VII FINANCIAL SECTOR EFFICIENCY

7.1   Financial sector efficiency reflects efficiency of both financial markets and financial institutions. Markets are viewed as efficient when market prices faithfully reflect all available information, so that it is not possible for any trader to earn excess profits in a systematic manner, based on the available information. A financial entity, on the other hand, could be viewed as relatively efficient when it offers competing services at relatively lower prices, without exposing it to higher levels of risk. In a competitive market, inefficient institutions are expected to be driven out by efficient ones, unless protected under certain safety nets or bailout measures. With a view to enhancing financial sector efficiency, therefore, it is necessary to not only foster competition among institutions but also to develop a system that facilitates transparent and symmetric dissemination of maximum information to the markets.

7.2   The financial sector reforms in India since the early 'nineties that covered the deregulation of financial markets, advances in technology, growing customer sophistication, stricter regulations and transition to undertaking banking activities under a flexible interest rate and exchange rate environment have generated intense competition among banks, non-banks and other financial institutions in India. Its impact has been felt in terms of competitive pricing of services, narrower spreads and improvement in the quality of services. Competition among financial institutions is also expected to have enhanced efficiency in saving mobilisation, credit allocation and in the provision of a diversified range of financial services. Indian markets have also become more information sensitive and, as a matter of policy, transparent dissemination of quality information on critical economic and financial variables has been accorded high priority. As a result of this, as also the deregulation of financial markets in terms of market forces setting asset prices, the informational efficiency of the markets has improved, which has also helped in the conduct of public policies.

Efficiency of Institutions

7.3   Generating enhanced competition in the banking sector has been an integral part of the overall design for creating a more efficient and stable financial system. Greater competition is sought to be fostered by permitting new private sector banks and more liberal entry of branches of foreign banks. As on March 31, 2000 eight new private sector banks and 42 foreign banks were in operation. In the rural and semi-urban areas, competition is being encouraged through Local Area Banks. Modest diversification of ownership of select public sector banks has helped the process of autonomy and also contributed to strengthening the competitive pressures. Over a period of time, this has resulted in a gradual reduction of spreads (defined as net interest income to total assets) and a tendency towards their convergence across all bank-groups, except foreign banks (Chart VII.1). Reduced spreads have been supported by improved efficiency reflected in a decline in the intermediation costs as percentage to total assets, especially for public sector banks and new private sector banks, due largely to a decline in their wage costs (Table 7.1). At the same time, there has been a gradual
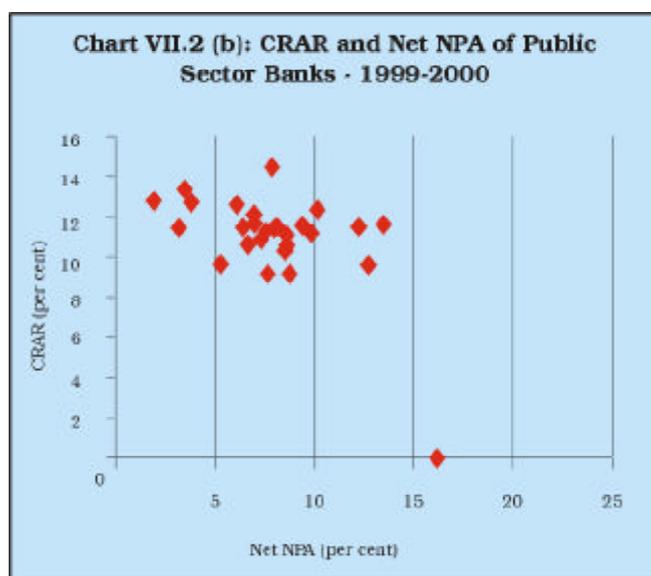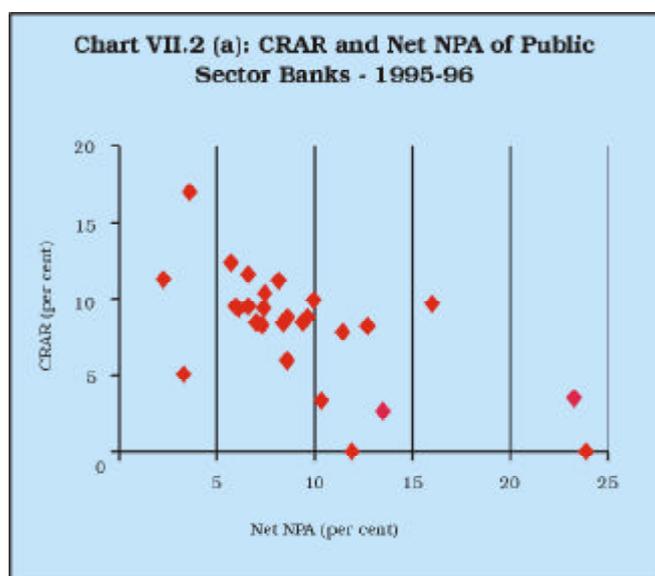

Chart VII.1: Spreads of Scheduled Commercial Banks according to Bank Groups
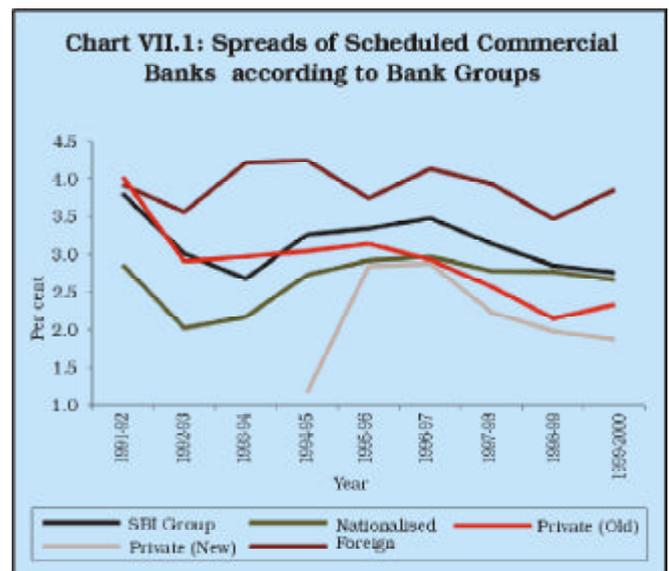
Table 7.1: Bank Group-wise Intermediation Costs and Wage Bill - 1995-96 to 1999-2000

(Per cent of Total Assets)

Bank Group	1995-96	1996-97	1997-98	1998-99	1999-2000
1	2	3	4	5	6
Intermediation Costs					
SBI Group	3.10	2.94	2.68	2.70	2.46
Nationalised Banks	2.93	2.85	2.65	2.63	2.56
Private Sector Banks (Old)	2.60	2.52	2.31	2.26	2.18
Private Sector Banks (New)	1.89	1.94	1.76	1.74	1.42
Foreign Banks	2.77	3.00	2.97	3.59	3.21
Wage Bill					
SBI Group	2.31	2.13	2.01	1.92	1.76
Nationalised Banks	2.14	2.07	1.91	1.93	1.88
Private Sector Banks (Old)	1.70	1.53	1.40	1.41	1.39
Private Sector Banks (New)	0.27	0.30	0.31	0.31	0.28
Foreign Banks	0.98	1.06	0.95	1.01	1.04

improvement in the capital level of the banking sector and on asset quality (Chapter VI). This is evident from the plot of CRAR and net NPAs (as per cent of net advances) of public sector banks for the years 1995-96 and 1999-2000 [Charts VII.2 (a) and VII.2(b)][1]. The improved efficiency and stability of the banking sector as analysed in the previous chapter augurs well for the Indian financial system.

per cent. The same is the case for all new private sector banks (Table 7.2). Among scheduled commercial banks other than foreign banks, only four nationalised banks and four old private sector banks have return on asset ratios up to 0.25 per cent. In contrast, in 1999-2000 as many as 14 out of 42 foreign banks have return on asset ratio up to 0.25 per cent. Since 1993-94, there are indications of improvement in the efficiency of the

Chart VII.2 (a): CRAR and Net NPA of Public Sector Banks - 1995-96

Chart VII.2 (b): CRAR and Net NPA of Public Sector Banks - 1999-2000

7.4 Although the banking industry in recent years has become more competitive, cost reductions have enabled banks to maintain their profitability levels. All the eight banks of the SBI Group have return on asset ratios exceeding 0.50

Indian banking system (Box VII.1). The spreads of scheduled commercial banks declined in the latter half of the 'nineties. The wage bill as percentage of total assets had also declined during this period from 2.05 in 1995-96 to 1.66 in 1999-2000.

7.5 The share of financial institutions (comprising all-India term lending and refinancing

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[1] The CRAR of two banks, which were negative as at end-March 1996 and that of one bank, which was negative as on March 2000, have been set at zero.

Table 7.2: Frequency Distribution of Return on Assets - Scheduled Commercial Banks

Year/Bank Group	Public Sector Banks		Private Sector Banks		Foreign
	SBI Group	Nationalised	Old	New	Banks
1	2	3	4	5	6
1996-97					
Less than and up to 0.25 %	Nil	4	6	Nil	9
Above 0.25% and upto 0.50%	Nil	5	2	Nil	4
Above 0.50%	8	10	17	9	26
1997-98					
Less than and up to 0.25 %	Nil	4	3	Nil	11
Above 0.25% and upto 0.50%	Nil	2	4	Nil	1
Above 0.50%	8	13	18	9	30
1998-99					
Less than and up to 0.25 %	Nil	4	8	Nil	18
Above 0.25% and upto 0.50%	4	5	3	Nil	3
Above 0.50%	4	10	14	9	23
1999-2000					
Less than and up to 0.25 %	Nil	4	4	Nil	14
Above 0.25% and upto 0.50%	Nil	7	3	Nil	4
Above 0.50%	8	8	17	8	24

Note : The Return on Assets (RoA) figure of 0.25 per cent is based on the Reserve Bank Discussion Paper on Prompt Corrective Action.

institutions, state level institutions, investment institutions like UTI, LIC and GIC and its subsidiaries, and other institutions like DICGC and ECGC) in the total assets of banks and financial institutions taken together grew from 26.2 per cent in 1980-81 to 34.5 per cent in 1990-91 and further to 36.0 per cent by 1999-2000. In the recent years, the effect of competition on the efficiency was also in evidence for financial institutions. For all-India financial institutions, the spread declined from 2.25 per cent in 1998-99 to 1.80 per cent by 1999-2000, at which it was almost 100 basis points lower than that for the public sector banks. The wage bill as percentage of total assets at 0.14 per cent was also lower than that of banks. It is, however, necessary to note that the operating environment of banks and financial institutions and their areas of strategic operations are different and, therefore, the ratios may not be strictly comparable.

Box VII.1

Efficiency of Financial Institutions

The concept of efficiency of financial institutions, though interpreted differently in academic literature, broadly represents (i) optimisation of output mix so as to fully exploit the economies of scale and scope, and (ii) optimisation of the input-mix so as to avoid both excessive levels of input usage (technical X-inefficiency) as well as non-optimal relative proportions of inputs (allocative X-inefficiency) (Allen and Rai, 1996). Technical inefficiency has been empirically observed to be the key factor behind weak performance of a financial institution rather than scale and scope economies. In other words, if a financial institution has not fully exhausted its scale economies or has over-expanded to reap diseconomies of scale, then its performance may not show drastic deterioration if it succeeds in reaping technical efficiency. Technical efficiency refers to the ability to produce as much output as possible per unit of input or use as little input as possible to produce one unit of output. Commonly used methods for estimating efficiency include data

envelopment analysis (DEA), free disposable hull analysis, the stochastic frontier approach, the thick frontier approach, and the distribution-free approach. While the first two represent non-parametric techniques, the latter three are parametric in nature. Estimates of efficiency alone may not prove useful unless the sources of different levels of efficiency across financial institutions are identified. Berger and Mester (1997) identified three such sources: (i) differences in the concept of efficiency, (ii) differences in the methodology used, given a particular concept, and (iii) presence of potential correlates – which are partially exogenous but may affect the efficiency level.

Using data for Indian banks for 1994-95, Chatterjee (1997) studied the effect of output expansion from the existing branches as also through opening of new branches. He concluded that Indian banks could reap cost efficiency gains

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by expanding their business at the existing branches. If new branches are opened to expand output, only the small and medium sized private sector banks may prove efficient. Indian banks, thus, appear to possess significant unrealised potential scale economies and can expand their business without expanding their branch network. Sarkar and Das (1997) examined the inter-bank differences in the efficiency levels of banks in India using balance-sheet data for 1994-95 and observed wide variation in the performance among banks based on indicators of profitability, productivity and financial management. In another study covering the period 1992 to 1998, Das (1999) found that banks in India have succeeded in achieving a reduction in their burden of raising working funds. Spreads, however, constitute the driving factor behind profitability of Indian banks and in a competitive environment banks must assign high importance to customer services to become more profitable through higher non-interest income in the form of commissions, brokerages, etc. There is scope for reduction in establishment expenses, particularly wage bills, and mechanisation of banks can enhance profitability of banks. The risk-averse behaviour of the banks in response to the tightening prudential regulations have contributed to the shift in the banks' preference for investments, as opposed to loans and advances. The Indian banking system, however, is gradually getting used to the risk-return trade-off in a liberalised market economy while improving its performance simultaneously. There has been some evidence of convergence in the performance of banks in recent years, with weak banks coming under greater pressures to meet the minimum efficiency standards.

References

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4. Das, A., (1999), "Profitability of Public Sector Banks: A Decomposition Model", *RBI Occasional Papers*, Summer.

5. Sarkar, P.C. and A. Das, (1997), "Development of Composite Index of Banking Efficiency: The Indian Case", *RBI Occasional Papers*, December.

7.6 With regard to profitability-based indicators, the median profit per employee of public sector banks witnessed a significant rise, between the periods 1996-97 and 1999-2000, due largely to a rise in the same in the case of the SBI Group [Table 7.3(a)]. Most of the other bank groups also posted a significant rise in this ratio, the most prominent being in the case of the new private sector bank group. Among other indicators, non-interest income to working funds, which also is reflective of a bank's profit margin, posted a modest increase for the median public sector bank, while the median foreign bank posted a noticeable rise in this ratio [Table 7.3(b)].

7.7 In addition, other earnings/cost-based indicators have also been used to examine the efficiency of banks in the Indian context. Using the ratio of wage bill to total expenses, it is observed that over the last two years, this ratio has remained at a high level for public sector banks, while the same has a remained low for foreign banks and new private sector banks. The return on advances, defined as the interest earned on advances/bills to average advances has witnessed a decline for the median bank and across all bank groups [Tables 7.4(a) and 7.4 (b)].

7.8 Another widely used measure of efficiency

Table 7.3 (a): Profitability-based Indicator of Efficiency of Commercial Banks

Bank Group	Profit per Employee (Rs. '000s)					
	1996-97			1999-2000		
	High	Low	Median	High	Low	Median
1	2	3	4	5	6	7
A. Scheduled Commercial Banks *Of which*						
i. Public Sector Banks* *Of which*	170.0	10.0	35.5	220.0	14.0	64.5
SBI Group	89.0	25.0	38.5	187.0	54.0	104.0
Nationalised Banks*	170.0	10.0	32.5	220.0	14.0	48.0
ii. Old Private Sector Banks $	400.0	11.0	80.0	963.0	9.0	91.0
iii. New Private Sector Banks	2,900.0	200.0	800.0	1,323.0	603.0	937.0
iv. Foreign Banks $	9,700.0	0.0	700.0	3,199.0	0.0	703.5

* Excluding 3 weak banks.
$ Excluding banks with negative figures.

Table 7.3 (b): Profitability-based Indicators of Efficiency of Commercial Banks

(Per cent)

| Bank Group | Non-interest Income to Working Funds | | | | | |
| | 1996-97 | | | 1999-2000 | | |
	High	Low	Median	High	Low	Median
1	2	3	4	5	6	7
A. Scheduled Commercial Banks						
Of which						
i. Public Sector Banks	1.69	0.80	1.27	2.41	0.78	1.34
Of which						
SBI Group	1.69	1.06	1.58	2.41	1.31	1.78
Nationalised Banks	1.37	0.80	1.22	1.79	0.78	1.25
ii. Old Private Sector Banks	2.48	0.49	1.31	3.08	0.59	1.74
iii. New Private Sector Banks	3.40	0.75	2.00	3.88	1.46	2.12
iv. Foreign Banks	10.06	-2.04	1.47	21.75	-1.28	2.25

| Bank Group | Spread to Total Assets | | | | | |
| | 1996-97 | | | 1999-2000 | | |
	High	Low	Median	High	Low	Median
A. Scheduled Commercial Banks						
Of which						
i. Public Sector Banks	4.28	0.71	3.21	3.86	1.61	2.86
Of which						
SBI Group	4.28	3.18	3.66	3.86	2.27	3.10
Nationalised Banks	3.89	0.71	3.17	3.07	1.61	2.73
ii. Old Private Sector Banks	4.65	1.29	3.05	3.85	1.24	2.39
iii. New Private Sector Banks	4.11	2.09	2.60	2.62	1.36	1.78
iv. Foreign Banks	7.79	0.75	4.27	7.87	-0.47	3.43

Table 7.4 (a): Earnings/Cost-based Indicators of Efficiency of Commercial Banks

(Per cent)

| Bank Group | Wage Bill to Total Expenses | | | | | |
| | 1998-99 | | | 1999-2000 | | |
	High	Low	Median	High	Low	Median
1	2	3	4	5	6	7
A. Scheduled Commercial Banks						
Of which						
i. Public Sector Banks	27.28	13.06	21.90	27.84	10.65	21.46
Of which						
SBI Group	26.96	16.96	24.90	27.84	18.75	21.74
Nationalised Banks	27.28	13.06	21.13	27.16	10.65	20.65
ii. Old Private Sector Banks	25.82	3.36	14.28	25.02	4.29	14.61
iii. New Private Sector Banks	6.94	1.99	3.50	8.89	2.02	3.21
iv. Foreign Banks	58.06	3.21	10.81	39.78	3.38	10.29

| Bank Group | Operating Profits to Total Assets | | | | | |
| | 1998-99 | | | 1999-2000 | | |
	High	Low	Median	High	Low	Median
A. Scheduled Commercial Banks						
Of which						
i. Public Sector Banks	2.34	-0.76	1.39	2.85	0.10	1.52
Of which						
SBI Group	2.34	1.39	1.84	2.85	1.47	2.03
Nationalised Banks	2.06	-0.76	1.11	2.54	0.10	1.22
ii. Old Private Sector Banks	2.42	-0.95	1.10	3.19	0.06	1.74
iii. New Private Sector Banks	2.90	1.01	1.78	3.29	1.25	1.87
iv. Foreign Banks	12.89	-27.32	2.40	7.23	-9.75	2.93

Table 7.4 (b): Earnings/Cost-based Indicator of Efficiency of Commercial Banks

| Bank Group | Return on Advances (per cent) | | | | | |
| | 1998-99 | | | 1999-2000 | | |
	High	Low	Median	High	Low	Median
1	2	3	4	5	6	7
A. Scheduled Commercial Banks						
Of which						
i. Public Sector Banks	14.42	10.87	12.28	14.99	8.40	11.84
Of which						
SBI Group	14.42	10.96	12.28	13.67	10.59	11.62
Nationalised Banks	13.84	10.87	12.44	14.99	8.40	11.86
ii. Old Private Sector Banks	16.61	11.03	13.84	16.18	10.16	13.38
iii. New Private Sector Banks	19.30	12.07	13.87	14.26	10.24	11.84
iv. Foreign Banks	28.44	1.74	14.38	22.63	5.16	13.04

is the cost-income ratio. Simply defined, it is the ratio of operating cost (non-interest expense) to net total income (total income less interest expense). Bank group-wise figures of this ratio reveals that both the SBI Group and the nationalised banks witnessed a decline in the ratio, which is an indicator of increased efficiency (Table 7.5). The ratio has, however, witnessed an increase in respect of the other bank groups indicating a tendency towards gradual convergence of efficiency between the public sector bank group on the one hand, and other bank groups, on the other. However, the ratio is quite high by international standards and would need to be lowered further to improve efficiency (Chart VII.3).

7.9   In India, application of technology varies across different bank groups. Generally, public sector banks tend to use more labour intensive technology, while new private sector banks and foreign banks use relatively capital-intensive technology. The past history of these bank groups and the entry of new private sector banks into these groups have influenced the varying capital intensity in these groups. Historically, the bank groups use divergent input mix and have different goals and objectives. For example, while foreign banks have a greater concentration in the metropolitan areas,

public sector banks have penetrated into rural and semi-urban areas. The possibility of exhausting branch level economies of scale in a public sector

Chart VII.3: Cost-Income Ratio of Bank Groups: 1995-96 to 1999-2000
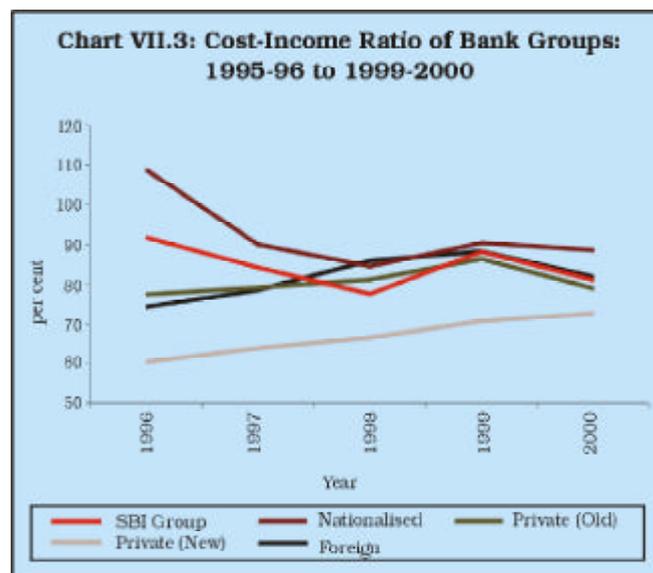
bank is expected to be quicker than that for a foreign bank. Hence, instead of analysing economies of scale for the scheduled commercial banks as a whole, economies of scale for various bank groups need to be studied separately.

Table 7.5: Bank Group-wise Cost-Income Ratio

(Per cent)

Bank Group	1995-96	1996-97	1997-98	1998-99	1999-2000
1	2	3	4	5	6
SBI Group	91.8	84.2	77.6	88.1	81.0
Nationalised Banks	108.9	90.0	84.5	90.4	88.6
Private Sector Banks (Old)	77.5	79.2	81.2	86.3	79.0
Private Sector Banks (New)	60.4	64.0	66.6	70.7	72.6
Foreign Banks	74.2	78.6	85.9	88.3	81.9

7.10 A majority of studies relating to Indian banks, however, concern public sector banks (nationalised banks and banks belonging to the State Bank group) exclusively, in view of their dominance - accounting for four-fifths of the assets of the commercial banking system (excluding regional rural banks). A recent study has adopted the intermediation approach in examining the overall efficiency – technical, allocative and scale - of all public sector banks which operate under the same regulatory framework and are subject to same social obligations[2]. The study decomposed overall efficiency into allocative efficiency and technical efficiency; with the latter further decomposed into pure technical efficiency and scale efficiency. It was found that the overall efficiency declined in the immediate post-nationalisation period of 1970-78 and remained unchanged thereafter (up to 1990). The study also noted fluctuation in technical efficiency during 1970-90 – improvement up to 1978 followed by decline in 1984 and improvement thereafter – entirely due to pure technical efficiency, with the scale efficiency remaining almost constant.

7.11 During the period 1990-96, the overall efficiency exhibited a slide as decline in technical efficiency-both pure technical efficiency and scale efficiency-was not offset by improvements in allocative efficiency. It was observed that the improvement in allocative efficiency was due to ushering in of financial sector reforms. A disaggregated analysis indicates that the deterioration in technical efficiency of public sector banks as a whole was primarily accounted for by four nationalised banks. These banks exhibited a sharp deterioration in the pure technical efficiency component following the introduction of prudential accounting norms of asset classification, income recognition and provisioning which sharply increased their provisioning requirement, causing severe dent on operating as well as net profits. The sharply increased provisioning requirement mainly reflected the surfacing of the stock-pile of non-performing assets accumulated primarily in the period prior to 1991-92. The marking to market of a progressively higher proportion of Government securities since 1992-93 also necessitated a higher order of provisioning in

respect of a few banks. Consequently, the expected growth in the operating margin was not in line with the growth in deposits which gave rise to the underutilisation of the input, *viz.,* deposits. Significant asset-liability mismatches also adversely affected on technical efficiency.

7.12 Developments in the subsequent period indicate that a majority of the public sector banks have been able to progress considerably towards the direction of passing the 'acid test' of achieving competitive efficiency. They have been actively engaged in overcoming the challenges of progressively conforming to the international best practices in various areas. The forces of competition are compelling banks to optimise resource use to attain pure technical efficiency and choose the optimal firm size including the quantity of various inputs and outputs so as to reap the maximum economies of scale/scope.

Efficiency of the Rural Credit System

7.13 The efficiency of the financial system also depends to a substantial extent on the efficiency of the rural credit delivery system. While these issues have not been covered at length in this report, the Report on Trend and Progress of Banking in India 1999-2000, documented the developments in detail. However, it may be added here that several weaknesses remain in the rural credit delivery system. For instance, the credit co-operative system is plagued by high transaction costs. The organisational structure of co-operative credit system consisting of separate wings for providing short and long-term credit and multiplicity of tiers have contributed to these high costs.

7.14 Transaction or management costs and costs associated with credit risks are required to be met out of the interest spread available. Low interest spread/margin is affecting the credit co-operatives. As at end-March 1998, the overall net margin available to State Co-operative Banks (StCBs) ranged between 0.29 per cent (Gujarat) and 2.03 per cent (Andhra Pradesh). In the case of Central Co-operative Banks (CCBs), it ranged from 0.11 per cent (Andhra Pradesh) to 2.28 per cent (Himachal Pradesh). The position at the level of Primary Agricultural Credit Societies was more disturbing with the available information indicating that the net margins ranged from (-) 3.80 per cent (Jammu and Kashmir) to 0.40 per cent (Madhya Pradesh). At the level of Primary

[2] Das, A., (1997), 'Technical, Allocative and Scale Efficiency of Public Sector Banks in India', *RBI Occassional Papers*, 18, June-September.

Co-operative Agriculture and Rural Development Banks (PCARDBs), the same ranged from (-) 1.93 per cent (Madhya Pradesh) to 1.53 per cent (Tamil Nadu).

7.15   To ensure the viability of co-operative banks, it is necessary to charge such rates of interest on their loans and advances as will cover the cost of raising funds, transaction and risk costs. Consequently, in view of the recommendations of the Narasimham Committee (1991), the StCBs and CCBs were given freedom from the interest rate regulations in regard to deposits and advances from October 1994 subject to the prescription of floor lending rate of 12 percent. Likewise State Co-operative Agriculture and Rural Development Banks (SCARDBs)/PCARDBs were also given the same freedom from August 1995.

7.16   The poor recovery of loans, coupled with

high transaction cost and lower level of loan business, results in losses in large amounts and thus, low financial viability. The total losses increased from Rs.440 crore in 1997-98 to Rs.498 crore in 1998-99 in the case of short-term co-operative institutions, and from Rs.120 crore to Rs.137 crore in 1998-99 in the case of long-term institutions. Many of these institutions have accumulated losses, which outstrip their net worth.

Efficiency of Financial Markets in India

7.17   There is some evidence that on the stock market and the foreign exchange market in India are becoming informationally more efficient than before. The concept of market efficiency, however, has often been differently interpreted and alternative empirical tests have been applied to assess the efficiency of a market (Box VII.2).

Box VII.2
Market Efficiency

Three commonly discussed forms of market efficiency are found in the literature. Weak form efficient market hypothesis suggests that current price of any asset reflects all information embodied in the past history of the asset price itself. Semi-strong form efficient market hypothesis states that all publicly available information such as financial statements, strategy and past history, *etc.* is fully reflected in the current price of the asset. Strong form efficient market hypothesis advocates that all public and private information is fully reflected in the price and, therefore, even the agents with inside information cannot constantly beat the market. The underlying assumptions of efficient markets in fact make it difficult to test their empirical relevance. The assumptions include: (a) large number of rational, profit maximising investors who actively participate in the markets based on informed analysis and valuation, (b) flow of information is symmetric, random and unrelated over time, and (c) market agents react quickly and accurately to any new information, causing the prices to instantly reflect any new information.

Empirical tests of weak form efficiency are generally done through the autocorrelation and variance ratio tests. Non-parametric runs-tests are also used. Event studies help in empirical analyses of semi-strong form of efficiency. Comparative analyses of the performance of different class of market participants help in evaluating the relevance of strong form efficiency. The most common test of weak form efficiency is the random walk hypothesis which states that successive price or return changes are independent over time and that the actual price hovers around a fundamental value. Campbell, Lo and Mackinlay (1997) define three types of random walk (RW) models: RW1 assumes identically

and independently distributed (i.i.d.) increments, RW2 assumes independently and not identically distributed increments (i.n.i.d.), and RW3 assumes uncorrelated increments. Given that emerging market returns on assets generally exhibit non-normality and heterosecdasticity, RW3 tests using autocorrelation and variance ratio tests are commonly applied. RW1 also assumes that the increments are uncorrelated but such increments need not be independent because squared increments may be correlated. In practice, market efficiency test is essentially a test of a joint hypothesis. According to Fama (1965), market efficiency and asset pricing represent an inseparable joint hypothesis and, therefore, any inefficiency observed on the basis of empirical tests may actually be the result of wrong models used for pricing of assets and determination of returns. For example, besides the widely known Capital Asset Pricing Model (CAPM), P/E ratio, market capitalisation, book to market, small versus large, credit ratings *etc.* have been used to explain equity returns. However, if stock returns can be predicted on the basis of these factors, then the market cannot be characterised as informationally efficient.

Efficiency of the foreign exchange markets is contingent upon forward premia serving as an unbiased predictor of future spot rate changes. Excess returns prevail if that is not the case. The existence of excess returns in the foreign exchange markets has been one of the most intractable puzzles in the international finance literature. With the exchange rate getting primarily getting determined in the market, the issue of foreign exchange market efficiency has assumed importance for India in recent years. The trading in the forward segment has

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picked up since 1994 making the alignment of the term structure of forward premia an important issue.

Evidence for recent years suggests that unlike in the case of the most developed countries, informational efficiency is not observed in the Indian foreign exchange markets. However, there is some evidence of such efficiency at the short-end of the market. Joshi and Saggar (1998) using monthly data, covering both pre and post-liberalisation period, note that Indian forex markets are not efficient, that forward premia are persistent and that volatility of expected depreciation is larger than implied excess returns.

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7.18 Standard random walk based tests of efficiency indicate that the Indian equity market may not be efficient. The stock returns series is non-stationary and exhibits persistence (Chart VII.4).[3] However, there is growing evidence that the Indian stock market is showing improvement in efficiency. The stock market has become more liquid. With the establishment of National Stock Exchange (NSE) and various other reform measures, the institutional mechanism has undergone significant changes to minimise the possibility of manipulations. With the emergence of portfolio management activities by banks, mutual funds and other non-bank financial institutions, the information content of these securities has improved. With electronic order matching, the transaction cost in stock exchanges has come down considerably.
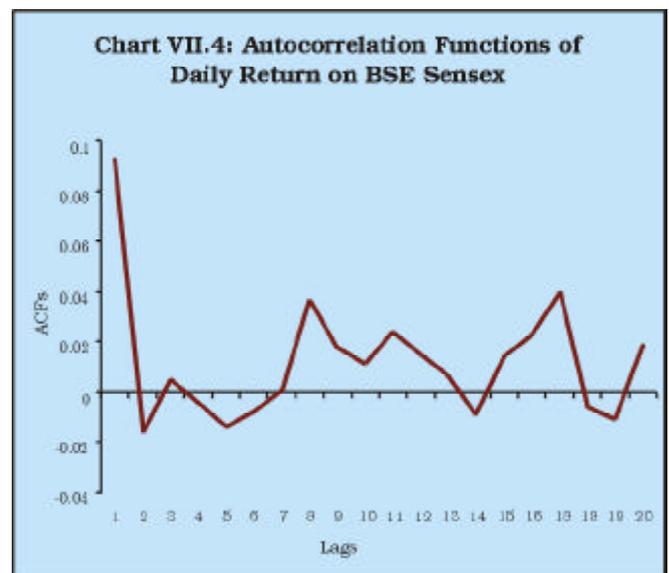
7.19 The foreign exchange market has also become relatively more efficient. Efficiency tests using daily spot and forward exchange rates for the recent period indicate that at the short end of the market, particularly for one month, the Indian forex market exhibits parametric efficiency. Improvements in informational efficiency of the markets may, however, be constrained by the

Chart VII.4: Autocorrelation Functions of Daily Return on BSE Sensex

presence of noise traders in both the stock and the forex markets (Box VII.3).

7.20 Several steps have been initiated to improve information collection and dissemination in India so as to enhance informational efficiency of the markets. The Government of India has constituted a National Statistical Commission - NSC (Chairman: Dr. C. Rangarajan) in order to (i) examine critically the deficiencies of the present statistical system - in terms of timeliness, reliability and adequacy, (ii) review the existing legislations for collection of statistics, (iii) examine the need for instituting statistical audit of the range of services provided by the Government and the local bodies, and (iv) recommend measures for correcting the deficiencies and for revamping the statistical system. The NSC has since set up seven sub-groups

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[3] The first order autocorrelation coefficient (estimated as the slope of the regression of daily return on BSE Sensex on one period lagged return) at 0.093 (with t = 6.02) indicates that the BSE daily returns are autocorrelated, and therefore time dependent. The autocorrelation coefficients (for 20 lags) also show that the return series is not stationary (Graph III.14) and the Box Pierce Q statistics reject the null hypothesis that all the autocorrelation coefficients are zero. The variance ratios also validate the presence of significant first order autocorrelation.

Box VII.3

Noise Trader Risk and Professional Arbitrage

One of the reasons why financial markets may not be efficient is the presence of noise traders. The case for efficient market hypothesis (EMH) exists on three suppositions. First, financial market participants are assumed to be rational in setting their price expectations. However, it is not generally realised that the EMH does not depend on this supposition for its survival. Realistically, not all agents in any financial markets can be expected to be rational. Second, to the extent some investors do not behave rationally, their trades cancel each other out. Third, irrational trades do not off-set each other, but the asset prices still get efficiently determined as the impact of these irrational trades are wiped out by gains by the professional arbitrageurs. Arbitrageurs by making simultaneous purchase and sale of the same, or similar, security in two different markets to book profits from the price differential in the two markets play a vital role in ensuring market efficiency. For instance, by buying underpriced security and selling short another similar security they are able to hedge risks, in the process correcting the underpricing in a fairly short-run.

Arbitrage is a common practice in financial markets and yet, empirical support for EMH is limited. As Black (1986) points out, a large segment of traders are unsophisticated and trade on noise rather than information on fundamentals. These noise traders sell winning stocks or hold losing stocks and fail to diversify risks because they react to irrelevant information. Odean (1998) examines the proven irrationality of investors not to sell stocks at losses, specially after slump. However, otherwise, short of correct information on fundamentals, noise traders do not choose to adopt passive trading opportunities. They may take trading positions that are very different from those that may be rationally set under the Neuman-Morgenstern framework (Kahneman and Riepe, 1998). They may systematically take positions that are inexplicable in terms of Bayesian probability theory. They may not fully factor in all information based on past prices and returns and instead take a short history in setting their trade quotes. The short history may have a high element of chance and may not fit the true model for the financial

markets. It is because of this short-history that investors hold more bonds and less of equities in several countries (Benartzi and Thaler, 1995). This could be a possible explanation for Mehra-Prescott equity premium puzzle.

Psychological factors reflected in investor sentiments and heuristic beliefs are important elements in noise trading, specially so in stock and forex markets. Biases, rumours, following the errors in beliefs that some time take the shape of herd mentality are more common in the market place than what the pure theorists accept. It is only recently that economists as part of behavioural finance are studying these aspects. While at least some arbitrageurs can be expected to be rational, their impact in financial markets can be constrained by limited and risky arbitrage opportunities in the absence of sufficiently good substitute securities. Also, when investor sentiments rule the roost, professional arbitrageurs' ability to lean against them becomes limited. In several such cases, the rational arbitrager chooses to trail the noise traders. He finds arbitrage risky on account of uncertainty attached to investor sentiments that makes future prices unpredictable. Agency costs involved in arbitrage further reduce arbitragers' abilities to lean against the market trend. Incentive contracts for fund managers typically penalises losses with a rather limited profit sharing, except that in cases of hedge funds.

References

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3. Kahneman, D. and M. Riepe, (1998), "Aspects of Investor Psychology", *Journal of Portfolio Management*, 24.

4. Odean, T., (1998), "Are Investors Reluctant to Realize Their Losses?" *Journal of Finance*, 53.

on statistics pertaining to various sectors of the economy and these groups have prepared technical papers on their respective areas. It is expected that the information gaps and related statistical issues in respect of various markets would be addressed comprehensively by the Group. India is one of the initial members to have subscribed to the Special Data Dissemination Standards (SDDS) of the IMF. Recognising the importance of generation and dissemination of information on a level comparable to international standards so as to facilitate better functioning of markets and also to consider applicability of international standards and codes to Indian conditions, a Standing Committee on International Financial Standards and Codes was

constituted by the Reserve Bank in December 1999. Ten advisory groups have been appointed by the Standing Committee to assist the Committee in diverse areas like accounting and auditing, data dissemination, securities market regulation, corporate governance, payment and settlement systems, banking supervision, transparency of monetary and financial policies, insurance regulation, fiscal transparency, and bankruptcy laws (See Box VI.5, Chapter VI).

Payment System and Efficiency

7.21 The operational efficiency of a financial system hinges critically on minimising transaction costs through the institution of a well-functioning

payment system. The Reserve Bank has, in recent years, initiated payment system reforms. It has facilitated orderly development of modern payment and settlement systems, focusing on commercially important centres which account for 65 per cent of the banking business in terms of value. The Reserve Bank's initiatives place emphasis on three broad inter-related heads, *viz.*, (i) development of an institutional framework to oversee payment system, (ii) operationalisation of information technology applications, thereby improving functionality of financial system, and (iii) institution of satellite-based and terrestrial-based communications infrastructure and providing for adequate bandwidth.

7.22   The Reserve Bank constituted a Payment System Group (PSG) in 1998 dedicated to various aspects of the payment system to oversee the institution of appropriate information technologies that draw on cross-country experiences and are consistent with our objectives of financial policies. The National Payments Council - NPC (Chairman: Shri S.P. Talwar) was also constituted as the apex body to co-ordinate reforms in payment and settlement in May 1999, along with five permanent task forces. These are (i) monetary policy and related issues, (ii) oversight of payment and settlement systems, (iii) legal issues, (iv) technology related issues and (v) issues relating to systems and procedures, supervises policy initiatives and guidelines for strengthening the payment and settlement system, including a time bound implementation of the Real Time Gross Settlement (RTGS) system. The Reserve Bank's Committee on Technology Upgradation in the Banking Sector (Chairman: Dr. A.Vasudevan) has laid out an agenda for future reforms in the technological environment for banking in India. Among others, the Indian Financial Network (INFINET) User Group acts as a bridge of understanding between the Reserve Bank and commercial banks.

7.23   The sharp increase in paper-based financial transactions is evident from the fact that the cheque clearance as a proportion to GDP is estimated to have reached over 403 per cent in 1999-2000 as against 350 per cent in 1998-99. This is partly reflective of Magnetic Ink Character Recognition (MICR) cheque clearing process, introduced in the 'mid-eighties and operating in 12 cities in 1999-2000. Other initiatives include introduction of electronic funds transfers through the inter-city RBI Electronic Fund Transfer (EFT) scheme (extended to 29 scheduled commercial banks, including the 27 public sector banks in

1999-2000, with monthly transactions amounting to Rs.5 lakh in 1998-99) and the intra-city Electronic Clearing Service (ECS) (extended to 8.4 lakh transactions valued at Rs.301.87 crore for debits in 1999-2000). In addition, initiatives such as inter-bank electronic payments system, clearing bank for extension of Delivery versus Payment (D*v*P) mode of trading in government securities, spread of automated teller machines by almost all major banks and putting in place shared payments network system termed as SWADHAN in Mumbai have also been undertaken. The Reserve Bank has also taken initiatives to introduce smart card technology.

7.24   The Reserve Bank introduced the INFINET in June 1999, jointly with public sector banks and the Institute for Development and Research in Banking Technology (IDRBT) at Hyderabad. It is a wide area based satellite communication and terrestrial lines network using VSAT technology, and is a critical precursor to an efficient telecommunication backbone for the banking and financial sector. The INFINET connectivity would be extended from the present 439 VSATs to 5,000 VSATs in the long-run, with augmented transponder capacity. As the INFINET depends critically on the messaging systems in place, the Reserve Bank set up a Working Group on Design of Message Formats, which submitted its report in October 1999, on issues relating to designing message formats relating to government transactions, currency chest transactions and open market operations. The state-of-the-art year 2000 compliant IBM S/390 mainframe systems with imaging capability (or faculty) were operationalised at the National Clearing Cells in four metropolitan cities in July-October 1999 to replace the existing MICR cheque processing system. In non-MICR centres, magnetic media based clearing was introduced during 1999-2000.

7.25   The payment system reforms crucially hinge on the institution of a full-fledged RTGS, in line with international best practices (Table 7.6). Apart from providing a real time fund settlement system domestically and internationally, the RTGS provides an effective risk control strategy for pre-empting domino effects of individual defaults. The Working Group on Operational and Technology Issues constituted by the Indian Banks Association in 1998 made several recommendations in this regard. The requisite infrastructure, in terms of the communication backbone, is being put in place along with the development of the Payment System

Table 7.6: RTGS in Select Developed Economies

Country	Name of the RTGS System	Owner/ Manager	No. of Participants	Processing	Settlement	Membership
1	2	3	4	5	6	7
Belgium	ELLIPS	B+CB	103	RTT	RTGS	RM
France	TBF	CB	216	RTT	RTGS	O
Germany	ELS	CB	2,773	RTT	RTGS	O
Italy	BI-REL	CB	769	RTT	RTGS	O
Japan	BOJ-NET	CB	429	RTT	RTGS #	RM
Switzerland	SIC	B+CB	288	RTT	RTGS *	RM
UK	CHAPS	B	434	RTGS**	N	RM
USA	Fedwire	CB	10,034	RTT	RTGS	O

* Combination of large-value system and retail system.
** Changed to RTGS from April 1996.
\# The system has been designed to allow participants to enter funds transfer instructions continuously, in which case the settlement takes place on the central bank's books immediately. It is however, also used to settle on a net basis.
B : Banks; CB: Central Bank; N: Multilateral Netting; RTT: Real-time Transmission.
O : Open membership (any bank can apply). RM: Restricted Membership (subject to criteria).
Source: Statistics on Payments System in the Group of Ten Countries, February 2000.

Generic Architecture Model for both domestic and cross-border payments. Pending the institution of a full-fledged RTGS system, the Reserve Bank is implementing a Centralised Funds Management System (CFMS), as an intermediate service facility, which would be implemented in phases to provide back-office support and funds transfer. As part of this strategy, the centralised funds inquiry system would now enable consolidation of banks' current accounts across all branches of the Reserve Bank.

7.26   With the smooth transition to Y2K dateline, the stage has been set for reinforcing efforts to integrate the financial markets and improve the systemic stability and efficiency. The approach should continue to be to avoid disruptions that may occur from any big-bang strategy. What is needed, however, is to implement the conceived changes in the financial system and to put in place supportive measures to enforce transition of the financial system along competitive and efficient lines.

7.27   With the on-going efforts to revitalise the payment system and structure it along modern lines (with the system being largely run through electronic media), it would be possible to make more rapid strides towards connecting various financial market segments. This would help promote informational efficiency in financial markets, align prices and return on various financial assets on an efficient basis, reduce risks

and prevent fraudulent practices and help improve financial integration. The RTGS could facilitate further financial innovation as new cash management products could emerge. Since RTGS transactions would be collateralised, repo activity could widen in terms of number of players as well as the term structure itself, helping emergence of benchmark term rates in the process. The payment system cannot be looked at in isolation, but needs to be developed in tandem with development of other segments of the financial markets.

7.28   Public ownership of banks, while contributing to systemic stability, has thrown a challenge to the integrity of the organisational structure in the banking system to improve the competitive provision of financial services. The changes brought about in the banking structure since 1992-93, when the Reserve Bank granted 'in-principle' approval for the establishment of new banks in the private sector, have helped to restructure the industry on more competitive lines. Provision for private shareholding in public sector banks, blurring up of distinctions among providers of various financial services and increasing integration of various market segments have generated greater competition. However, there is a scope to improve the markets further, especially the debt and the forex markets, so that the financial entities are able to manage their risks more effectively.