

ANALYSIS OF EFFICIENCY OF BANKS IN A DEVELOPING ECONOMY: A CASE OF INDIA

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ABSTRACT

The efficiency of banking system is very important for the growth of the overall economy of a country. This is because of the reason that sound banking system serves as an important medium for accomplishing economic growth through the mobilisation of fiscal savings and putting them to the productive use. Given the socioeconomic implications of the banking sector the analyses of relative efficiency of banks has gained popularity among people from banking sector, policy makers, researchers and academicians and other interested parties. This paper is an attempt to investigate the efficiency of Indian commercial banks with the help of data envelopment analysis (DEA), a deterministic non-parametric approach. DEA was firstly applied by Sherman and Gold (1985) for assessing the efficiency of banks. It is a very promising tool for measuring the efficiency of banks (Berger and Humphrey, 1997). DEA is a preferred econometric approach of measuring efficiency because of its advantages over other techniques. The results of this study show that only 5 and 17 banks are efficient on the criteria of technical efficiency and pure technical efficiency respectively. Further ANOVA test indicates that there is no significant difference in the mean technical efficiency scores of various banks belonging to various groups defined for the purpose of this study.

Key words: DEA, Technical Efficiency, Scale Efficiency

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Introduction

The banking sector plays an important role in the overall development of an economy. Only an efficient banking system can contribute towards the formation of capital and implementation of monetary policy of

a country. Banking system serves as an important channel to accomplish higher economic development by mobilising the small savings of the people from household sector and diverting them to the productive uses in industrial sector (Rajan and Zingales, 1998). Efficient banking system of a country also makes a contribution towards the societal welfare by providing financial services at an economical cost to its citizens (Valverde et al., 2003).

Because of the socioeconomic implications of the banking sector the analyses of relative efficiency of banks has gained popularity among people from banking sector, policy makers, researchers and academicians and other interested parties. Other important reasons for continued interest in this area are the financial liberalisation and increasing competition in the sector. Financial liberalisation was first introduced in developed countries and later on it was taken by developing economies. This is the reason why initial studies on the effect of liberalisation or deregulation were carried out in developed countries first.

Review of Literature

S. No.	Year	Author & Study	Methodology used	Major Findings	Variables used in the study
1	2008	Kumar and Gulati "Technical, Pure Technical and Scale Efficiencies in Indian Public Sector"	Logistic Regression, Data Envelopment Analysis using input orientation	Technical efficiency scores of banks are not significantly affected by market share, profitability and asset quality of banks.	Output: Net interest income and non interest income Input: Physical capital, Labor, Loanable funds
2	2004	Rammohan and Ray "Comparing Performance of Public and Private Sector Banks: A Revenue Maximisation Efficiency Approach"	The study made a comparison among the efficiency scores of banks in India in 1990's with the help of Data Envelopment Analysis.	With regard to revenue maximising efficiency public sector banks are significantly better than private banks but there was no significant difference between public and foreign banks on this parameter.	Output: Loans, Investments and Other incomes Input: Physical capital, Labor, Loanable funds
3	2004	Das et al	Das and others analysed the efficiency of Indian banks using Data Envelopment Technique.	The study found that liberalisation had not brought any significant change among various types of Indian banks in terms of technical and cost efficiency but profit and revenue efficiencies were significantly different among different banks.	Output: Loan Assets, Other Incomes and Investments Input: Physical capital, Labor, Loanable funds and Equity
4	2010	Ray and Das "Distribution of Cost and Profit Efficiency: Evidence from Indian Banking Industry"	Non Parametric DEA and Non Parametric Kernel Density Estimation	The major finding of the study is that privatisation does not lead to more efficiency in Indian banking sector	Output: Investments, Earning Advances and Other Income Input: Funds, Labor, Capital and Quasi-Fixed Inputs
5	2003	Kumbhakar and Sarkar	Non Parametric Data Envelopment Analysis	Private sector banks have improved their performance as a result of deregulation and freedom imparted to expand output whereas public sector banks have not faired well to the deregulation measures adopted by the Indian government.	
6	2004	Shanmugam and Das	Stochastic Frontier Analysis	Technical efficiency of raising interest margin is different across the banks and private and foreign sector banks are more efficient than public sector banks.	Output: Net Interest Income, Non Interest Income, Credits and Investment Input: Deposits, Borrowings, Labor and Fixed Assets
7	2002	Sathye M. "Effectiveness of Banks in a Developing Economy: The case of India"	Data Envelopment Analysis Technique	Mean efficiency scores of Indian banks are at par with world mean efficiency scores and also that private banks are less efficient in comparison to public sector banks and foreign banks.	
8	1998	Kraft and Tirtiroglu	Stochastic Frontier Analysis was used to study the effectiveness of banks in Croatia in mid	The main finding of the study was that newly organised private banks are more efficient in comparison to	

			1990's.	older state institutions.	
9	1997	Bhattacharya et al	Data Envelopment Analysis was used to measure the effectiveness of Indian commercial banks in late 1980's to early 1990's.	Indian Public sector banks were the best performing banks during the studied period and new private sector banks were yet to emerge.	
10	2006	Sanjeev	Data Envelopment Analysis	There was an increase in the efficiency of Indian banks in the post-reform period and NPAs have a negative effect on the efficiency of banks	

Data & Methodology

The data for the study pertains to a sample of 75 banks operating in India, of which twenty seven each are public sector (20 Nationalised Banks and 7 State Bank & its Associates) and foreign banks and twenty one private sector banks. The study includes almost all the banks operating in the country. The data was obtained from the website of Reserve Bank of India.

Various researchers have used data envelopment analysis (DEA) to evaluate bank performance. DEA is a technique to assess the efficiency of production units (in this case, the banks) relative to a set of similar units operating in the same business environment (here, the banking industry). It can identify the benchmark units in comparison to the peers to determine the best practice. A bank is said to be technically efficient if it produces more output using less input resources. In particular, there are several different approaches of measuring output, usually classified into two broad approaches: the production approach and the intermediation approach. The production

approach, initiated by the contribution of Benston (1964) and Bell and Murphy (1968), describes banking activities as the production of services to depositors and borrowers, wherein output is measured by the number and type of transactions or accounts (both deposit and loan) and inputs used are only physical units (such as labor and capital), since only physical inputs are needed to provide financial services. Under the intermediation approach, financial institutions are thought of as primarily intermediating funds between savers and investors, wherein the inputs of the bank are essentially financial capital (i.e. the deposits collected and the funds borrowed from financial markets and their interest cost), and outputs are measured by the volume of loans and investments outstanding. It has been generally suggested by a number of writers that a researcher can adopt any measure of output for the financial firm as long as the measure is consistent with the researcher's goals (Sealey and Lindley, 1977).

Along with an efficiency index, the results of the DEA indicate which inputs and

output constraints are tight, and which are not. In the context of an efficient bank, a tight input constraint indicates an input which is properly utilized for a given level of outputs, i.e. any reduction in the input would not allow the bank to maintain its present level of outputs; while an input constraint that is not tight indicates an input which is underutilized or improperly utilized (or underproductive). In the context of an inefficient bank, a tight input constraint indicates a “best-utilized” input, though not properly utilized; in fact, in the case of an inefficient bank, all inputs are underutilized. On the other hand, in the context of an efficient bank, a tight output constraint indicates an output which is “just-sufficiently” produced for a given level of inputs; while an output constraint that is not tight indicates an output that is over-produced for the given level of inputs. In the context of an inefficient bank, a tight output constraint indicates an output that is under-produced for the given level of inputs; while an output constraint that is not tight is generally difficult to interpret (may or may not be over-produced for the given level of inputs).

Of particular interest are the properly-utilized and under-utilized inputs of efficient banks, and the under-produced outputs of inefficient banks. The present study adopts an intermediation approach. For this purpose two input variables viz.

interest expended, operating expenses and two output variables net interest income and non interest income have been considered.

The present study has been undertaken to compare the efficiency of public, private, and foreign banks operating in India, from the viewpoint of control systems, to identify the critical factors affecting the efficiency of banks, and to analyze the gap between efficient and inefficient banks. The study has employed the data envelopment analysis (DEA) model to analyze the efficiency of banks, and to identify critical factors affecting the efficiency of banks.

Empirical Results

The efficiency measures computed in the present study are relative in nature. The performance of a bank is not assessed in an absolute manner but is compared with the best in the industry i.e. benchmark with the purpose of improving it.

The sources of inefficiency can be determined by comparing the relative sizes of various efficiency measures. Table - 1 presents the average efficiency estimates of all commercial banks for the year 2008-2009. The table indicates that Public Sector Banks (Nationalised and SBI & Associates) have an average technical efficiency score of 0.73 each which means these banks have the scope of producing

1.37 times (1/0.73) as much output from the same input. Foreign banks have a technical efficiency score of 0.72 followed by Private Sector banks with an average technical efficiency score of 0.67 only.

Table - 1

Bank Category	Technical Efficiency (TE)	Pure Technical Efficiency (PTE)	Scale Efficiency (SE)
Foreign Banks	0.72	0.89	0.80
Nationalised Banks	0.73	0.94	0.78
Private Sector Banks	0.67	0.83	0.82
SBI & Associates	0.73	0.87	0.85
Total	0.71	0.88	0.81

Further, in case of pure technical efficiency nationalised banks are better than all other banks followed by foreign banks and SBI & Associates. Private sector banks have least average PTE score among all categories of banks. It can also be observed from the table-1 that SE is the main source of technical inefficiency among all the banks across all categories. A bank-wise disaggregated analysis is presented in Table 2. In this, results of input oriented CCR and BCC model (assuming constant return to scale and variable return to scale respectively) have been provided. It represents the technical,

pure technical and scale efficiency scores obtained from DEA model for individual public, private and foreign banks, their peer set, returns to scale and peer count.

The results indicate the presence of a marked deviation of the efficiency scores from the best practice frontier. The average technical efficiency score is 0.71, which means that overall level of technical inefficiency in Indian commercial banking industry is to the tune of 29 per cent during 2008-2009. This suggests that of adopting the best practices these 75 banks can on an average reduce their inputs by at least 29 per cent.

However, the potential reduction in inputs from adopting best practices varies from bank to bank. Alternatively these banks have the scope of producing 1.41 times i.e. (1/0.71) as much outputs from the same inputs. Of the 75 commercial banks, 5 banks have indentified as “relatively efficient” with technical efficiency score equal to one. The remaining 70 banks have been found to be “relatively inefficient” with efficiency score less than one. The inefficient banks can improve their efficiency by decreasing resource inputs and increasing outputs.

Table -2
(Efficiency Scores of Banks)

	DMU	TE Score	PTE Score	SE Score	RTS	Peer Count	Peer Set
1	AB Bank	1.00	1.00	1.00		0	1

2	ABN Amro	0.46	0.83	0.56	Drs	0	6	18	17
3	Abu-Dhabi	0.71	0.81	0.89	Drs	0	10	6	8
4	American Express	0.52	1.00	0.52	Drs	0	4		
5	Antwerp Diamond	0.95	0.98	0.97	Drs	0	10	6	8
6	Bank of America	0.85	1.00	0.85	Drs	24	6		
7	Bank of Bahrain and Kuwait	0.56	0.64	0.88	Drs	0	10	6	8
8	Bank of Ceylon	1.00	1.00	1.00		13	8		
9	Bank of Nova Scotia	1.00	1.00	1.00		11	9		
10	Bank of Tokyo Mitsubishi	1.00	1.00	1.00		18	10		
11	Barclays Bank	0.48	0.78	0.62	Drs	0	18	17	6
12	BNP Paribas	0.65	0.82	0.80	Drs	0	54	6	10
13	Calyon Bank	0.65	0.80	0.81	Drs	0	19	10	6 8
14	Chinatrust Commercial Bank	0.67	0.71	0.95	Drs	0	6	8	
15	Citi Bank	0.53	1.00	0.53	Drs	1	15		
16	DBS Bank	0.75	0.89	0.85	Drs	0	6	19	54 9
17	Deutsche Bank	0.67	1.00	0.67	Drs	2	17		
18	HSBC	0.60	1.00	0.60	Drs	14	18		
19	JP Morgan Chase Bank	1.00	1.00	1.00		7	19		
20	Krung Thai Bank	0.63	1.00	0.63	Irs	0	8	25	
21	Mizuho Corporate Bank	0.68	0.80	0.85	Drs	0	10	6	8
22	Oman Intl Bank	0.49	0.52	0.94	Irs	0	27	8	
23	Shinhan Bank	0.88	0.97	0.91	Drs	0	10	6	8
24	Societe Generale	0.48	0.59	0.81	Drs	0	10	6	8
25	Sonali Bank	0.71	1.29	0.56	Irs	1	25		
26	Standard Chartered Bank	0.49	1.16	0.42	Drs	0	26		
27	State Bank of Mauritius	0.89	1.00	0.89	Irs	1	27		
28	Allahabad Bank	0.73	0.94	0.78	Drs	0	31	37	54
29	Andhra Bank	0.71	0.90	0.79	Drs	0	54	31	18
30	Bank of Baroda	0.67	0.94	0.71	Drs	0	42	31	18
31	Bank of India	0.76	1.00	0.76	Drs	19	31		
32	Bank of Maharashtra	0.67	0.85	0.79	Drs	0	18	54	31
33	Canara Bank	0.74	1.00	0.74	Drs	0	33		
34	Central Bank of India	0.72	0.92	0.78	Drs	0	54	31	37
35	Corporation Bank	0.78	0.99	0.79	Drs	0	54	19	37 31
36	Dena Bank	0.68	0.85	0.80	Drs	0	54	18	6
37	IDBI Bank	0.94	1.00	0.94	Drs	17	37		
38	Indian Bank	0.74	0.99	0.75	Drs	0	54	31	18
39	Indian Overseas Bank	0.71	0.93	0.77	Drs	0	31	54	18
40	Oriental Bank of Commerce	0.78	0.98	0.80	Drs	0	54	31	37
41	Punjab & Sind Bank	0.70	0.86	0.81	Drs	0	54	18	6
42	Punjab National Bank	0.71	1.00	0.71	Drs	1	42		
43	Syndicate Bank	0.74	0.96	0.77	Drs	0	31	37	54
44	UCO Bank	0.71	0.90	0.79	Drs	0	54	31	37
45	Union Bank of India	0.75	0.99	0.76	Drs	0	54	31	37
46	United Bank of India	0.66	0.83	0.79	Drs	0	54	31	18
47	Vijaya Bank	0.72	0.89	0.81	Drs	0	54	31	37
48	Axis Bank	0.63	0.90	0.69	Drs	0	15	31	18 19
49	Bank of Rajasthan	0.66	0.78	0.84	Drs	0	54	6	10
50	Catholic Syrian Bank	0.52	0.62	0.84	Drs	0	54	6	10

51	City Union Bank	0.77	0.87	0.89	Drs	0	9	54	10	
52	Development Credit Bank	0.49	0.60	0.82	Drs	0	54	6	10	
53	Dhanlakshmi Bank	0.59	0.66	0.90	Drs	0	54	6	10	
54	Federal Bank	0.83	1.00	0.83	Drs	37	54			
55	HDFC Bank	0.56	1.00	0.56	Drs	0	55			
56	ICICI Bank	0.66	1.00	0.66	Drs	0	56			
57	Indusind Bank	0.61	0.74	0.83	Drs	0	6	19	54	9
58	ING Vysya Bank	0.63	0.84	0.75	Drs	0	31	18	54	
59	J&K Bank	0.83	1.00	0.83	Drs	0	54	37	9	
60	Karnataka Bank	0.73	0.86	0.84	Drs	0	19	37	54	9
61	Karur Vysya Bank	0.75	0.87	0.86	Drs	0	37	54	9	
62	Kotak Mahindra Bank	0.52	0.83	0.63	Drs	0	54	18	6	
63	Lakshmi Vilas Bank	0.63	0.72	0.88	Drs	0	54	6	10	
64	Nainital Bank	0.82	0.87	0.94	Drs	0	10	6	8	
65	Ratnakar Bank	0.72	0.79	0.90	Drs	0	10	6	8	
66	SBI Comm. & Intl Bank	0.76	0.77	0.99	Irs	0	9	10	8	
67	South Indian Bank	0.73	0.87	0.84	Drs	0	54	6	10	
68	Yes Bank	0.68	0.81	0.83	Drs	0	9	19	37	54
69	SBBJ	0.70	0.86	0.81	Drs	0	31	18	54	
70	State Bank of Hyderabad	0.77	0.96	0.81	Drs	0	31	37	54	
71	State Bank of India	0.65	0.65	1.00		0	71			
72	State Bank of Indore	0.76	0.92	0.83	Drs	0	54	37	9	
73	State Bank of Mysore	0.69	0.83	0.83	Drs	0	54	9	37	
74	State Bank of Patiala	0.82	0.98	0.83	Drs	0	54	37	9	
75	State Bank of Travancore	0.73	0.90	0.81	Drs	0	31	54	37	
	Mean Score	0.71	0.89	0.80						

Table-3
(Actual and Targets)

DMU	Int. Inc. (O)		Oth. Inc.(O)		Int. Exp. (I)		Op. Exp. (I)		
	Actual	Target	Actual	Target	Actual	Target	Actual	Target	
1	AB Bank	5.000	5.000	8.000	8.000	1.000	1.000	4.000	4.000
2	ABN Amro	3120.000	3120.000	1225.000	1444.930	1437.000	1194.088	1497.000	1243.946
3	Abu-Dhabi	48.000	48.000	5.000	29.746	20.000	16.135	13.000	10.488
4	American Express	77.000	77.000	335.000	335.000	81.000	81.000	375.000	375.000
5	Antwerp Diamond	46.000	46.000	13.000	22.459	20.000	19.618	8.000	7.847
6	Bank of America	607.000	607.000	393.000	393.000	152.000	152.000	175.000	175.000
7	Bank of Bahrain and Kuwait	49.000	49.000	15.000	30.843	25.000	16.081	17.000	10.935
8	Bank of Ceylon	14.000	14.000	15.000	15.000	3.000	3.000	3.000	3.000
9	Bank of Nova Skotia	545.000	545.000	171.000	171.000	371.000	371.000	59.000	59.000
10	Bank of Tokyo Mutsibishi	315.000	315.000	63.000	63.000	174.000	174.000	41.000	41.000
11	Barclays Bank	2037.000	2037.000	589.000	972.840	979.000	763.460	892.000	695.614
12	BNP Paribas	636.000	636.000	243.000	321.167	272.000	222.892	193.000	158.155
13	Calyon Bank	347.000	347.000	255.000	255.000	174.000	140.035	100.000	80.480
14	Chinatrust Commercial	19.000	19.000	2.000	18.187	6.000	4.256	9.000	4.450

Bank									
15	Citi Bank	6840.000	6840.000	3582.000	3582.000	3429.000	3429.000	2587.000	2587.000
16	DBS Bank	809.000	809.000	302.000	302.000	494.000	437.191	165.000	146.025
17	Deutsche Bank	1881.000	1881.000	1020.000	1020.000	588.000	588.000	1155.000	1155.000
18	HSBC	6327.000	6327.000	2699.000	2699.000	2611.000	2611.000	2195.000	2195.000
19	JP Morgan Chase Bank	516.000	516.000	718.000	718.000	231.000	231.000	138.000	138.000
20	Krung Thai Bank	10.000	10.000	1.000	11.923	5.000	2.385	3.000	3.000
21	Mizuho Corporate Bank	129.000	129.000	38.000	66.349	58.000	46.450	36.000	28.831
22	Oman Intl Bank	15.000	15.000	3.000	14.613	9.000	3.903	6.000	3.097
23	Shinhan Bank	64.000	64.000	8.000	32.452	26.000	25.122	13.000	12.561
24	Societe Generale	153.000	153.000	69.000	90.083	80.000	46.889	66.000	38.683
25	Sonali Bank	1.000	1.000	5.000	5.000	1.000	1.000	3.000	3.000
26	Standard Chartered Bank	5649.000	5649.000	3097.000	3097.000	2490.000	2490.000	2500.000	2500.000
27	State Bank of Mauritius	45.000	45.000	3.000	3.000	31.000	31.000	6.000	6.000
28	Allahabad Bank	7365.000	7365.000	1142.000	1266.512	5206.000	4884.062	1399.000	1312.486
29	Andhra Bank	5375.000	5375.000	765.000	950.999	3748.000	3367.978	1104.000	992.062
30	Bank of Baroda	15092.000	15092.000	2758.000	2901.491	9968.000	9366.865	3576.000	3360.344
31	Bank of India	16347.000	16347.000	3052.000	3052.000	10848.000	10848.000	3094.000	3094.000
32	Bank of Maharashtra	4292.000	4292.000	500.000	796.777	3035.000	2581.921	963.000	819.239
33	Canara Bank	17119.000	17119.000	2311.000	2311.000	12401.000	12401.000	3065.000	3065.000
34	Central Bank of India Corporation	10455.000	10455.000	1070.000	1697.554	8227.000	7590.184	1862.000	1717.871
35	Bank	6067.000	6067.000	1107.000	1107.000	4376.000	4332.970	1002.000	992.147
36	Dena Bank	3447.000	3447.000	430.000	625.348	2383.000	2017.121	768.000	650.083
37	IDBI Bank	11632.000	11632.000	1390.000	1390.000	10306.000	10306.000	1338.000	1338.000
38	Indian Bank	6830.000	6830.000	1035.000	1429.469	4222.000	4180.438	1415.000	1401.070
39	Indian Overseas Bank	9641.000	9641.000	1596.000	1757.469	6772.000	6285.624	1942.000	1802.522
40	Oriental Bank of Commerce	8856.000	8856.000	1071.000	1334.056	6860.000	6691.495	1383.000	1349.029
41	Punjab & Sind Bank	3247.000	3247.000	408.000	567.888	2235.000	1914.786	692.000	592.855
42	Punjab National Bank	19326.000	19326.000	2920.000	2920.000	12295.000	12295.000	4206.000	4206.000
43	Syndicate Bank	9580.000	9580.000	860.000	1612.802	6978.000	6690.628	1716.000	1645.331
44	UCO Bank	8121.000	8121.000	1020.000	1290.025	6477.000	5838.850	1463.000	1318.857
45	Union Bank of India	11889.000	11889.000	1483.000	2143.398	8076.000	7968.020	2214.000	2184.398
46	United Bank of India	4312.000	4312.000	491.000	779.436	3150.000	2614.566	975.000	809.271
47	Vijaya Bank	5238.000	5238.000	699.000	786.967	4113.000	3674.398	925.000	826.360
48	Axis Bank	10835.000	10835.000	2897.000	2897.000	7149.000	6460.611	2858.000	2582.799
49	Bank of Rajasthan	1384.000	1384.000	124.000	284.239	998.000	782.875	315.000	247.100
50	Catholic Syrian Bank	557.000	557.000	100.000	211.874	391.000	242.824	187.000	116.133
51	City Union Bank	804.000	804.000	124.000	156.532	562.000	486.960	140.000	121.307
52	Development Credit Bank	645.000	645.000	120.000	267.862	448.000	266.557	242.000	143.988
53	Dhanlakshmi Bank	408.000	408.000	79.000	136.276	287.000	189.227	113.000	74.504
54	Federal Bank	3315.000	3315.000	516.000	516.000	2000.000	2000.000	571.000	571.000
55	HDFC Bank	16332.000	16332.000	3291.000	3291.000	8911.000	8911.000	5533.000	5533.000
56	ICICI Bank	31093.000	31093.000	7604.000	7604.000	22726.000	22726.000	7045.000	7045.000
57	IndusInd Bank	2309.000	2309.000	456.000	456.000	1850.000	1367.199	547.000	404.247
58	ING Vysya Bank	4004.000	4004.000	848.000	891.705	2682.000	2250.813	1027.000	861.888

59	J&K Bank	2988.000	2988.000	245.000	466.840	1988.000	1985.593	471.000	470.430
60	Karnataka Bank	1917.000	1917.000	353.000	353.000	1444.000	1244.476	347.000	299.053
61	Karur Vysya Bank	1446.000	1446.000	265.000	283.099	1036.000	903.377	258.000	224.972
62	Kotak Mahindra Bank	3065.000	3065.000	358.000	1287.338	1547.000	1276.872	1196.000	987.162
63	Lakshmi Vilas Bank	658.000	658.000	107.000	142.538	504.000	363.391	152.000	109.594
64	Nainital Bank	209.000	209.000	10.000	64.902	116.000	101.315	39.000	34.063
65	Ratnakar Bank	138.000	138.000	16.000	56.860	74.000	58.804	33.000	26.224
66	SBI Comm. & Intl Bank	54.000	54.000	3.000	23.568	36.000	27.760	10.000	7.711
67	South Indian Bank	1687.000	1687.000	164.000	272.155	1164.000	1007.705	328.000	283.958
68	Yes Bank	2003.000	2003.000	435.000	435.000	1492.000	1212.632	419.000	340.545
69	SBBJ	3810.000	3810.000	577.000	625.833	2707.000	2323.948	787.000	675.636
70	State Bank of Hyderabad	5709.000	5709.000	769.000	858.154	4243.000	4067.293	933.000	894.363
71	State Bank of India	63788.000	63788.000	12691.000	12691.000	42915.000	42915.000	15649.000	15649.000
72	State Bank of Indore	2713.000	2713.000	350.000	433.038	1979.000	1814.390	460.000	421.738
73	State Bank of Mysore	3247.000	3247.000	480.000	505.889	2409.000	1994.646	665.000	550.618
74	State Bank of Patiala	5804.000	5804.000	632.000	772.901	4676.000	4583.969	794.000	778.373
75	State Bank of Travancore	4123.000	668.244	573.000	2566.415	2841.000	2566.415	799.000	721.776

Table-4

(Efficient and Non Efficient Banks Group-Wise)

Category	Eff. units		Ineff. units		Total units	
	TE	PTE	TE	PTE	TE	PTE
Foreign Bnks	05	14	22	13	27	27
Nationalised Banks	00	04	20	16	20	20
Pvt. Banks	00	04	21	17	21	21
SBI & Ass.	00	00	07	07	07	07

The results for the DEA run with variable returns to scale (PTE) for 75 banks shows that average size of efficiency scores was higher in the variable returns 0.88 compared with 0.71 for constant returns to scale. Further, there are 22 banks achieving an efficiency score of 1 in under VRS assumption in comparison to only 5 under CRS assumption. However, of the

17 additional efficient units 7 units do not appear in any peer count. This indicates that these banks are found apparently efficient by default because there were no other banks of comparable size. These banks are American Express, Krug Thai, Standard Chartered, Canara Bank, HDFC, ICICI and J&K Bank.

The average scale efficiency score is 0.81. The banks that are not of optimal size i.e. technical efficiency score less than 1 are 70 in numbers. Out of which only 5 banks have increasing returns to scale. It shows that except these 5 banks, remaining 65 inefficient banks are over resourced. They should try to reduce their inputs.

Of the 75 banks studied, Federal Bank has maximum peer count of 37 banks followed by Bank of America, Bank of India, Bank of Tokyo & Mitsubishi, IDBI and HSBC

etc. These banks are well managed and have healthy input-output ratio.

The banks which performed very poorly were (on the basis of Technical Efficiency Score) are ABN Amro, Societe Generale, Barclays Bank, Standard Chartered, Development Credit Bank etc. These banks have diminishing returns to scale which shows that these banks are over resourced.

Target Setting

An inefficient bank may become overall efficient by adjusting its operation to the associated target point determined by the efficient banks that define its reference frontier. The DEA provides diagnostic information about the reasons of inefficiency for all the banks with respect to the variables taken into consideration. The inefficiency scores and the optimal slack values provide the target points on the efficiency frontier that the inefficient banks can reach by adjusting their input and output levels.

Table 3 presents the target values of inputs and outputs for inefficient banks along with the actual values of inputs and outputs. The relative reduction in inputs shows that Oman International Bank needs to reduce its input by nearly 56.63% followed by Krung Thai bank 52.3%, DCB 40.5%, Catholic Syrian Bank 37.9% and Bank of Bahrain and Kuwait 35.68% etc.

Group-wise difference in the Technical Efficiency of Banks

Among the 4 groups of banks i.e. Foreign, Public, Private and SBI & its Associates the difference in the mean technical efficiency score has been tested by applying ANOVA. The results of the test shows that there is no significant difference between the mean efficiency score of various banks belonging to different groups at 95% confidence level (significant value 0.496 being greater than 0.05).

ANOVA					
TEScore					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.042	3	.014	.803	.496
Within Groups	1.246	71	.018		
Total	1.288	74			

Conclusions

The primary purpose of this paper is to investigate recent efficiency record of Indian commercial banking industry. This has been executed by implementing Data Envelopment Analysis (DEA) on a cross section of 75 banks taken in the year 2008-2009. The overall level of technical efficiency in these banks has been found to be 88 percent. This implies that the

sample banks have the scope of producing 1.136 times as much output from the same inputs. The inefficiency that exists in these banks was more a result of both technical and pure technical efficiency. On the basis of technical efficiency only 5 banks have been found to be efficient and all of them belong to foreign bank category. With regard to pure technical efficiency score 17 banks are efficient which indicates that scale inefficiency is the main reason of inefficiency among banks in India. Further ANOVA statistical test does not indicate any significant difference among the 4 groups of banks chosen for the purpose.

References

- [1] Banker, R.D., A. Chranes, W.W. Cooper (1984): "Some Models for Estimating Technical and Scale Inefficiencies in Data Envelopment Analysis", *Management Science*, 30 (9), pp. 1078-92.
- [2] Berger, A.N., DB Humpherey (1992): *Measurement and Efficiency Issues in Commercial Banking* in Z Grilliches (ed.), *Output Measurement in the Service Sector*, The University of Chicago Press, Chicago: pp. 245-300.
- [3] Coelli, T., P.D.S Rao and G.E Battese (2002): *An Introduction to Efficiency and Productivity Analysis*, (London: Kluwer Academic Publishers).
- [4] Das, Abhiman & Gosh, Saibal (2006): "Financial Deregulation and Efficiency: An empirical analysis of Indian Banking during the Post-Reform Period", *Review of Financial Economics*, 15, Pp: 193-221.
- [5] Das, Abhiman & Gosh, Saibal (2009): "Financial Deregulation and Profit Efficiency: A Non-Parametric Analysis of Indian Banks", Munich Personal RePEc Archive.
- [6] Das, S.K.(2010): "Financial Liberalization and Banking Sector Efficiency: The Indian Experience", 12th Money and Finance Conference, 11-12th March IGIDR, Mumbai (India).
- [7] Kumar, S., Gulati, R., (2008): "An Examination of Technical, Pure Technical and Scale Efficiency in Indian Public Sector Banks using Data Envelopment Analysis", *Eurasian Journal of Business and Economics*, Vol.1 (2), Pp:33-69.
- [8] Leigh, D. & Hall, J.B.(2003): "Efficiency in Japanese Banking: An Empirical Analysis", *Journal of Banking & Finance*, 27, Pp:891-917.
- [9] Mishra, B.S.(2003): "Allocative Efficiency of the Indian Banking System in the Post-Reform Period- A State Level Analysis", Reserve Bank of India Occasional Paper, Vol.24, No.3, Winter.
- [10] Musonde, Anthony (2008): *An Investigation into the Determinants of Cost Efficiency in the Zambian Banking Sector*, 13th Annual African Econometric Society Conference, 9-11 July.
- [11] Ram Mohan T. T. (2002), "Deregulation and Performance of Public Sector Banks", *Economic and Political weekly*, Vol. 37, pp. 393.
- [12] Ram Mohan T. T. & Subhash C. Ray (2004), "Comparing Performance of Public and Private Sector Banks: A Revenue Maximisation Efficiency Approach", *Economic and Political weekly*, Vol.39, No-12, Pp: 1271-1276.
- [13] Subhass, C.Ray & Abhiman Das (2010): "Distribution of Cost and Profit efficiency: Evidence from Indian Banking", *European Journal of Operational Research*, 201, Pp: 297-307.