PUBLIC SECTOR BANKS ARE STILL RELEVANT IN INDIA? (PRODUCTIVITY EFFICIENCY OF COMMERCIAL BANKS IN INDIA)

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Abstract: *This paper attempts to examine the productive efficiency of commercial banks in India, by using the Data Envelopment Analysis (DEA) technique for the sample of 70 commercial banks viz., (26 public banks, 19 private banks and 25 foreign banks). The study is conducted for the period of 10 years i.e. from 1999 to 2009. It is concluded that the public sector banks are on the efficiency frontier but the notable result is that the public sector banks are followed by foreign banks which in turn is followed by private banks.*

Keywords *Public sector Banks, Commercial Banks, Foreign Banks, Private Banks*

INTRODUCTION

A proper financial sector is of special importance for the economic growth of developing and underdeveloped countries. Therefore, the commercial banking sector which is backbone of the financial sector should be well organized and efficient for the growth dynamics of a growing economy. No underdeveloped country can progress without first setting up a sound system of commercial banking, as in many developing countries, the commercial banking sector has been the dominant element in the country's financial system. The opening up of the financial sector in 1990 followed by RBI's reform program which intended to create viable, competitive and efficient banking system in India has resulted in the entry of many private banks both Indian as well as foreign banks and the increase in competition among the commercial banks in India. As financial markets grew in size, especially since the late 1990s, the dominant fear of market failure receded. Thanks to financial sector reforms, which initiated in the early 1990s have attempted to overcome these weaknesses in order to enhance efficiency of resource allocation in the economy. While the broad objectives of the financial sector reforms, thus, were to enhance efficiency and productivity, the process of reforms were initiated in a gradual and properly sequenced manner so as to have a reinforcing effect. The approach has been to consistently upgrade the financial sector by adopting the international best practices through a consultative process. In the aforesaid back drop, the present study attempts to measure the efficiency of commercial banks viz. public, private and foreign sector banks in India in the light of financial reforms initiation through Productivity.

METHODOLOGY

The main focus of the study is to measure the efficiency of the banks through productivity. The study is conducted for the time period of 10 years ranging from 1st April 1999 to 31st March 2009. The data is collected from the publications of RBI namely; The Statistical Tables Relating to the Banks in India and Trends & Progress of Banking in India, both available on www.rbi.org.in.

Data

Initially, it was planned to consider all the eighty (80) Commercial Banks operating in India for the study. However, due to various reasons like mergers and late beginning of the banking operations, the sample was reduced to 70 banks i.e. 26 public, 19 private and 25 foreign banks. Of those 80 commercial banks operating in India, 3 private banks and 4 foreign banks which started their business after the study period i.e. 1st April 1999 were excluded, and the data regarding 2 foreign banks for the year 2008 and 2009 was not available and were excluded, and one public sector bank which was also excluded namely IDBI Bank Ltd., due to merger of IDBI Bank with IDBI Ltd. in 2004-05. Therefore, the sample was reduced to 70 banks.

Tools

There are two approaches to measure the efficiency of banks i.e. parametric and non-parametric. Stochastic Frontier Approach (SFA), Thick Frontier Approach (TFA) and Distribution Free Approach (DFA) are classified under

parametric approach and Data Envelopment Analysis (DEA) and Free Disposal Hull (FDH) are under non-parametric approach. The study is using the non-parametric DEA approach to measure efficiency of banks in India.

Model Specification

Data Envelopment Analysis (DEA) is a linear programming based model which evaluates the relative efficiency of decision making units (DMUs), with multiple inputs and outputs. It identifies a subset of efficient "best-practice" DMUs and for remaining DMUs, the magnitude of their non-efficiency is measured by comparing to a frontier constructed from the efficient DMUs.

The DEA approach is based on Farrell (1957) concept and on the extensions of his work DEA was first developed by Charnes et al. (1978) to measure Technical Efficiency in input output relation. Now-a-days, DEA is at the service of the managers and efficient tool for evaluating the performance of DMUs.

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.

Relative efficiency of a DMU is defined as the ratio of weighted sum of outputs to weighted sum of inputs. This can be written as follows:

$$h_0 = \frac{\sum_{r=1}^{s} u_r y_{ro}}{\sum_{i=1}^{m} v_i x_{io}} \qquad \text{Equation 1}$$

Where s = number of outputs

u_r = weight of output r

y_{ro}= amount of output r produced by the DMU

m = number of inputs

v_i = weight of input i

x_{io} = amount of input i used by the DMU

Equation 1 assumes constant returns to scale and controllable inputs. While, outputs and inputs can be measured and entered in this equation without standardization, determining a common set of weights can be difficult. DMUs might value outputs and inputs quite differently. The Charnes Cooper & Rhodes DEA model addresses this concern of weights, by selecting the weights that maximize each banks efficiency score under the conditions that no weight is negative.

CCR Model

Charnes et al. (1978) addressed the above problem by permitting a DMU to adopt a set of weights that will maximize its relative ratio without the same ratio for other DMUs exceeding 1. Thus, Equation 1 is rewritten in the form of a fractional programming problem.

$$\max h_o = \frac{\sum_{r=1}^{s} u_r y_{ro}}{\sum_{i=1}^{m} v_i x_{io}} \qquad \text{Equation 2}$$

subjected to

$$\frac{\sum_{r=1}^{s} u_r y_{rj}}{\sum_{i=1}^{m} v_i x_{ij}} \le 1 \text{ for each DMU in the sample, where j = 1,.., n}$$

(number of DMUs).

To measure efficiency, Equation 2 is converted in to the more familiar components of a linear programming problem. In equation 3, the denominator is set to a constant and the numerator is maximized.

$$\max h_o = \sum_{r=1}^{s} u_r y_{ro} \qquad \text{Equation 3}$$

subjected to

$$\sum_{i=1}^{m} v_i x_{io} = 1$$

$$\sum_{r=1}^{s} u_r y_{rj} - \sum v_i x_{ij} \le 0$$

$$u_r, v_i \ge 0$$

To prevent the mathematical omission of an output or an input in the iterative calculation of efficiency, weights u and v are not allowed to fall below small positive numbers (0). Equation 3 uses controllable inputs and constant returns to scale. It is a primal linear programming problem that models output maximization.

Variables

Table: (a) Productivity Efficiency scores of Public Sector Banks in India during the study period of 1999 to 2009

S.no.	Name of the Bank	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1	State Bank of India	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**
2	State Bank of Bikaner & Jaipur	0.326	0.356	0.352	0.373	0.370	0.445	0.432	0.540	0.519	0.224
3	State Bank of Hyderabad	0.452	0.543	0.433	0.495	0.559	0.503	0.587	0.699	0.659	0.690
4	State Bank of Indore	0.543	0.583	0.478	0.572	0.518	0.523	0.663	0.610	0.662	0.637
5	State Bank of Mysore	0.296	0.347	0.321	0.352	0.331	0.366	0.489	0.489	0.529	0.511
6	State Bank of Patiala	0.465	0.490	0.533	0.669	0.684	0.689	0.719	0.732	0.778	0.742
7	State Bank of Travancore	0.459	0.509	0.488	0.560	0.585	0.616	0.637	0.586	0.589	0.589
8	Allahabad Bank	0.397	0.408	0.410	0.421	0.426	0.467	0.582	0.576	0.689	0.621
9	Andra Bank	0.426	0.509	0.545	0.559	0.631	0.657	0.608	0.704	0.742	0.676
10	Bank of Baroda	0.573	0.573	0.643	0.630	0.555	0.529	0.535	0.653	0.741	0.790
11	Bank of India	0.534	0.584	0.602	0.644	0.580	0.428	0.445	0.555	0.707	0.727
12	Bank of Maharastra	0.424	0.517	0.543	0.571	0.603	0.418	0.319	0.468	0.535	0.615
13	Canara Bank	0.546	0.636	0.612	0.682	0.666	0.575	0.629	0.665	0.646	0.684
14	Central Bank of India	0.331	0.333	0.377	0.392	0.361	0.336	0.306	0.316	0.352	0.402
15	Corporation Bank	0.909	**1.000**	0.920	**1.000**	0.923	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**
16	Dena Bank	0.555	0.607	0.608	0.590	0.599	0.480	0.671	0.634	0.625	0.579
17	Indian Bank	0.405	0.395	0.414	0.438	0.374	0.398	0.441	0.576	0.607	0.592
18	Indian Overseas Bank	0.456	0.448	0.471	0.510	0.477	0.456	0.579	0.624	0.676	0.623
19	Oriental Bank of Commerce	**1.000**	**1.000**	**1.000**	0.969	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**
20	Punjab & Sind Bank	0.472	0.504	0.481	0.467	0.401	0.275	0.297	0.457	0.470	0.518
21	Punjab National Bank	0.389	0.448	0.451	0.499	0.049	0.429	0.531	0.522	0.560	0.561
22	Syndicate Bank	0.399	0.391	0.394	0.427	0.486	0.389	0.427	0.575	0.597	0.608
23	Union Bank of India	0.475	0.344	0.372	0.631	0.613	0.577	0.624	0.721	0.814	0.708
24	United Bank of India	0.349	0.504	0.507	0.371	0.331	0.322	0.353	0.396	0.362	0.426
25	UCO Bank	0.314	0.346	0.359	0.459	0.490	0.386	0.340	0.402	0.477	0.517
26	Vijaya Bank	0.396	0.390	0.455	0.465	0.527	0.593	0.625	0.627	0.604	0.572
	Mean	0.496	0.529	0.530	0.567	0.544	0.533	0.571	0.620	0.652	0.639
	Median	0.454	0.504	0.480	0.534	0.541	0.474	0.580	0.598	0.635	0.618
	SD	0.191	0.195	0.185	0.182	0.209	0.200	0.200	0.174	0.171	0.177
	MAX	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	MIN	0.296	0.333	0.321	0.352	0.049	0.275	0.297	0.316	0.352	0.224

In computing the efficiency scores, the most challenging task that analysts always encounters is to select the relevant input and output for modelling bank behaviour. In the literature on banking efficiency there are three approaches for selecting the input and output variables for a bank. These are, Intermediation Approach, User Cost Approach and Value Added Approach. Most of the DEA follows intermediation approach, as it seems to be more suitable for evaluating the efficiency of banking sector. Therefore, in this study Intermediation Approach is used for selection of variables, which considers banks as financial intermediaries. The present study is using one input and three output variables, establishment expenses to operating expenses are the input variable and business per branch, business per employee and operating per employee the three output variables.

RESULTS AND INTERPRETATIONS

(a) Productivity of Public Sector Banks

The average efficiency of Public Sector Commercial Banks is 0.496, which is very much less than expected performance of 1, which means that banks were able to produce atleast to the level of input. [Refer Table: (a)] In India, Public Sector Banks together have not performed to the expected level during 2000 but they have had steadily toned up performance

over the study period. Analysis of performance of individual Banks, namely SBI, had produced their output on the efficiency frontier throughout the ten years study period. Oriental Bank of Commerce had productivity efficiency for nine years and Corporation Bank was efficient for seven years out of ten years of study period. Productivity efficiency of all other 23 banks is not to the expected level of 1.

(b) Productivity of Private Banks

The average efficiency of Private Banks is 0.129, which is far below the expected level of 1, which indicates that Private Banks have not had productivity on the efficiency frontier. [Refer Table: (b)] But the point to be noted is that their performance score show the increasing trend except the year 2009, which may be attributed to the global financial crisis. Among all banks, IndusInd Bank alone shows the expected result for nine years and in 2009 their score is reduced. Performance of ICICI Bank is on the efficiency frontier during 2008 and 2009. It is worth noting that when every other bank has not performed during 2009 due to financial crisis, ICICI Bank has done well. South Indian Bank had score 1 during 2007. All other Banks do not have productivity efficiency during the study period this is against the general assumption that Private Bank would normally do well than Public Sector Banks. In terms of Productivity efficiency both Public & Private Banks are not up to the expected level.

(c) Productivity of Foreign Banks

The average efficiency of Foreign Banks is 0.473, which on average is close to Public Sector Banks but less than 1 indicates that Foreign Banks are able to compete with Public Banks. [Refer Table: (c)] It is worth to note that the performance scores show the increasing trend from 2001 up to 2004 although there was decline in the later years. Among all banks, two banks i.e. Bank of Nova Scotia and State Bank of Mauritius had produced maximum times their output i.e. 4 years on the efficiency frontier followed by three years output on the efficiency frontier by four banks viz. Bank of Tokyo-Mitsubishi UFJ, Citi Bank, JP Morgan and Shinhan

Table: (b) Productivity Efficiency scores of Private Banks in India during the study period of 1999 to 2009

S.no.	Name of the Bank	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1	Bank of Rajasthan	0.025	0.037	0.415	0.070	0.117	0.162	0.230	0.289	0.381	0.378
2	Catholic Syrian Bank	0.023	0.034	0.039	0.063	0.099	0.146	0.182	0.198	0.237	0.278
3	City Union Bank	0.036	0.050	0.062	0.100	0.177	0.223	0.309	0.320	0.587	0.516
4	Development Credit Bank	0.105	0.162	0.164	0.235	0.312	0.293	0.337	0.303	0.371	0.301
5	Dhanalakshmi Bank	0.037	0.053	0.060	0.094	0.150	0.217	0.285	0.287	0.322	0.449
6	Federal Bank	0.037	0.057	0.062	0.117	0.194	0.269	0.364	0.410	0.624	0.601
7	HDFC Bank	0.417	0.408	0.424	0.635	0.870	0.872	0.863	0.555	0.562	0.373
8	ICICI Bank	0.208	0.362	0.217	0.723	0.830	0.793	0.843	0.812	**1.000**	**1.000**
9	IndusInd Bank	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	0.774
10	ING Vysya Bank	0.049	0.063	0.066	0.116	0.217	0.302	0.377	0.383	0.424	0.436
11	Jammu & Kashmir Bank	0.039	0.065	0.078	0.119	0.207	0.316	0.434	0.434	0.511	0.360
12	Karnataka Bank	0.040	0.061	0.074	0.121	0.197	0.265	0.426	0.430	0.521	0.521
13	Karur Vysya Bank	0.043	0.058	0.067	0.134	0.201	0.301	0.405	0.427	0.577	0.538
14	Lashmi Vilas Bank	0.038	0.057	0.065	0.094	0.160	0.200	0.295	0.316	0.358	0.381
15	Nainital Bank	0.017	0.025	0.029	0.044	0.065	0.104	0.165	0.197	0.346	0.299
16	Ratnakar Bank	0.028	0.053	0.053	0.088	0.128	0.171	0.225	0.187	0.315	0.544
17	SBI Comm. & Intl. Bank	0.242	0.300	0.304	0.182	0.441	0.491	0.691	0.567	0.860	0.909
18	South Indian Bank	0.027	0.047	0.063	0.111	0.175	0.249	0.345	**1.000**	0.498	0.473
19	Tamilnad Mercantile Bank	0.043	0.065	0.076	0.119	0.175	0.228	0.315	0.352	0.502	0.504
	Mean	0.129	0.156	0.175	0.219	0.301	0.347	0.426	0.446	0.526	0.507
	Median	0.039	0.058	0.067	0.117	0.194	0.265	0.345	0.383	0.502	0.473
	SD	0.234	0.235	0.235	0.263	0.280	0.257	0.242	0.245	0.219	0.198
	MAX	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	MIN	0.017	0.025	0.029	0.044	0.065	0.104	0.165	0.187	0.237	0.278

Table: (c) Productivity Efficiency scores of Foreign Banks in India during the study period of 1999 to 2009

S.no.	Name of the Bank	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1	AB Bank	0.106	0.427	0.271	0.160	0.191	0.117	0.137	0.139	0.128	0.095
2	ABN Amro Bank	0.604	0.406	0.472	0.403	0.429	0.363	0.489	0.397	0.269	0.250
3	Abu Dhabi Commercial Bank	0.610	0.440	0.502	**1.000**	0.589	0.350	0.646	0.588	0.426	0.464
4	Bank of America	0.821	0.726	0.841	0.923	0.928	0.790	0.957	0.985	0.891	0.783
5	Bank of Bahrain & Kuwait	0.375	0.151	0.272	0.395	0.430	0.437	0.397	0.348	0.273	0.211
6	Bank of Ceylon	0.572	0.502	0.517	0.314	0.379	0.386	0.328	0.340	0.263	0.314
7	Bank of Nova Scotia	0.598	0.459	0.668	0.826	0.844	**1.000**	**1.000**	**1.000**	0.972	**1.000**
8	Bank of Tokyo-Mitsubishi UFJ	0.057	0.343	0.180	0.238	0.393	**1.000**	0.484	0.733	**1.000**	**1.000**
9	Barclays Bank	0.124	0.014	0.882	0.637	**1.000**	0.523	**1.000**	0.321	0.208	0.266
10	BNP Paribas Bank	0.287	0.102	0.037	0.422	0.375	0.412	0.483	0.526	0.588	0.561
11	Chinatrust Commercial Bank	0.395	0.301	0.410	0.492	0.610	0.401	0.559	0.419	0.288	0.171
12	Citi Bank	**1.000**	0.771	**1.000**	0.849	**1.000**	0.782	0.962	0.665	0.642	0.551
13	DBS Bank	0.514	0.555	0.733	0.694	0.826	0.473	0.425	0.575	0.410	0.529
14	Deutsche Bank	0.535	0.616	0.618	0.492	0.644	0.654	0.521	0.460	0.377	0.348
15	Hong Kong & Shanghai Bank	0.296	0.205	0.334	0.286	0.411	0.376	0.529	0.411	0.297	0.271
16	JP Morgan Bank	0.247	0.069	0.955	0.246	0.202	0.386	0.877	**1.000**	**1.000**	**1.000**
17	Krung Thai Bank	**1.000**	0.490	0.282	0.213	0.249	0.329	0.510	0.394	0.492	0.563
18	Mashreq Bank	0.287	0.078	0.670	0.781	0.646	0.354	0.361	0.434	0.310	0.192
19	Mizuho Corporate Bank	0.308	0.201	0.202	0.243	0.297	0.306	0.368	0.502	0.600	0.653
20	Oman International Bank	0.309	0.016	0.192	0.594	0.700	0.715	0.401	0.190	0.128	0.147
21	Shinhan Bank	**1.000**	0.796	**1.000**	**1.000**	0.631	0.683	0.749	0.697	0.766	0.869
22	Societe Generate Bank	0.240	0.061	0.087	0.168	0.618	0.555	0.638	0.528	0.389	0.323
23	Sonali Bank	0.122	0.132	0.039	0.035	0.049	0.051	0.027	0.036	0.026	0.039
24	Standard Chartered Bank	0.422	0.378	0.544	0.432	0.455	0.399	0.537	0.457	0.286	0.286
25	State Bank of Mauritius	**1.000**	**1.000**	0.550	0.666	**1.000**	0.795	**1.000**	0.771	0.496	0.646
	Mean	0.473	0.370	0.490	0.500	0.556	0.505	0.575	0.517	0.461	0.461
	Median	0.395	0.378	0.502	0.432	0.589	0.412	0.521	0.460	0.389	0.348
	SD	0.298	0.272	0.301	0.282	0.271	0.242	0.268	0.250	0.282	0.294
	MAX	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	MIN	0.057	0.014	0.037	0.035	0.049	0.051	0.027	0.036	0.026	0.039

Bank and Barclays Bank for two years. Finally, there were two banks viz. Abu Dhabi Bank and Krung Thai Bank which had produced one year output on the efficiency frontier. The interesting point to note down is foreign banks had more banks on the efficiency frontier as comparison to public & private banks. Productivity efficiency of all other 16 banks is not up to the efficiency level of 1.

The above Table: (d) shows that the overall mean of productivity range lies between 35%-54%, 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 the 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. Similarly for foreign banks, the relative efficiency is more than the private banks except for last two years. The reason could be that these banks are enriched in utilization of technological resources and they are operating branches

Table: (d) Overall Productivity Efficiency scores of Commercial Banks in India for the period 1999 to 2009

Bank Groups	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Public Sector Banks	0.496	0.529	0.530	0.567	0.544	0.533	0.571	0.620	0.652	0.639
Private Sector Banks	0.129	0.156	0.175	0.219	0.301	0.347	0.426	0.446	0.526	0.507
Foreign Sector Banks	0.473	0.370	0.490	0.500	0.556	0.505	0.575	0.517	0.461	0.461
Overall Mean	0.366	0.352	0.398	0.429	0.467	0.462	0.524	0.528	0.546	0.536

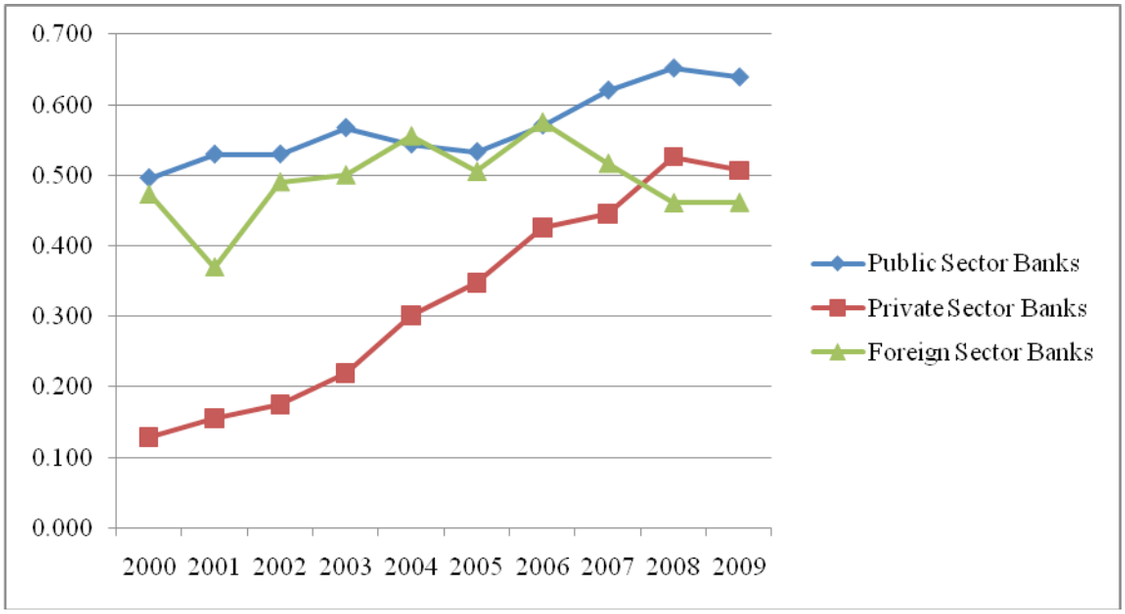

Figure: (a) Graphical scenario of Productivity Efficiency

at the global level. However, it has been observed that in the year 2001, these banks experienced lower efficiency scores of 37%. The reason for this could be the increased establishment to operating expenses without proportional increase in outputs. [Fig. (a)]

CONCLUSION

The analysis of productivity leads to the conclusion that the overall average efficiency scores for productivity are not up to the expected level although there is an increase in their overall average efficiency of productivity except for the year 2001 & 2009. Analysis of performance of individual banks, indicate that State Bank of India, Oriental Bank of Commerce and Corporation Bank in public sector banks are on the efficient frontier in most of the years. Among private banks, IndusInd Bank is the only bank that is on the efficiency frontier in maximum years followed by ICICI Bank & South Indian Bank. Similarly, among foreign banks, majority of the banks are on efficiency frontier as compared to public & private banks where few banks have meet this benchmark. It is worth mentioning that among all the banks, Public Sector Banks are relatively efficient and they are relevant to India as compared to Private & Foreign Banks. The relative efficency of foreign banks is more than the Private Banks except for last two years. Reasons are to be identified and strengthened for policy direction.

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