importance. This requires addressing certain policy and institutional issues in developing a market for risk-taking, risk sharing and risk-diversification in India.

First and foremost, a well-developed repo market constitutes an important pre-requisite for promotion of risk-management practices among market participants. Regulatory gaps and overlaps in debt markets need to be sorted out quickly to facilitate the repeal of the 1969 Notification which bans forward trading in securities. Market players can then be permitted to short sell securities, which will go a long way in aiding the process of ALM for banks and other market players. There is a case for encouraging RUF in Indian market. Regulatory issues regarding the RUF need to be reviewed in this context.

Indian conditions are suitable for introduction of asset-liability based derivatives such as Strips and Asset Backed Securities, specifically from two viewpoints. First, they provide an ALM tool and secondly, strips facilitate a risk-free zero-coupon yield curve which can be used for pricing other instruments. Introduction of a market for strips requires meticulous planning on aspects such as issue of benchmark securities, fungibility, auction system, settlement procedures and general infrastructure. There is a vast scope for asset based securitisation in India, despite its constraints. A few deals have already been concluded with respect to residential mortgages and auto loans. However, inhibitive stamp duties, inadequate foreclosure laws and lukewarm investor response come in the way of development of this market.

There is also scope for introduction of credit-default swaps in India. Credit swap offers advantages of hedging credit risk without impairing the relationship with the borrower. Under Indian conditions, this instrument provides a mechanism for an institution like IDFC to take on the credit risks of banks. As a prelude to permitting credit derivatives, there seems to be a case for permitting banks to extend guarantee or lend on the guarantee of another bank within prudential limits.

FRAs/IRS enable users to lock into spreads. The Reserve Bank of India has already announced its intention to introduce interest rate swaps. In addition, the market for forward rate agreement can also be developed. A prerequisite for the development of rupee

derivatives in India is the existence of a term yield curve which would enable efficient pricing of derivatives. A benchmark rate should be a good proxy for the actual borrowing costs in the market. The rate should be transparent and non-manipulative. The overnight call money market is the only liquid market in the Indian financial system. An overnight reference rate has already emerged through National Stock Exchange and Reuters. Therefore, to begin with, the Mumbai Interbank Overnight Average (MIONA) swap, settled against a call benchmark, can be considered as a starting point. Once, the term money market develops, other benchmarks will emerge.

Active use of derivatives require the existence of a term money market for six-months to one year tenure. It is widely accepted that there is no clearly defined interbank term money structure in India beyond the overnight rates. Statutory pre-emptions on inter-bank liabilities, somewhat regulated interest rate structure, cash credit system of financing, high degree of volatility in the call money rates, availability of sector specific refinance, and absence of money market instruments of varying maturities have been some of the factors that affect the development of a term money market.

The Reserve Bank of India has gradually removed many of the constraints in the term money market. Freeing of interest rates in the call money market, replacement of the system of cash credit by the loan system, deregulation of term deposit rates and lending rates, bringing down the minimum period of term deposits to 15 days, freedom to banks to determine their own penalty structure for premature withdrawal of deposits and exemption of interbank liabilities from the maintenance of CRR and SLR, subject to the statutory minimum of 3 percent and 25 per cent, respectively, for all categories of bank liabilities are some of the important steps in this direction.

A major reason for the lack of term money market is the absence of the practice of ALM system among banks for identifying mismatches in various time periods. The recent RBI guidelines on ALM are expected to contribute to the evolvement of an ALM

system, which would help banks to take decisions to lend on a term basis and also offer two-way quotes in the market. This would act as a catalyst for development of a term money market. Banks should also be given freedom to announce PLR across the term curve so as to give them an additional tool to match their duration gaps. Risk management will be further enhanced when banks are permitted to extend fixed rate loans to borrowers.

A deep cash market is imperative before derivative products can be introduced in order to prevent derivatives market from transmitting volatility to the cash market. This requires orderly movement of the interbank call money market and also raises the need for a liquidity adjustment facility from RBI to facilitate the development of a corridor of interest rate through repo and reverse repo mechanisms. This would obviate the need for having various refinance facilities and impart necessary stability to interbank reference rate.

FRAs are particularly useful from a risk management perspective to hedge short term interest rate risk. FRAs are good indicators of forward money market curves and as such are the best indicators of market participants' expectations of future deposit rates which can be an useful input in monetary management. These pro-ducts enable issuers to access those markets (whether fixed or floating) where they possess a comparative advantage, and swapping the interest payments in the market of their choice. However, given the current structure of the Indian Rupee money market and its characteristics, introduction of derivatives should be undertaken in a gradual manner. A suggested sequencing pattern could be to develop market for FRA and IRS first before moving on to options.

Reserve Bank of India Occasional Papers
Vol. 19, No. 4, December, 1998

BOOK REVIEWS

Emancipating the Banking System and Developing Markets for Government Debt, **Maxwell J. Fry, The Bank of England, Routledge, London, New York, 1997, pp. XVII + 280.**

It was often stated that inflation was positively related to the proportion of government borrowing from the central bank and in total domestic credit, and that inflation was negatively related to growth. This gave rise to the question : how should a government best meet its borrowing requirements? This was the question which was addressed at the Central Bank Governors' Symposium, hosted by the Bank of England in June 1996. The papers presented at the Symposium and the discussions which followed form the basis of this book.

Since monetary policy to achieve price stability must be integrated with fiscal and exchange rate policy, the central bank cannot, in practice, stand passive in respect of policies in these areas. There must be a proper synthesis between fiscal adjustment and macro economic performance which influences price dynamics. Empirical applications differ widely. There is, however, a general agreement that the use of indirect market based techniques of monetary control is conducive to achieving sustainable price stability. The central bank is thus obliged to play a role in developing voluntary domestic markets for government debt.

The process of developing voluntary domestic markets for government debt requires not only conducive macro economic conditions and appropriate market structures, but also financial infrastructure. But the appropriate financial infrastructure is highly country specific. It depends on the legal system, tax treatment, accounting conventions, geographical characteristics, the state of technological progress etc. Although the Bank of England had been involved in government debt financing for over 300 years, practices are still developing. Over time, the Bank of England has developed four

guiding principles for the UK's debt management policy:

1. The marketing exercise: Since the government has a product to sell, market intelligence is crucial. The Bank of England has, therefore, to maintain a dialogue with both financial intermediaries and final investors.

2. Keeping it simple: Experience indicated that, since the markets' understanding of new products could be patchy, it was important to keep products clear and comprehensible. Index-linked securities offered several benefits to both issuer and investor, but they are inherently complex and the UK market has taken some time to digest them. The conference on index-linked securities organised by the Bank of England in 1995 constituted part of the Bank's efforts to educate the market.

3. A variety of instruments and selling techniques could broaden appeal.

4. The central bank's involvement in the secondary market should be developmental. For example, with the introduction of index-linked government securities in the UK, the Bank of England acted initially as a market maker to promote this market. Obviously, however, care was taken not to substitute for the market.

In countries that are just starting to develop voluntary domestic markets for government debt, considerable central bank involvement in government debt management is highly appropriate.

Developing voluntary domestic markets for government debt demands a sea change in the approach to financing the government deficit. To obtain a better understanding of the change in approach towards voluntary market financing, the Bank of England requested some central banks (Ghana, India, Jamaica, Malaysia, Mexico, New Zealand, Sri Lanka and Zimbabwe) that had recently developed voluntary domestic markets for government debt, to answer several

questions relating to monetary policy implementation, government financing, and debt management including market development.

The questionnaire responses, together with other sources, suggest that successful development of voluntary domestic markets for government debt hinges on four key elements:

1. Macroeconomic stability involving monetary control; fiscal discipline and consistent monetary, fiscal and exchange rate policies.

2. Coordination, necessitating establishing a coordinating committee including the central bank and ministry of finance; sharing information; limiting central bank credit to the government; and promoting secondary market development.

3. Supervision and regulation, to ensure that weak financial institutions are detected early, and to prevent Ponzi-type borrowing that escalates real interest rates to pathologically high levels.

4. Sequencing the reforms, among which some of the more important measures that require initial planning for the subsequent market development process include auctioning treasury bills; reducing reserve and liquid asset requirements; lengthening the maturity of debt offered at auction; and opening up the market to foreign buyers.

At the microeconomic level, five essential elements have been identified as essential.

1. Market-clearing yields on government paper.

2. Relatively stable money maket conditions.

3. A predictable or preannounced schedule of issues.

4. Some market-making arrangement.

5. Financial infrastructure ensuring transparency, low risk and low cost.

Three key groups of players that need to be considered at the start of any market development programme:

1. The ministry of finance which needs to:

   Acquire expertise in treasury management; forecast its cash flow; plan the maturity structure of its debt; determine an optimal menu of debt types; announce an issue schedule; and stimulate costs of alternative funding strategies.

2. The central bank which may have to assume tasks such as :

   The responsibility for the smooth and efficient functioning of the government debt market; vetting and regulating market participants; providing depository, registry and electronic delivery-versus-payment systems; implementing monetary policy to avoid excessive short-term interest rate volatility; and implementing monetary policy to allow a normal degree of short-term interest rate fluctuation.

3. Financial institutions which require the central bank's attention in at least three areas:

   Facilitating the acquisition of treasury expertise and the expansion of Treasury activities; dismantling or at least controlling any bank cartel; and selecting, where appropriate, primary dealers.

   As primary dealers, financial institutions are typically obliged to act as market maker and support auctions. In return, they may receive various privileges such as exclusive right to bid at auction; exemption from prepayment with bids; right to make telephone or electronic bids; access to borrowing from the central bank; and tax breaks.

Various issues namely financial repression, foreign debt accumulation, prerequisites, persuasion and pitfalls for developing voluntary domestic markets have been chapterised. Two key points on the

development of voluntary domestic markets for government debt which emerge from the questionnaire responses of the case study countries are important. These are: success is critically dependent on the implementation of any required concomitant fiscal reform; and real as opposed to illusory success is critically dependent on taking the plunge and really letting market forces determine the price of government debt. Emancipating all captive buyers is essential.

The lessons of experience indicate that governments must be prepared to accept the rough with the smooth, with more of the rough likely during the early stages. In other words, strong commitment to market development at the outset is a prerequisite for success in the longer run. One of the litmus tests of commitment and acceptance of the principle of the market determination of the price of government debt lies in the way the treasury bill auction market works. Specifically, market development is likely to take root and flourish only when the authorities resist the very strong temptation to set a reserve price. There are four advantages of a clean auction in which all bills are sold at whatever price the market offers: First, it informs the government of the true opportunity cost of its borrowing. Secondly, it avoids recourse to the central bank and so avoids the road back to inflationary finance. Thirdly, it provides important feedback signals from the market for use in monetary policy making. Finally, the treasury bill yield can and soon will be used as a crucial reference rate for the pricing of other financial claims in new markets.

The volume has done an outstanding job discussing issues that need to be addressed and identifying process of move towards emancipating the banking system and developing markets for government debt. However, it might be suggested that fiscal policies affect private investment through three major channels: public investment, public deficits, and the user cost of capital. The complementarity of public and private capital should not be disregarded. It is thus useful that fiscal adjustment is tried mainly through improving the quality of public expenditure, not mainly raising the cost of expenditure which is inherent in the initial phase

of developing markets for government debt.

There is no doubt that each country will learn much from its own experience as it develops its own markets for its own government debt. Nevertheless, countries could benefit from the experiences of other countries, which are described in Part III of this book. This is a very important aspect of the book. Besides, the book is strong on analysis as well as documentation. It is probably the most useful reference on the subject, and that is a great deal to be thankful for.

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Reserve Bank of India Occasional Papers
Vol. 19, No. 4, December, 1998

International Trade and Finance: New Frontiers for Research
Edited by Benjamin J. Cohen, Cambridge University Press, 1997, pp. ix + 402.

This book is a collection of essays in honour of Peter Kenen. The essays aim at defining the research agenda for the late 1990s and beyond in international trade and finance. The essays are grouped into three parts: international trade theory, international monetary theory and applied policy analysis. The book is introduced by Benjamin J. Cohen, a student of Prof. Kenen, alongwith another introductory piece by Prof. Paul Krugman. Contributors to this volume are well known scholars in their respective fields. Krugman's essay highlights Peter Kenen's more important achievement and serves as an useful starter. Kenen's contribution to trade theory mainly lies in expanding the two - commodity, two-factor (Heckscher - Ohlin) model to three-factor two-goods model. The distinctive features of this model are that it is amenable to analytical treatment the way the standard two - factor model is, and the Leontief paradox could be resolved by its application. Kenen's contribution to international monetary theory mainly relates to Optimum Currency Areas and the role of Reserve Currency. Kenen builds up on the premise that demand for reserves may increase not only along with increase in world trade but rise due to precautionary motives. This premise led reserve money demand analysis beyond simple money multiplier model. Kenen enlisted two additional factors for success of the Optimum Reserve Currency Area. His work showed that even in the absence of labour mobility and openness of the regions the currency area may succeed provided the regions' economies are diversified, and taxation and spending policies are followed in a harmonious way. The portfolio approach to exchange rates had many exponents but the most definitive statement exploring its implications for macro policy, Krugman says, came from Allen and Kenen. Krugman also makes a special mention of Kenen's silent role in negotiating the Brady debt relief plan and many of his other initiatives in the field.

Patrick J. Conway essay takes a second look at the interna-

tional trade theory. He agrees with the thesis developed by Kenen in his 1965 article 'Nature, Capital and Trade'. Kenen suggested that international trade theory might best be understood if the factor capital were viewed not as a direct input into production but rather as an activity that improves land and labour services. This in effect means an extension of the standard 2 x 2 Heckscher-Ohlin model to incorporate the third factor. Efforts to update that formulation within a general 3 x 3 theoretical structure, Conway shows, reinforces Kenen's conclusion that neither factor price equalization nor identical technology is a necessary result of international trade. The asymmetric role played by capital in production process is not fully explored in the emergence of trading patterns as yet and could form a part of the agenda for future research. This, the author says, will be particularly rewarding given the improved and more complex role of capital to many sectors. Arvind Pangariya tries to bring in focus the history, the analytics and the implications of the Meade-Model of preferential trading areas. He finds the post-Meade literature in error in two important aspects. The post-Meade literature attributes Meade model with the assumption that union members are price takers in the world market. This was first made by Lipsey though without explicit recognition, and later adopted by virtually all analysts. Pangariya is of the view that Meade model in fact considers explicit the effects of the changes in the international price of the products on which tariff preference is granted. The results he obtained for welfare implications for the Union or an individual Union member under fixed terms of trade are similar to those obtained by Meade under flexible terms of trade. Pangariya proves that the problem of world welfare can be analysed by solving the model in terms of expenditure function rather than by ex-post analysis. Since Mead's assumption of complete specialisation is arbitrary further research towards reformulating the Meade model in terms of Dixit - Stiglitz - Krugman model of monopolistic competition would, he feels, be rewarding.

The relationship between a country's openness in terms of foreign trade and its government expenditure is a largely neglected area in the literature. David Cameron's paper of 1978 show that the best single predictor of the increase in OECD governments'

size between 1960 and 1975 was the economy's openness in 1960 with a correlation co-efficient of 0.78. This study was confined to a small sample limited to 18 OECD countries and therefore raised doubts about the generality of this finding. D. Rodrik takes up this issue in his paper using a larger sample of more than 100 countries. He found openness in the early 1960s to be a statistically significant predictor of the expansion of the government sector over the following three decades. The correlation held both for low and high income samples and existed in all the available data sets including Summers - Heston data on government consumption, World Bank data on broader spending, IMF data on tax revenues and UNESCO's data on public spending on education. The components of government spending closely associated with openness were economically meaningful items, such as education, subsidies, social security and welfare and public investment (and not defense, interest payment and 'other' expenditures). Rodrik's work on estimating a system of equations that treats both government spending and openness as endogenous suggested that the causality runs directly from openness to large size of the government and not vice versa. Further, the relationship between openness and different components of government spending and tax revenue was analysed individually. The distance variable approach confirmed the negative association between geographical distance of a country's trade partners and size of that country's government sector, an evidence of the size of government increasing with international trade integration. The plausible reason for a positive correlation between openness and large size of government sector, the author feels, is that a large public sector serves the sheltering role in very open economies, exposed to significant amounts of external risks. The public sector serves to insulate the economy to some extent from the vagaries of the global market forces and demand for such insulation is greatest in countries most exposed to the rest of the world. A larger government sector can reduce instability in economies that would otherwise experience higher level of volatility due to exposure to external risks. Government and the market are complements and not substitutes for each other. A strong positive association was found between openness and import tax revenue (the Laffer curve for import tariff revenue) and tendency of a more open economy to

rely more on import taxes and less on quantitative restrictions. In the light of these findings it is for further research to understand the channels through which governments have been forced to respond to increase openness and also about the role of the government in todays global economy.

R. Glick and C.G. Wihlborg's article deals with relationship between risk, exchange rate regimes and trade flows. Establishing a clear link between risk, exchange rate regimes and trade flows is fraught with difficulties. Greater exchange rate variability does not necessarily imply a greater exposure to risk. The time variations in the subjective evaluation of risk is difficult to capture. To over come these problems, the authors made use of 'exchange rate flexibility' measure by scaling actual exchange rate variability by a measure of exchange rate pressure eminating from macro-economic shocks. This measure essentially captures the share of exchange market pressure that is not offset by intervention but is allowed to be transmitted into actual exchange rate changes. By using this method the authors estimated the effects of cross-country variation in exchange rate regimés on export and import elasticities. For this purpose data on bilateral trade in manufactures between the U.S. and its 30 largest trading partners, constituting over 80 per cent of the U.S. trade in manufactures, over the period 1980 to 1993 was used. The pooled regression as also the scatter plot analysis showed a positive relationship between export elasticities and the degree of exchange rate flexibility. The U.S. export elasticity increased with the degree of bilateral exchange rate flexibility of the importing country. The total macro-economic risk exporters face decreased with exchange rate flexibility. The conventional presumption that firms face more risk under floating exchange rates and that exchange rate flexibility reduces international trade was not proved by the study. Studying the link between exchange rate risk and trade flows using industry-wise decomposed manufactures trade data, both for across countries and across industries, and adding a few variables to control industry specific characteristic, the authors feel, could be instructive.

Kenen's seminal work of 1994, on exchange rate and invest-

ment linkages was based on industrial countries' experiences. Cinda S. Goldberg's paper takes the topic further and examines the link between exchange rate movements and investment activity in six Latin American countries of Argentina, Brazil, Chile, Columbia, Mexico and Venezuela. It was found that the investment responses to exchange rate changes depend upon producer export shares, degree of reliance on imported inputs into production and effects of sectoral exchange rate pass-through elasticities of domestic sales, export sales or imported input costs. The paper used aggregate investment data because of non-availability of industry specific or sector-wise time series data on real investments. The empirical results were in agreement with the broad mainstream development economists. Export production diversification proved of milder aggregate implication when faced with individual shocks but was found of dubious appropriateness when faced with sharp exchange rate movements. This is because, unlike commodity price movements, exchange rate movements are common to all traded-goods sectors. The revenue elasticities of exchange rate effects were found smallest for Argentina and Mexico while for Chile and Venezuela, the two countries with the least diversified activity, the elasticities were strongest. The net consequences of exchange rate movement on profitability depended on the level of external trade, the producers' ability to influence world market prices for their products and the share of imported inputs into export production. As regards the pass through effect of exchange rate changes, it was one for one in these Latin American countries except Brazil, since over 75 per cent of these countries' import were manufactures. For Brazil where manufacturing imports were closer to 60 per cent of its total imports, the pass through was less than one.

On the subject of optimum currency areas and exchange rate volatility, Bayoumy and Eichengreen's paper examines individual country's choice of exchange rate regime in a framework that allows consideration of systemic as well as country - specific factors. By adopting a historical approach spanning from that under the Bretton Woods, during the transition to generalised floating in 1970s, and in the 1980s, and 1990s when that transition was largely completed, it suggests that evolution of the broader system

of exchange rate has been critically important for individual country's decision in such a choice. The European experience strongly supports the view that international and regional monetary arrangements influence exchange rate outcome. The stability of bilateral exchange rates was found significantly affected not only by the characteristic of the two countries concerned but also by the structure of the global and regional monetary arrangements. The investigation has revealed a robust correlation between observed exchange rate behaviour and OCA variables like a symmetric shocks and the importance of trade and country size. The Optimum Currency Area variables were found relatively more important in the 1970s and 1980s whereas other factors in the 1960s. This was, the authors point out, because in the 1960s, when the currencies stabilized against one another, there was no optimum currency area dilemma as such and stabilizing against one currency facilitated stabilizing against the rest.

The standard theoretical work on optimal currency areas has suppressed the role of market forces. This effectively amounted to ignoring the existence of cross border currency competition. Benjamin Cohen in his paper An Optimum Currency Area Theory has gone beyond the standard theory. He probed into the welfare implications of a currency region for both the home and host countries. In formation of a formal currency area in regions where there were market determined currency regions already in existence, the currency substitution was found depend upon the relative rate of inflation and political stability. Much of the same effect also could be achieved even in the absence of an overt currency substitution provided external financial linkages were sufficiently strong. The effects of tying up of home capital markets to a strong currency abroad Cohen opines, is cededing of domestic monetary management control to a foreign central bank. The gains will be more to the dominant currency, he pointed out, since market forces create a hierarchy of national moneys. All the benefits of reduced adjustment cost resulting from larger currency regions are, however, not likely to accrue to the dominant currency alone. Formation of the currency areas also increases opportunities for extraction of seigniorage, international as well as domestic. Thus, he points out, the implica-

tions of the currency region are much wider than those relating to capital markets or to a few narrowly defined economic policies. A more detailed work is needed for understanding the mutually endogenous roles of governments and markets in determining the overall organisation of currency areas.

Despite the academic concern and discussions about the relationship between trade and employment, the actual effects of trade regimes on labour market adjustments remains largely unexplored. No cross country studies linking changes in the trade regimes with unemployment or wage effects at the aggregate economy-wide level are available. Whitman takes up this issue in his paper on "Labour market adjustment and trade : Their Interaction in Triad" (i.e. in the US, Japan and Western Europe). His empirical analysis found that despite significant differences in institutions and processes of labour market adjustments, greater reliance is placed on external (between firms) as opposed to internal (within - firm) adjustment process and this tends to move the costs of adjustment away from firms and towards workers making them more visible and politically sensitive. Such a phenomenon, particularly when countries are facing labour market difficulties, the author says, leads to an enhanced vulnerability to protectionist pressure, and also makes more difficult the expansion efforts of such regional groups particularly if that involves inclusion of relatively more low wage developing or Eastern European countries since such efforts would call for harmonization or convergence of labour-market policies. Intensified pressure for harmonization of domestic labour market policies could, however, impede the potential benefits of international trade and investments. The author feels that further studies inquiring other vital aspects of the link between nature of structural changes and relative efficacy of different labour-adjustment process could be undertaken.

The book containing essays on the vital aspects of international trade and finance will be an intellectual stimulant to the serious students of the subject. These essays have accorded a rigorous mathematical treatment to many of the problems with which both

academia and practitioners in the field are often confronted with. The book has raised substantial issues for further research work, besides providing a succinct presentation of the current research status in the area of international trade and finance.

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Reserve Bank of India Occasional Papers
Vol. 19, No. 4, December, 1998

India's Exports: An Analytical Study **by Sugata Marjit and Ajitava Raychaudhuri, Oxford University Press, 1997, pp ix + 179, Rs. 350.**

The authors of the book under review set out a meaningful agenda in studying the behaviour of Indian exports during the last three decades or so. Some of the familiar hypotheses relating to Indian exports have been put to statistical tests taking into account the recent developments in exchange rate, incentive structure and market share. The book presents a succinct review of India's trade policy and export performance both in the macro and micro policy setting and in particular, the role of exchange rate in promoting exports. The application of 'high tech' econometric techniques by the authors indicates the long and fruitful association of Sugata Marjit with the Indian Statistical Institute, Calcutta.

The synoptic view of the evolution of India's trade policy, especially during the post-reform period, has been spelt out in the opening chapter of the book. The trade policy reforms put in place since 1991 included, *inter alia*, relaxation of quantitative restrictions on a large number of exportables and importables, elimination of export subsidies and reduction of export and import taxes and adjustment of the exchange rate to more realistic levels. The authors have chosen to provide a descriptive outline of these reforms without sufficient focus on their analytical contents. For example, the initiation of trade policy reforms in 1991 may be considered as a watershed as it represented a paradigm shift in India's trade and exchange rate regimes. The switch over to an exchange rate neutral regime envisaged the adoption of an effective exchange rate for exports (EERx) which is equal to that for imports (EERm). The change resulted in narrowing the gap between profitability of sales in the overseas and the domestic markets. The import substitution or inward-looking strategy which was in vogue prior to 1991 was characterized by a situation where EERm was higher than EERx.

This takes us to the main theme of the book. The authors put forward a view that Indian exports are residual in character, at

least for a number of major exportables (Pp-167). The residual character of Indian exports was a logical outcome of the in-built anti-export bias in the exchange rate regime which was in vogue for about four decades. It has been noted for long that India's loss of overseas market was by and large policy-induced. Textiles are a case in point. After having enjoyed a strong comparative advantage in textile exports India lost valuable ground due to various restrictions that stifled the growth and modernisation of Indian textile industry. While China, Korea, Pakistan and Thailand have increased their shares, India's share had declined through the seventies and eighties. The declining Indian share in world exports of textiles during the period could be explained by the fact that India concentrated on certain quota markets which are relatively stagnant markets.

An interesting issue to which the authors devote their attention in the book is whether price competitiveness is both a necessary and a sufficient condition for promoting exports. Answer to this question is based on a Constant Market Share (CMS) analysis which is negative. Some of the non-price factors, viz., quality of products and timely delivery have been found to be more important than price. The authors point out that export competitiveness may be defined as the capacity of an exporting country, both in terms of price and non-price factors, to improve the exportability of a commodity in the overseas markets. Transaction costs which vary across the sectors are indicative of the incidence of non-price factors. Since transaction costs are by and large reflected in prices, the export competitiveness of an economy hinges critically on the relative prices. Conceptually, export competitiveness is related to factors such as real exchange rate, prices, labour costs, etc.

Needless to mention that commonly used indicator of competitiveness is real effective exchange rate. The authors have adopted Constant Market Share (CMS) analysis to evaluate the export performance of the Indian economy. A *priori*, the CMS approach essentially decomposes export growth into four components: (i) a global market growth factor; (ii) a commodity composition effect; (iii) a market distribution effect; and (iv) a residual competitiveness

effect. An intrinsic weakness of the CMS model is that it can't be used to trace out the direction of chain of causation. Most importantly, it cannot decompose competitiveness effect into price and non-price components.

The authors evaluate the impact of devaluation on exports in the chapter "Micro Foundation of India's Trade Policy". Referring to the exchange rate adjustment of 1991 as a part of economic reforms programme, the authors have erred on the side of pessimism by pointing out that real devaluation has a positive though insignificant impact on exports (Pp 167). Needless to point out that the impact of exchange rate adjustment hinges critically on the fulfilment of Marshall-Lerner condition. Empirical evidence produced in a number of studies have shown the fulfilment of Marshall-Lerner condition in the case of India economy. It is worth recalling that the exchange rate adjustments effected in 1991 did have a significant impact on India's exports during the period 1993-94 through 1996-97. Exports recorded an annual average growth rate of about 20 per cent in dollar terms in the period 1993-94 through 1996-97, surpassing even the previous peak witnessed during 1987-88 to 1990-91.

The chapter "Micro Foundation of India's Trade Policy" deals with a host of issues which include, *inter alia,* the impact of devaluation on exports, the relationship between the firm size and exports and tariffs and volume of trade. That apart, the authors have brought out succintly the indirect impacts of devaluation on the economy. The authors have rightly argued that devaluation reduces the extent of distortion in the foreign exchange market. As far as the firm size and exports are concerned, Indian experience suggests that larger firms prefer to sell in the domestic market with the result that the output of small scale sector is exported. Needless to point out that a bulk of Indian exports is contributed by the small scale sector.

In chapter "Micro Foundation of India's Trade Policy" the authors have raised various issues relating to 'Washington Consensus' which promoted the ideas of unhindered trade with low or zero

tariff, market-determined exchange rates and current account convertibility. Washington Consensus is based on the implicit assumption that there are no non-price barriers and distortions in the flows of trade, investment and technology. The authors feel that the exchange rate has a very limited role to play in a supply-constrained economy like India. It is no doubt true that the importance of supply factors can not be underplayed. It is equally not possible to deny the role of price factors. The impact of exchange rate is diluted, albeit partially, in the context of inflow of foreign capital. Thus, some of criticisms against IMF - World Bank policies are no doubt without substance.

The authors discuss issues relating to foreign trade multiplies in the chapter "Macro Economic Perspectives". The casual link between the GDP and exports has been explored with the application of Granger causality tests. Econometric evidence reported by the authors show that the chain of causation runs from GDP to exports but not vice versa. The hypothesis is, however, contestable, both theoretically and empirically. Prime facie, it was apposite for the authors to examine whether the time series on GDP and exports are co-integrated or not. Perhaps, it is not plausible to apply causalty tests without ascertaining whether the two series are co-integrated or not. The importance of high level of savings and investment has been highlighted by the authors. This has been considered to be an essential condition for the operation of foreign trade multiplier. The argument of the authors loses force in the context of welcome upward shift in the growth trajectory of the Indian economy. This could be explained, as already stated above, in terms of causal link between income and exports. A study conducted by the Indian Institute of Foreign Trade has brought to focus the role of economic growth in export promotion.

The operation of foreign trade multiplier in any economy could hardly be denied. This fact is unmistakably corroborated by the positive impact of exports on GDP of the Indian economy during the period 1994-95 through 1996-97. An average growth rate of 7.5 per cent per annum in GDP in the last three years of the Eighth Plan (1994-95 to 1996-97) could be explained, albeit partly,

in terms of a spurt in income terms of trade. The income terms of trade increased from 283.3 in 1993-94 to 373.1 in 1994-95 and further to 530.3 in 1995-96. Although quantification of the impact of income terms of trade on India's GDP falls beyond the scope of this review its role in the generation of additional income could hardly be underplayed. However, this should not detract us from the fact that the present volume is an invaluable addition to the swelling literature on India's exports.

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