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Measurement of Efficiency of Banks in India

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Introduction:

The opening up of the financial sector in 1990 followed by RBI's reform program[4] which intended to create an viable, competitive and efficient banking system in India had resulted in entry of many private banks both Indian as well as foreign banks and increase competition among the commercial banks in India. Between the years 1991-97 there ware a greater inflow of 21 foreign banks and 9 private banks in the Indian banking. In 1998 the Cash Reserve Ratio (CRR) was raised to 9% (effective as March 2000) with government securities given a 2.5% risk weight to begin reflecting interest rate risk. On-site supervision of banks was introduced in 1995, and CAMELS system of annual supervision was introduced in 1997, and in 1998, RBI judged that this system can fully met 14 of the 25 Basel Core Principles of Supervision and was implementing compliance with the other 11 core principles. In this process, by 1997-98, most of the financial market was liberalized. In 1999, Vasudevan committee made an initiative to the beginnings of a strategy for

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[4] RBI has implemented this reforms program in two phases. The first phase of reforms in 1991, focused on modification in the policy framework, improvement in financial health through introduction of various prudential norms and creation of a competitive environment. The second phase of reforms in 1997, targeted strengthening the foundation of banking system, streamlining procedures, upgrading technology and human resources development and further structural changes and help them move towards achieving global benchmarks in terms of prudential norms and best practices.

computerization of the public sector banks. At this juncture the performance of banks has become a major concern to planners and policy makers in India, since, the gains of real sector economy depend on how efficiently the financial sector performs the function of financial intermediation. In this regard, the present study threw a light on this issue.

From the beginning, the Reserve Bank of India (RBI) and Government of India has been constituting committees for study, to make banking sector more viable and efficient. Such studies include: Luther Committee (1977), PEP Committee (1977), Sukhmoy Chakravarty Committee (1985), Pendekhar Working Groups (1982-83), Ahluwalia Committee (1985), Padmanabhan Working Group (1991), Narasimham Committee (1991,98) and Verma Committee (1999). The major suggestions given by the above committees are: invited reforms in the banking sector, proposed lowering CRR and SLR, gradual decreasing of interest rates, introduced prudential norms and adoption of flexible exchange rates in current account and also to create a competitive environment internationally in the banks by modification in policy framework with high financial soundness.

In Indian context the whole literature which tries to measure/capture the performance of banks can be divided into two parts based on their methodologies viz., traditional measures and frontier approaches[5]. The major works under traditional measures are: Divitia and Venkatachalam (1978), Angadi (1983), Karkal (1983), Subramanyam (1985), Subramanyam and Swamy (1994 a,b), Das and Sarkar (1994), Hansda (1995) and Das (1999). The major findings of the above studies are; the banking functions are more or less

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[5] The traditional approaches used in the above studies are ratio analysis, regression analysis, Index number approach, taxonomic method, multivariate analysis, translog function etc., and the frontier approaches mainly characterized into two groups i.e., parametric and non-parametric approaches.

uniform, production differences between firms not only with technological improvement but also from competence, there are wide disparities in their measure of performance of bank groups and rural branches are more profit making than urban.

Studies under frontier approaches (that is, Data Envelopment Analysis (DEA) to measure the efficiency of banks in India) are: Noulas and Katker (1996), Battacharya et. al (1997), Das (2000), Satan and Ravisankar (2000), Shanmugam et. al (2001), Mukherjee et. al (2002), Kumar and Verma (2002-03), Satheye (2003), Tapan and Sinha (2004) and Mohan and Ray (2004). Most of the above studies are confined to the Pubic Sector Banks (PSBs) and Private Banks (PrBs). The major findings of the above studies are: (PSBs) are efficient but, still many of the PSBs have improper utilization of resources.

Further, all above discussed studies looked only into the productivity aspect of performance but not on the other aspects viz., profitability, financial management and asset quality, which were focused by the post-liberalization committees' recommendations. And further the studies focused on the efficiency of banking sector after 1997-98 are scanty. Thus, in the light of the above discussion, the objective of the present study has been focused on to estimate the efficiency of commercial banks including public, private and foreign banks operating in India for the period 1999-2000 to 2002-2003 with four indicators i.e., productivity, profitability, financial management and asset quality. Data has been obtained from various issues of Reports on trends and progress on banks in India published by RBI and IBA Bulletins and adopting the DEA methodology.

This paper is organised into four sections. Methodology follows this section. Empirical results are discussed in section III and summary conclusions are given in the final section.

Methodology:

A variety of techniques have been used to study the efficiency of commercial banks. It is found that estimates of efficiency are sensitive to the choice of technique. It is also found that estimate different studies of commercial bank efficiency often reach contradictory findings. This may however be due to the fact that there are differences in the manner in which a banking institution is modelled. The efficiency is a broader concept; it involves optimally choosing the levels, and mixes of inputs and/or outputs. The overall bank efficiency can be decomposed into scale efficiency, scope efficiency, pure technical efficiency, and allocative efficiency. The bank has the scale efficiency when it operates in the range of constant returns to scale (CRS). Scope efficiency occurs when the bank operates in different diversified locations, when the bank maximizes the output from the given level of input, pure technical efficiency occurs. And when bank, chooses revenue maximizing mixes of output, allocative efficiency occurs. However, the technical efficiency is the major criteria for measuring efficacy of banks.

Technical efficiency is defined as a ratio of minimum costs that could have expended to produce a given output bundle to the actual costs expended. Technical efficiency variance between 0-100% and it includes both technical and allocative inefficiency, or errors that result in general oversees of inputs and allocative inefficiency, or in choosing on input mix that is consistent with relative prices. There are four types of technical efficiency estimations

based on different assumptions. They are Data Envelopment Analysis (DEA), Stochastic Frontier Approach (SFA), Thick Frontier Approach (TFA), and Distribution Free Approach (DFA). They differ from one another on the basis of the arbitrary assumptions used to disentangle efficiency differences from random error using a single observation for each firm. We can separate those approaches into two categories based on the parametric and non-parametric.

- Parametric approaches – SFA, TFA, DFA

- Non-parametric approaches – DEA

For the present study, we have used non-parametric approach i.e., Data Envelopment Analysis for measuring the efficiency of banks in India.

Data Envelopment Analysis a non-parametric approach[6] was developed by Charnes et. al (1978) and further extended by Banker et. al (1984). DEA uses the principles of linear programming theory to examine how a particular Decision Making Unit (DMU) like a bank – operates relative to other DMUs in the sample. The method constructs a frontier based on actual data. Firms on the frontier are efficient, while firms off the efficiency frontier are inefficient. Efficiency is measured as the ratio of weighted outputs (*virtual output)* to weighted inputs (*virtual input)* and considers the values between zero and one. An efficient firm does not necessarily produce the maximum level of output given the set of inputs. Further, efficiency means that the firm is a "*best practice"* firm in the taken sample.

Some researchers view banks as producers of loans and deposit accounts (Sherman and Gold, 1985) and measure output either by the number of transactions or by the number

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[6]See, Yeh Quey Jen (1996).

of accounts serviced (Production Approach). Others have argued that output of banks should be measured in terms of the value of loans and inputs are various costs of labour, capital, operations, deposits and other resources (Piyu Yue, 1992) (Intermediation Approach). Unlike the production approach, which focuses on operating cost and ignores interest expense, in the intermediation approach both operating and interest ex-penses are included in the analysis (Berger et al., 1987).

Let us assume that there are 'P' banks in the group and that there are 'N' output variables and 'M' input variables for a bank. Let 'Y_{jk}' and 'X $_{ik}$' respectively denote the jth output and the ith input for the kth bank . j:1, 2, . . N; i: 1 ,2 . . . M; k: 1, 2 . . . , P. The relative efficiency 'E' of the kth bank is then defined as 'E' .

DEA, however, selects the weights that maximize each bank's efficiency score under the conditions that no weight is negative, that any bank should be able to use the same set of weights to evaluate its own efficiency ratio, and that the resulting efficiency ratio must not exceed one. That is, for each bank, DEA will choose those weights that would maximise the efficiency score in relation to other banks. In general, a bank will have higher weights on those inputs that it uses least and on those outputs that it produces most.

The DEA model for a specific bank can be formulated as a linear fractional programming problem, which can be solved if it is transformed into an equivalent linear form in which the bank's input and output weights are treated as the decision variables. A complete DEA solution would require one such linear program to be solved for each bank. In the present study covering 93 banks (i.e 27 public, 30 private and 36 foreign banks

operating in India) for the each ownership of different bank groups of kth bank .k: 1, 2, . . . ; 27 and so on,

The DEA model has certain specific advantages such as, it is a methodology directed to frontier rather than central tendencies. This model is able to identify any apparent slack in input used or output produced and provides insight on possibilities for increasing output and/or conserving input in order for an inefficient decision-making unit to become efficient. And it also takes care of uncovering relationships, which remain hidden for other methodologies, and allows to rank decision-making units (DMUs) according to their technical efficiency scores and to single out the driving forces for inefficiencies.

In the present study we have used the following linear programming model:

$$
\left.
\begin{array}{l}
\min\ imize\ :\theta - \varepsilon\left[\sum_{i=1}^{m} s_i^{-} + \sum_{r=1}^{s} s_r^{+}\right] \\[2ex]
Sub.to : \theta x_{i0} - \sum_{j=1}^{n} x_{ij}\lambda_j - s_i^{-} = 0 \\[2ex]
y_{r0} = \sum_{r=1}^{s} y_{rj}\lambda_j - s_r^{+}
\end{array}
\right\} \qquad \dots\dots\dots\dots (1)
$$

$0 \leq \lambda_j$, S_i^{-}, S_r^{+} $\forall$ i, r and j Where θ is unrestricted in sign.

The y_{rj}, x_{ij} (>0) in the model are constants which represent observed amount of the rth output and the ith input of the jth DMU. DMU$_j$ utilizes 'i' inputs and produce 'r' outputs. One of the j DMUs is singled out of evolution as DMU$_0$. Further details of the programming model have been given in the appendix I.

The problem in equation 1 assumes Constant returns to scale. To calculate pure technical efficiency we can solve the above linear programming problem with additional restriction i.e.,

$$\sum \lambda_j = 1 \ \ldots\ldots\ldots \ (2)$$

which allows the VRS (Variable returns to scale) and it is more flexible in measuring the efficiency of banks. In the present study we adopted a BCC (1984) input oriented[7] model which (i) estimates Pure Technical Efficiency (PTE) at a given scale of operations and (ii) identifies whether increasing, decreasing or constant returns to scale possibilities are present for further clarification.

Data and Estimation:

For the present study data has been obtained from the various issues of Report on Trend and Progress on Banks in India published by RBI and Indian Banks Associations Bulletins from 1999-2003. Time series data from 2000 to 2003[8] is used for the study. The study covers 93 banks – 27 public sector banks, 30 private banks and 36 foreign banks. There are three approaches for measuring and defining outputs and inputs in the banking industry they are intermediation approach, user cost approach, and the value added approach[9]. In this study, we used the intermediation approach, which considers banks as financial intermediaries. As said earlier in this study we measure the efficiency through four indicators they are productivity, profitability, financial management and asset quality. This study totally has consider to explain the above four indicators used 7 inputs and 13 outputs.

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[7] See, Charnes et.al (1994))
[8] Financial year runs from April 1 to March 30. Data for 2000 is for 1999-2000 and so on.
[9] For detailed discussion of the approaches, see Berger and Humphrey et. al (1985, 85, 97)

For measuring *Productivity*, we consider establishment expenses to operating expenses as input, business per branch, business per employee and operating profit per employee are taken as outputs. For *Profitability*, we consider net profit to spread, establishment expenses to operating expenses as inputs and Return on assets, return on equity, net interest income to % change to assets and net profits to deposits are taken as outputs. For *Financial Management*, we consider spread to total advances, NPA to net advances as inputs and average yield on assets, average yield on advances, average yield on investments and capital adequacy ratio has been taken as outputs. And finally for *Asset Quality* we consider Gross NPAs/Gross advances, Net NPAs/Net advances as inputs and Gross NPAs/Total assets, Net NPAs/Total advances are considered as outputs.

Empirical Results:

The table I explains details of the DEA scores of efficiency of four indicators.

Table I
Overall DEA efficiency indicators for the period 2000-2003

Indicator	Bank Group	2000	2001	2002	2003
Productivity	PSB	0.457648	0.505927	0.516059	0.548334
	PrB	0.25683	0.299825	0.294245	0.323439
	FB	0.440134	0.487746	0.516871	0.481646
	Overall Mean	0.38487	0.431166	0.442392	0.45114
Profitability	PSB	0.813349	0.838662	0.882426	0.898332
	PrB	0.883556	0.504013	0.789142	0.602978
	FB	0.652762	0.47491	0.644768	0.730267
	Overall Mean	0.783222	0.605861	0.772112	0.743859
Financial Management	PSB	0.906969	0.924558	0.918859	0.951938
	PrB	0.865086	0.858025	0.850344	0.819002
	FB	0.595039	0.771896	0.790559	0.552213
	Overall Mean	0.789031	0.851493	0.853254	0.774384
Asset Quality	PSB	0.623832	0.682297	0.699809	0.706804
	PrB	0.353423	0.444461	0.461166	0.294626
	FB	0.351567	0.423351	0.271728	0.308458
	Overall Mean	0.44294	0.516703	0.477568	0.436629

The overall mean of productivity range lies between 38 % - 45%, which shows very low technical efficiency. The reasons might be establishment to operating expenses per bank is high comparative to business per branch i e., transaction cost is high. Among all banks public sector banks are relatively efficient compare to private and foreign banks, the main reason for this could be a wide network of branches, inter-connectivity of banks and social responsibility. For private banks it shows inefficiency because its transaction cost seems to be high and mobilization of deposits per employee is declined in the sample period. For Foreign banks, the relative efficiency is more than the private banks, because these banks are enriched in utilization of technological resources and they are operating branches at the global level.

Figure 1
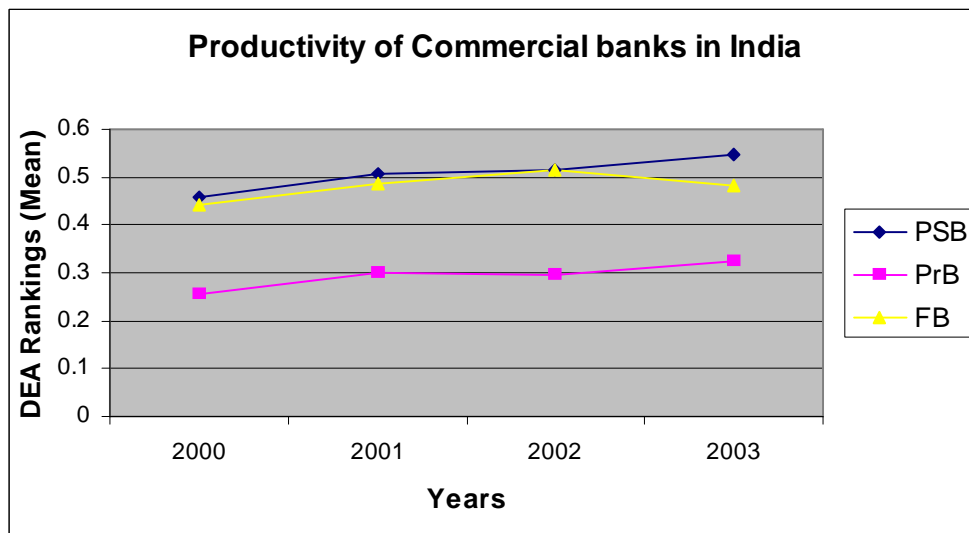
The overall mean of profitability efficiency range between 60%-79%, it indicates high efficiency of banks in terms of profitability. Here Return on Assets (RoA), Return on Equity (RoE), has been increasing and these made net profit to spread and establishment

expenses to operating expenses to minimal level. Among the banks groups, public sector banks are more efficient in terms of profitability because of its RoA, RoE are high and they have more profit to deposits ratio, here the net profits to spread costs are less because of economies of scale.

Figure 2
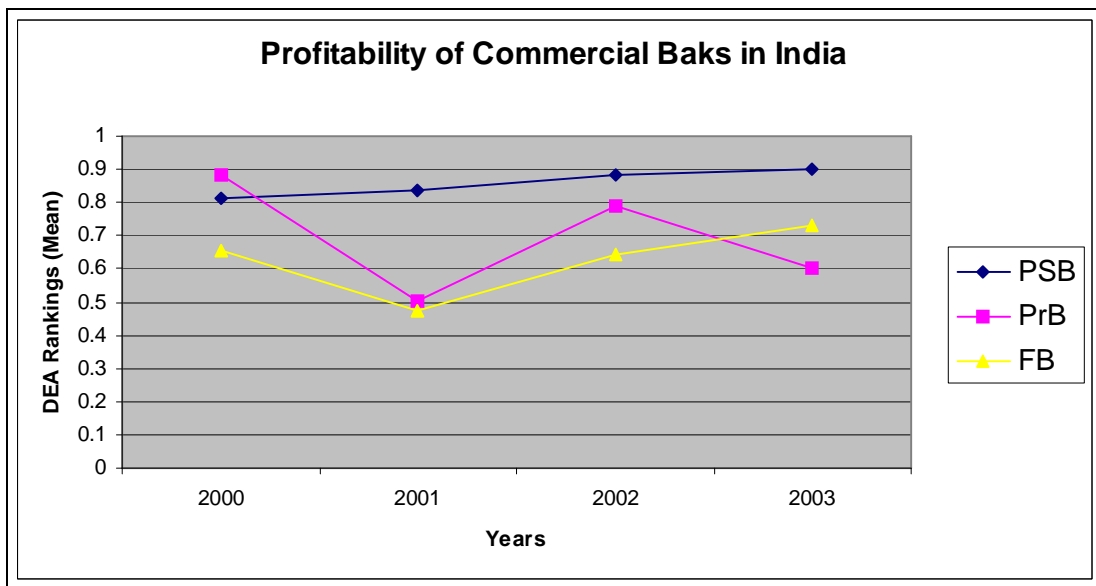
The overall mean of financial management efficiency range between 77% - 85%, it shows the more efficient indicator in the sample period. The reasons could explain by spread to total advances and NPAs to net advances are diminishing in the sample period in all bank groups respectively. The capital adequacy ratio for public sector banks are more and average yield on assets, advances and investments are also seems to be high. In the case of foreign banks it ranges between 55% - 79%, it shows the high variance in its efficiency level, the reasons in terms of financial management might be explained by their increasing spread to total advances, and the average yield on investment and assets are not increasing in the same

line with public sector banks. Where as private banks shows the less efficient compare to public sector banks and more efficient compare to the foreign banks.

Figure 3

Financial Management of Commercial Banks in India
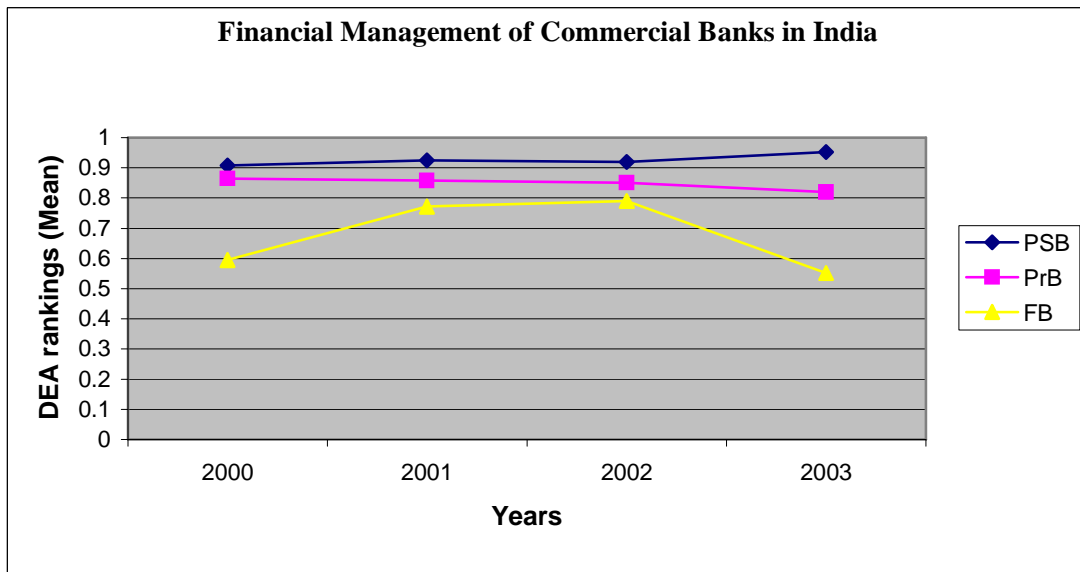
And finally, the overall mean of asset quality efficiency score ranges between 43%-51% which clearly explains, all bank groups are having average efficiency. In terms of public sector banks the DEA efficiency score range between 62 to 70% percent, which explained by these banks are more efficient compare to private and foreign banks in maintaining the Non-Performing Assets by intervention and restriction of RBI (Reserve Bank of India) authorization. Where as it is less in private and foreign banks. Further foreign and private banks have very less efficiency scores because of improperly maintaining of the accounting practices and they show NPAs level is more and it can also explain through the figure 4.

Figure 4

Asset Quality of Commercial Banks in India
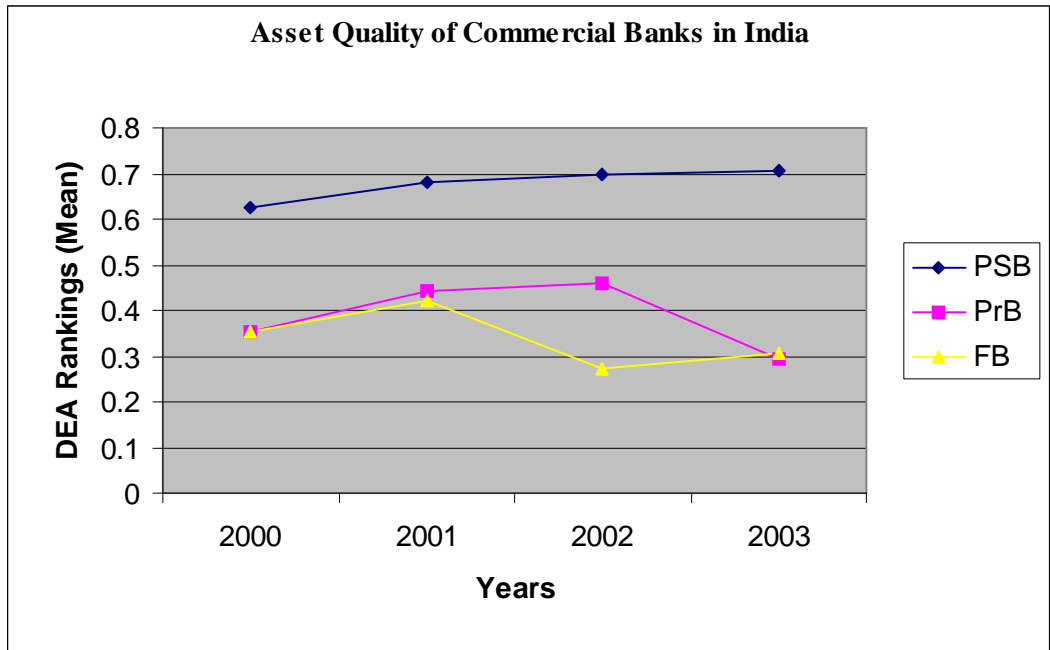
Table2
Overall efficiency/performance indicators for the sample period

Public Banks	Productivity						Profitability						Financial Management						Asset Quality					
	Effic.	%	Less effi.	%	Ineffi.	%	Effic.	%	Less effi.	%	Ineffi.	%	Effic.	%	Less effi.	%	Ineffi.	%	Effic.	%	Less effi.	%	Ineffi.	%
1999-2000	2	7	4	15	21	78	11	41	14	52	2	7	10	37	17	63	0	0	4	15	14	52	9	33
2000-2001	3	11	5	19	19	70	11	41	16	59	0	0	13	48	14	52	0	0	6	22	15	56	6	22
2001-2002	3	11	10	37	14	52	10	37	17	63	0	0	9	33	18	67	0	0	6	22	14	52	7	26
2002-2003	3	11	11	41	13	48	9	33	18	67	0	0	11	41	16	59	0	0	6	22	14	52	7	26
Private Bank																								
1999-2000	3	10	18	60	9	30	16	53	14	47	0	0	14	46	14	47	2	7	4	13	2	7	24	80
2000-2001	5	19	3	10	22	73	9	30	5	17	16	53	14	46	14	47	2	7	3	10	7	23	20	67
2001-2002	5	17	3	10	22	73	9	30	19	63	2	7	14	47	16	53	0	0	3	10	6	20	21	70
2002-2003	4	13	6	20	20	67	11	37	7	23	12	40	10	33	19	64	1	3	3	10	1	3	26	87
Foreign Banks																								
1999-2000	6	17	6	17	24	66	12	33	8	22	16	45	13	36	8	22	15	42	6	17	2	6	28	77
2000-2001	6	17	10	28	20	55	6	17	7	19	23	64	15	42	16	44	5	14	8	22	4	11	24	67
2001-2002	8	22	8	22	20	56	11	31	10	28	15	41	19	52	11	31	6	17	5	14	3	8	28	78
2002-2003	5	14	9	25	22	61	14	39	10	28	12	33	13	36	4	11	19	53	7	19	1	3	28	78

The above table (2) gives the comparative scores of different banks in their respective groups. First indicator is Productivity, in which large numbers of banks are lying between the less efficient and inefficiency categories. And the results have not much varied over the years, though public sectors banks proved to be good in the latter years. In productivity, most of the private banks proved to be inefficient, the reasons for which have been mentioned earlier. Even Foreign banks have been proved to be less efficient and inefficient. In PSBs, the Corporation Bank, Oriental Bank of Commerce are operating at larger score with rank unity (1). Relatively SBI and Group performance is better than other nationalized banks, in which SBI is operating efficiently. Coming to PrBs, SBI Commercial and International Bank Ltd, Indusland Bank Ltd and Bank of Punjab Ltd stood first among the group. And in FBs, CityBank NA, Bank of America NA, Bank of International Indonesia and The Toronto Dominion Bank stood first among the respective group.

And in the question of Profitability, all PSBs fell under the category of efficient and less efficient except UCO Bank, United Bank of India. Further, in this indicator, Corporation Bank, Dena Bank, Oriental Bank of Commerce, United Bank of India from nationalized and State Bank of Indore, State Bank of Mysore, State Bank of Patiala from State Banks Group have score unity. And relatively State Bank of Bikaner and Jaipur, State Bank of Hyderabad, State Bank of Saurashra are also efficient. Coming to the Prbs, Profitability has been falling over the years and fell under the category of less efficient and inefficient. Among PrBs, Bank of Punjab Ltd, Centurion bank Ltd., and the Karur Vysya Bank Ltd., have relatively performed better in the PrBs Group. And FBs, have been inefficient, the reason for which is already mentioned above i.e. because of high operating expenses due to less branches.

For the financial management, all PSBs have outperformed, as a large numbers of banks are operating between efficient and less efficient category with zero inefficiency. Andhra Bank, Corporation Bank, United Bank of India rank one (1) during the sample period, and State Bank group also proved to be the efficient in the sample period. And coming to the PrBs, many of them are in the efficient and less efficient group except Kotak Mahindra Bank Limited, The Sangli Bank Limited. There are good number of banks which are having efficiency score unity namely The National Bank Limited, SBI Commercial and International Bank Limited, Tamilnad Mercantile Bank Limited, The Ganesh Bank of Kurundwad Limited, Centurion Bank, Global Trust Bank, HDFC, ICICI and UTI Bank Limited. And FBs fell under the less efficient and inefficient scores.

And finally for the Asset Quality, most of the banks are being inefficient throughout the sample period, though a few banks have shown rank unity in study period, i.e., Corporation Bank, State Bank of Indore, State Bank of Mysore and State Bank of Saurashra.

Hence, from the above analysis of the public sector banks throughout the sample period, most of the banks are found in the category of efficient and less efficient. From which Corporation Bank, Oriental Bank of Commerce, State Bank of Indore are found to be efficient in all categories and other nationalized banks were recorded mixed performance in the sample period. In private banks, many of them are in the less efficient and inefficient range in all the performance indicators in the sample period. For the productivity, except SBI Commercial and International Bank Ltd., Indusland Bank Ltd, Bank of Punjab, no other banks are found to be efficient. And for the profitability, comparatively to the productivity indicator a large numbers of banks are found to be less efficient. Bank of Punjab Limited,

Centurion Bank, UTI Bank limited, The Catholic Syrian Bank Limited, the Karur Vysya Bank Limited have performed efficiently with the score unity. And the same trend continued for the PrBs even with the other performance indicators viz., Financial Management and Asset Quality.

Finally, in the sample period foreign banks are having wide disparities in the efficiency. For the productivity, Citi Bank NA, Abu Dhabii Commercial Bank Limited, Bank of Internasional Indonesia, Bank of America NA are found to be efficient with a score unity. And for the profitability, Bank of Internasional Indonesia, JP Morgan Chese Bank, the Toronto Dominion Bank are found to efficient with score unity, and many other banks also indicate relatively efficient. For the financial management, many banks are lying between [0.5,1). And for the Asset Quality, Bank of Internasional Indonesia, Oversea-Chinese Banking Corporation Limited are found efficient and most of the remaining banks score range lies between [0, 0.5], so they are inefficient in this category.

Conclusion:

From the above analysis it is clear that public sector banks are having high efficiency in terms of productivity, profitability, financial management and asset quality, whereas the private banks are having a very high inefficiency levels during the sample period in the different indicators but foreign banks are seems to more efficient than the private banks. Therefore, it is quiet evident to say, from my study, that public sector banks have wider scope to produce more and more output. Implementation of the reforms in banking sector has given handy to public sector banks than the private and foreign banks as a result; one could conclude that public sector banks are in the forefront of beneficiaries list of reforms in the banking field. The public sector banks profitability has improved and their NPAs are declined massively and it is hoped that this trend would continue and the NPAs would be bright down to a tolerable level. As a matter of fact, public sector banks are having more high possibility to fulfil corporate and social responsibilities towards all stakeholders. In order to improve the efficiency, in both private and foreign banks should maintain their financial standards properly.

Appendix –I

Considering the linear programming model used:

$$
\left.
\begin{aligned}
&\min \ imize \ : \theta - \varepsilon \left[\sum_{i=1}^{m} s_i^- + \sum_{r=1}^{s} s_r^+ \right] \\
&Sub.to : \theta x_{i0} - \sum_{j=1}^{n} x_{ij} \lambda_j - s_i^- = 0 \\
&y_{r0} = \sum_{r=1}^{s} y_{rj} \lambda_j - s_r^+
\end{aligned}
\right\} \qquad \text{............ (1)}
$$

$0 \le \lambda_j, \ S_i^-, \ S_r^+ \ \forall \ i, r \ \text{and} \ j$ Where θ is unrestricted in sign.

The y_{rj}, x_{ij} (>0) in the model are constants which represent observed amount of the rth output and the ith input of the jth DMU. DMU$_j$ utilizes 'i' inputs and produce 'r' outputs. One of the j DMUs is singled out of evolution as DMU$_0$. Further details of the programming model have been given in the appendix I.

Here λ_j Provides an upper limit for the outputs and a lower limit for the inputs of DMU$_0$ and against these limits θ is tightened with $\lambda_j^*, S_i^{-*}, \ S_r^{+*} \ge \ 0$ representation of optimizing choices with minimize $\theta = \theta^*$ and θ is the overall technical efficiency (OTE) of the DMUs and must lie between zero and one. The symbol 'ε' represents a non-Archimedean constant which ensures the smaller than any positive real value and its use ensures that the optimal solutions are at finite non-zero external points. The S_r^+ represents the surplus in output and while S_i^- represents the slack in input.

Technical efficiency is achieved only when $\theta = 1$ and $S_r^+ = 0$, $S_i^- = 0$. The condition $\theta = 1$ ensures that the DMUs is on the frontier, while the conditions $S_r^+ = 0$,

$S_i^- = 0$ exclude external points. If DMU is inefficient, it can become efficient by adjusting outputs and inputs as follows.

$$\max : \sum u_r y_{r0} - v_0$$

$$Sub.to : \sum_{r=1}^{s} u_r y_{rj} - \sum_{i=1}^{m} v_i x_{ij} - u_0 \leq 0$$

$$\sum_{i=1}^{m} v_i x_{i0} = 1 \qquad \dots\dots\dots\dots (8)$$

$$-u_r \leq -\varepsilon$$

$$-v_i \leq -\varepsilon$$

In this model, the u_0^* indicates the returns to scale possibilities. An $u_0^* < 0$ implies local increasing returns to scale. If $u_0^*=0$, this implies local constant returns to scale. Finally, an $u_0^*>0$ implies local decreasing returns to scale.

Appendix –II
Name of the Banks

S.No	Nationalised Banks	Old Private Banks	Foreign Banks
1	Allahabad Bank	Bharat Overseas Bank Ltd.	ABN-Amro Bank N.V.
2	Andhra Bank	City Union Bank Ltd.	Abu Dhabi Commercial Bank Ltd.
3	Bank of Baroda	Development Credit Bank Ltd.	American Express Bank Ltd.
4	Bank of India	ING Vysya Bank Ltd	Antwerp Diamond Bank N.V
5	Bank of Maharashtra	Karnataka Bank Ltd.	Arab Bangladesh Bank Ltd.
6	Canara Bank	Lord Krishna Bank Ltd.	Bank International Indonesia
7	Central Bank of India	The Nainital Bank Ltd.	Bank Muscat SAOG
8	Corporation Bank	SBI Coml. and Intl. Bank Ltd.	Bank of America NA
9	Dena Bank	Tamilnad Mercantile Bank Ltd.	Bank of Bahrain and Kuwait BSC
10	Indian Bank	The Bank of Rajasthan Ltd.	Bank of Ceylon
11	Indian Overseas Bank	The Catholic Syrian Bank Ltd.	Barclays Bank PLC
12	Oriental Bank of Commerce	The Dhanalakshmi Bank Ltd.	BNP Paribas
13	Punjab & Sind Bank	The Federal Bank Ltd.	Chinatrust Commercial Bank
14	Punjab National Bank	The Ganesh Bank of Kurundwad Ltd.	Chohung Bank
15	Syndicate Bank	The Jammu & Kashmir Bank Ltd.	Citibank N.A.
16	UCO Bank	The Karur Vysya Bank Ltd.	Credit Agricole Indosuez
17	Union Bank of India	The Lakshmi Vilas Bank Ltd.	Credit Lyonnais
18	United Bank of India	The Ratnakar Bank Ltd.	Deutsche Bank AG
19	Vijaya Bank	The Sangli Bank Ltd.	ING Bank
20	**State Bank of India (SBI)**	The South Indian Bank Ltd.	JP Morgan Chase Bank
21	State Bank of Bikaner & Jaipur	The United Western Bank Ltd.	Krung Thai Bank Public Company Ltd.
22	State Bank of Hyderabad	Bank of Punjab Ltd.	MashreqBank psc
23	State Bank of Indore	Centurion Bank Ltd.	MIZUHO Corporate Bank Ltd.
24	State Bank of Mysore	Global Trust Bank Ltd.	Oman International Bank SAOG
25	State Bank of Patiala	HDFC Bank Ltd.	Oversea-Chinese Banking Corporation Ltd.
26	State Bank of Saurashtra	ICICI Bank Ltd.	Societe Generale
27	State Bank of Travancore	IDBI Bank Ltd.	Sonali Bank
28		IndusInd Bank Ltd.	Standard Chartered Bank
29		Kotak Mahindra Bank Ltd	State Bank of Mauritius Ltd.
30		UTI Bank Ltd.	Sumitomo Mitsui Banking Corporation
31			The Bank of Nova Scotia
32			The Bank of Tokyo - Mitsubishi Ltd.
33			The Development Bank of Singapore Ltd.
34			The Hongkong & Shanghai Bkg.Corp.Ltd.
35			The Toronto Dominion Bank
36			UFJ Bank Ltd.

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