Evaluating Efficiency of Commercial Banks in India: Using DEA Model

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The proposed study is an attempt to assess the stability of the Indian banking system by evaluating their relative performance through a non-parametric data envelopment analysis (DEA) approach. The results reveal that Foreign Commercial Banks have performed inadequately as compared to Public as well as Private Sector Banks during the study period.

Keywords: DEA, efficiency, banks

JEL Classification: D61; G21; G34

Introduction

The efficiency of financial institutions has been widely and extensively studied in the last few decades. For financial institutions, efficiency implies improved profitability, greater amount of funds channeled in, better prices and services quality for consumers and greater safety in terms of improved capital buffer in absorbing risk (Berger, Hunter, & Timme, 1993). In India, the landscape of financial institutions has changed significantly with various liberalization measures being introduced in 1991. This includes government reforms to improve the bank infrastructure, existing ownership structures, lending practices and capital requirements; deregulation to allow for increased competition, and focus on consolidation and mergers and acquisitions. However, the impact of competitive and regulatory changes could be judged by gross measures of performance such as profitability and failure rates. Economists and other financial experts are also interested in how such changes affect the efficiency with which banks transform resources into various financial services. This is because that the commercial banks have been facing an increasing degree of competition in the intermediation process from term lending institutions, non banking intermediaries (like mutual funds and leasing companies), chit funds and the capital market. Besides, new banking services like (ATM machines and Internet banking) are significantly growing due to the advancement of computers and information technology. The banks are facing pricing pressure, squeeze on spread and have to give thrust on retail assets. With the ongoing financial meltdown, the position of Indian banking sector has become more critical. In particular, the recent financial crisis has redefined the broad contours of regulation of the banking sector globally. This in turn has made it necessary to look for efficiencies in the banking business. This article is an attempt to contribute to the banking efficiency literature by measuring relative efficiency of banks in three different ownership groups that is Public, Private and Foreign Commercial banks.

The remainder of the present paper is organized as follows: the next section presents the review of literature. The following section is to discuss the source of data, research methodology and framework. The penultimate section concentrates on interpretation of the findings and discussion and the final section concludes with our research results.

Literature Review

The efficiency of commercial banks has been studied using a variety of techniques. However, recent studies typically use techniques that accommodate the multiple inputs and outputs of banks. This includes the non parametric Data Envelopment Analysis (DEA) methodology in which bank's input and output weights are treated as the decision variables. Studies that are based on DEA analysis include the work of Chen (1998) who concluded that the privately-owned banks enjoy a higher efficiency score than that of publicly-owned banks at Taiwan. Jackson and Fethi (2000) found that, larger and profitable banks were more likely to operate at higher levels of technical efficiency. Schmid (1994) observed that small and very large banks in Australia were technically most efficient while the least efficient units were the regional banks. Jemric and Vujcic (2002) found that foreign banks and new banks were more efficient banks in Croatia during the late 1990's. Yildrim (2002) on the other hand observed that state owned banks outperform both privately owned and foreign banks, and also found larger banks have higher levels of efficiency. Barbara and Philip (2003) concluded geographic location influences banks efficiency. Bonaccorsi di Patti and Hardy (2005) concluded that deregulation seems to increase efficiency for all banks in Pakistan. Ariff and Can (2007) concluded that profit efficiency levels are lower than cost efficiency and the medium sized

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Chinese commercial banks are more efficient than their small and large peers. In Indian context, Bhattacharyya et al. (1997) found that state owned banks were the best performing banks and these banks improved their efficiency after deregulation. Debasish and Mishra (2007) concluded that foreign owned banks were on average most efficiency and that new banks were more efficient than old ones which were often burdened with old debts. Debnath and Shankar (2008) observed that medium banks perform worse than the large or smaller banks when evaluated on variance return to scale. Gupta et al, (2008) observed that the State bank group was, most efficient in all the years, followed by the private banks. Ketkar and Ketkar (2008) results show that foreign banks were found to be the most efficient followed by private banks. Kumar and Gulati (2008) confirmed that efficiency of PSBs was positively influenced by their exposure to off-balance sheet activities. Time and again, there had been many attempts to measure the efficiency of commercial banks operating in India but the studies were mostly either constricted in scope or possess methodological limitations. The distinctiveness of this article is that it considers entire banking sector of India for efficiency measurement. Apart from this an adequate time period of six years along with core efficiency variables have been taken into consideration to work out for a broader conclusion. This is because a measure of relative efficiency with an adequate sample and variable framework would provide a good indicator of the success or otherwise of a bank in a competitive market. In fact, the phenomenon reflects the potentiality for failure of a banking institution in particular. Studies reveal that banks which operate efficiently have a better chance of sustaining their business in the future. Berger et al. (1992) found that during the 1980s, the high-cost banks experienced a higher rate of failure than more efficient banks. Moreover efficiency indices could also be used not only to evaluate the impact of changes in regulation and in market conditions on the performance of banks but can also provide a framework to the regulators to assess the health of individual banks and to work out appropriate interventions to prevent systemic failures (Lacasta, 1988).

Data and Methodology

The study aims to evaluate the performance of the commercial banks comprising (public, private and foreign sector banks) in India for six years ranging from 1st April 2005 to 31st March 2011. The required data has been collected from the Statistical Tables Relating to the Banks in India and Trends & Progress of Banking in India, being available on the official website of RBI. In the beginning it was planned to consider all the 81 Commercial Banks operating in India as on 31st March 2011 for the study. However, due to various reasons like non-availability of data, mergers and late beginning of the banking operations, the sample has been reduced to 59 banks i.e., 26 public, 18 private and 15 foreign banks.

Tools

Technically 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. 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 bank's input and output weights are treated as the decision variables. A complete DEA solution would be required on such linear programming to be solved for each bank.

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, i.e., for each bank, DEA will choose those weights that would maximize 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:

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

Where *s* = number of outputs
ur= weight of output r
yro= amount of output r produced by the DMU
m = number of inputs
vi= weight of input I
xio= 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 bank's 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.

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

subjected to

$$\frac{\sum_{r=1}^{s} u_r y_{rj}}{\sum_{i=1}^{m} v_i x_{ij}} \leq 1$$

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

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

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

$$u_r, v_i \geq 0$$

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

In computing the efficiency scores, the most challenging task that analysts always encounters is to select the relevant input and output for modeling bank behavior. In the literature on banking performance 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 variables selected for the analysis are total assets, deposits and borrowings as inputs and operating profit, interest income (spread) advances and investments as output variables.

Analysis and Interpretations

Tables I, II and III summarizes the results of descriptive statistics of Public Sector Banks, Private Sector Banks and Foreign Sector Banks. The efficiency scores of sample banks are shown under sector wise separately in three different tables. In addition, each table is accompanying some descriptive statistics of efficiency about the banks in the sample. This paper worked out the relative efficiency score of Indian Banks during 2006-2011. The scores were calculated using the non-parametric technique of Data Envelopment Analysis. This approach has been used since "recent research has suggested that the kind of mathematical programming procedure used by DEA for efficient frontier estimation is comparatively robust" (Seiford and Thrall, 1990). The choice of inputs and outputs in DEA is a matter of long standing debate among researchers. Most of the DEA studies follow an intermediation approach. Therefore, this study is also based on intermediation approach and uses total assets, deposits and borrowings as inputs and operating profit, interest income (spread), advances and investments as output variables

Table I - Descriptive Statistics of Public Banks as on 31 March

		2006	2007	2008	2009	2010	2011
Total Assets	Average	7556224	9194160	11428035	14360156	17398517	20922158
	SD	9237681	10552810	13353623	17900496	19560213	22961968
	Average	6021766	7428147	8747444	11125508	14082288	16819172
Deposits	SD	7198171	8249964	10014953	13773903	15031521	17711795
	Average	436207.8	456195.6	588411.7	605391	1231990.7	1559895.8
Borrowings	SD	1065228	1084580	1251483	1295298	2079768.8	2396539.2
	Average	146366.6	163458.2	193526.3	259588.2	249826.85	333552.12
Operating Profit	SD	210682.5	186269	248550.9	343972.6	338996.57	470463.05
Net Interest Margin (Spread)	Average	217207	244121.7	242865.3	302108.7	358594.23	519865.5
	SD	291423.5	302137.7	322729.5	399234.9	448850.78	613492.31
	Average	4176803	5438040	6795943	9797091	10297468	12713969
Advances	SD	4905546	6289769	7739977	11249571	11847262	14299392
	Average	2319492	2463493	3023752	3863905	4751379.6	5233361
Investment	SD	3031511	2786929	3489859	5088658	5452105.3	5495936

Source: Collected and compiled from Reserve Bank of India Website (www.rbi.org.in)

Table - II : Descriptive Statistics of Private Banks as on 31 March

		2006	2007	2008	2009	2010	2011
Total Assets	**Average**	2757221	3633156	4570804	5162097	5765043	7087686
	SD	5720879	7836544	9269578	9294880	9455732	11095595
	Average	2047417	2692742	3275940	3710310	4122949	5120972
Deposits	**SD**	3779495	5258226	5798758	5795678	5925887	7127351
	Average	250875.6	336751.3	430296.3	493600.9	753731.5	917160.4
Borrowings	**SD**	876222.6	1166594	1493673	1575454	2151627	2516800
	Average	48781.05	69956.95	94883.16	123121.6	146844.1	165794.3
Operating Profit	**SD**	94822.89	141580.6	193140.5	229768.9	266014.1	276885.6
Net Interest Margin (Spread)	**Average**	64831.16	87425.42	105466.1	136128.2	154737.7	197137.6
	SD	114036.2	163081.6	195307.4	244729.2	260476.2	310890.7
	Average	1512127	2028174	2520400	2897993	3174375	4041761
Advances	**SD**	3288210	4421879	5164485	5285306	4931750	6111502
	Average	880258.9	1041531	1355885	1527991	1715354	2049961
Investment	**SD**	1690376	2128437	2675677	2629805	3018990	3465435

Source : Collected and compiled from Reserve Bank of India Website (www.rbi.org.in)

Table III - Descriptive Statistics of Foreign Banks as on 31 March

		2006	2007	2008	2009	2010	2011
Total Assets	**Average**	1288288	1795030	2342171	2982166	2816470	3153024
	SD	1737417	2339676	3073614	3969104	3682512	4068169
	Average	1087299	1479126	1890327	2432872	2280386	2648357
Deposits	**SD**	1410277	1806595	2273249	3018431	2740421	3251448
	Average	1303977	1741381	2221814	2868758	2658749	3084739
Borrowings	**SD**	1325179	1699321	2133358	2844262	2585702	3081744
	Average	1089227	1468283	1891424	2443555	2271770	2604600
Operating Profit	**SD**	600895.2	813489.5	1053979	1359017	1253509	1410309
Net Interest Margin (Spread)	**Average**	1149095	1544373	1982020	2566723	2370930	2716255
	SD	512049	692759.5	894379	1153456	1062416	1200364
	Average	1045974	1398367	1796213	2330941	2156807	2474638
Advances	**SD**	490030.6	651214.2	841904.1	1093927	1013438	1154109
	Average	1003209	1340894	1722805	2235786	2068855	2373059
Investment	**SD**	473162.9	629556.4	812848.7	1055906	977978	1115398

Source: Collected and compiled from Reserve Bank of India Website (www.rbi.org.in)

Table: IV demonstrated the relative performance of public sector commercial banks during 2006-2011. The Indian Bank as per DEA analysis is considered as best performer during the study period followed by Punjab & Sind Bank and State Bank of Bikaner & Jaipur and State Bank of Mysore. However, the IDBI Bank Ltd. is found on the lowest efficiency frontier although the average performances of all these banks are relatively admirable. The 2007 year reveals that there is highest fluctuation in efficiency scores among different public sector banks with a standard deviation of about 14% followed by the previous financial year 2011. Most of times the banks have achieved only about 77% efficiency level score during this period whereas some have achieved highest efficiency over 98% during the same period. While on the other hand 2008 year shows the lowest volatility in efficiency scores among the same class of commercial banks.

Table: IV : Performance of Public Banks in India during the study period of 2006 to 2011

S.No.	Name of the Banks	2006	2007	2008	2009	2010	2011
1	State Bank of India	0.955	0.770	0.930	0.942	0.944	0.886
2	State Bank of Bikaner& Jaipur	1.000	0.878	0.987	0.839	1.000	1.000
3	State Bank of Hyderabad	0.884	0.857	0.957	0.891	0.927	0.957
4	State Bank of Mysore	0.901	0.763	1.000	0.908	1.000	1.000
5	State Bank of Patiala	0.786	0.694	0.956	0.788	0.939	0.968
6	State Bank of Travancore	0.951	1.000	1.000	0.938	0.994	0.925
7	Allahabad Bank	0.877	0.751	0.997	1.000	0.901	0.938
8	Andhra Bank	0.845	0.872	1.000	0.861	0.952	0.945

9	Bank of Baroda	0.851	0.769	0.960	0.809	0.964	0.918
10	Bank of India	0.729	0.707	0.990	0.838	0.945	0.886
11	Bank of Maharashtra	0.965	0.777	1.000	1.000	0.864	0.982
12	Canara Bank	0.798	0.744	1.000	0.881	0.976	0.946
13	Central Bank of India	0.992	0.710	0.964	0.893	0.880	0.934
14	Corporation Bank	0.853	0.816	0.961	0.937	0.874	0.794
15	Dena Bank	0.845	0.840	0.989	0.869	0.939	0.996
16	IDBI Bank Ltd.	0.390	0.296	0.812	0.765	0.933	0.689
17	Indian Bank	1.000	1.000	1.000	1.000	0.942	0.993
18	Indian Overseas Bank	0.996	0.866	0.968	0.886	0.928	0.840
19	Oriental Bank of Commerce	0.815	0.721	0.981	0.826	0.930	0.898
20	Punjab & Sind Bank	1.000	1.000	0.945	1.000	0.881	0.941
21	Punjab National Bank	0.900	0.950	0.998	1.000	0.970	0.911
22	Syndicate Bank	0.873	0.698	0.981	0.786	1.000	1.000
23	Union Bank of India	0.802	0.806	0.983	0.912	0.936	0.956
24	United Bank of India	1.000	0.794	0.941	0.916	0.394	0.336
25	UCO Bank	0.796	0.609	0.997	0.814	0.914	0.924
26	Vijaya Bank	0.941	0.744	0.950	0.896	0.904	0.960
	Mean	**0.875**	**0.786**	**0.971**	**0.892**	**0.917**	**0.905**
	Median	**0.881**	**0.773**	**0.982**	**0.892**	**0.937**	**0.939**
	SD	**0.127**	**0.142**	**0.039**	**0.072**	**0.113**	**0.135**
	MAX	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**
	MIN	**0.390**	**0.296**	**0.812**	**0.765**	**0.394**	**0.336**

Source: Authors own compilation and computation.

Table: V shows that the Catholic Syrian Bank as per DEA analysis is considered as best performer during the study period followed by Tamilnad Mercantile Bank which in turn is followed by Karur Vysya Bank, City Union Bank and Karnataka Bank. However, the ICICI Bank is found on the lowest efficiency frontier although the average performances of all these banks are relatively commendable. The year of 2007 & 2008 reveals that there is highest fluctuation in efficiency scores among different private sector banks with a standard deviation of about 19.3% & 19.1% followed by financial year 2009. Most of times the banks have achieved minimum of about 67% efficiency level score during this period as against of the highest efficiency level of 97% in 2010 and which also demonstrates the lowest volatility in efficiency scores among the same class of commercial banks.

Table: V Performance of Private Banks in India during the study period of 2006 to 2011

S.No.	Name of the Banks	2006	2007	2008	2009	2010	2011
1	Axis Bank	0.816	0.592	0.638	0.807	0.974	0.974
2	Catholic Syrian Bank	1.000	1.000	1.000	0.991	1.000	1.000
3	City Union Bank	1.000	0.795	0.789	1.000	0.985	0.985
4	Dhanalakshmi Bank	0.956	0.847	0.872	0.896	0.992	0.992
5	Federal Bank	0.937	0.648	0.835	0.964	0.999	0.999
6	HDFC Bank	0.869	0.773	0.932	0.819	0.937	0.937
7	ICICI Bank	0.719	0.270	0.315	0.553	0.963	0.963
8	IndusInd Bank	0.870	0.668	0.606	0.718	0.961	0.961
9	ING Vysya Bank	0.885	0.476	0.522	0.757	0.989	0.989
10	Jammu & Kashmir Bank	0.972	0.661	0.687	0.953	0.931	0.931
11	Karnataka Bank	0.953	0.759	1.000	1.000	0.954	0.954
12	KarurVysya Bank	0.986	0.673	0.631	1.000	1.000	1.000
13	Lashmi Vilas Bank	1.000	0.636	0.802	0.937	0.971	0.971
14	Nainital Bank	0.849	0.664	0.698	0.807	0.823	0.823
15	Ratnakar Bank	0.905	0.946	0.970	0.926	0.989	0.989
16	South Indian Bank	0.995	0.836	0.875	0.870	0.927	0.927
17	Tamilnad Mercantile Bank	1.000	1.000	0.985	0.894	1.000	1.000
18	Yes Bank	0.798	0.424	0.596	0.601	0.848	0.848
	Mean	**0.917**	**0.704**	**0.764**	**0.861**	**0.958**	**0.958**
	Med.	**0.945**	**0.671**	**0.795**	**0.895**	**0.972**	**0.972**
	SD	**0.084**	**0.193**	**0.191**	**0.134**	**0.051**	**0.051**
	MAX	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**
	MIN	**0.719**	**0.270**	**0.315**	**0.553**	**0.823**	**0.823**

Source: Authors own compilation and computation.

Table: VI indicates that as per DEA scores, Bank of Bahrain & Kuwait are considered the best performers during the study period followed by China Trust Commercial Bank which in turn is followed by seven other banks having achieved the efficiency score of one in each year of the study period. However the average performance of Societe Generate Bank is lowest as compared with other banks during the study period. In the year 2007 there is highest fluctuation in efficiency scores among different foreign sector banks with a standard deviation of about 30% followed by the 2006 year. Most of times the banks have achieved minimum of about 56% efficiency level score during this particular period as against of the highest efficiency level of 90% in 2010 which also shows the lowest volatility in efficiency scores among the same class of commercial banks.

Table: VI Performance of Foreign Banks in India during the study period of 2006 to 2011

S.No.	Name of the Banks	2006	2007	2008	2009	2010	2011
1	Bank of America	0.561	0.875	0.916	0.569	0.952	1.000
2	Bank of Bahrain & Kuwait	0.916	1.000	0.824	0.870	1.000	1.000
3	Bank of Nova Scotia	0.649	0.635	0.756	0.210	0.880	0.715
4	Bank of Tokyo-Mitsubishi UFJ	0.823	0.851	1.000	0.279	0.914	0.853
5	Barclays Bank	0.610	0.875	1.000	0.843	0.868	0.624
6	BNP Paribas Bank	0.481	0.860	0.750	0.454	0.941	0.835
7	Chinatrust Commercial Bank	0.535	0.826	0.851	0.296	1.000	1.000
8	Citi Bank	0.632	0.710	0.946	0.408	0.763	0.687
9	DBS Bank	0.324	0.416	0.499	1.000	0.784	0.541
10	Deutsche Bank	0.131	0.259	0.725	0.675	0.845	0.901
11	Hong Kong & Shanghai Bank	0.877	0.856	0.851	0.893	0.871	0.943
12	JP Morgan chase Bank	0.134	0.197	0.377	0.715	1.000	0.792
13	Societe Generate Bank	0.128	0.107	0.239	0.627	0.948	0.566
14	Standard Chartered Bank	0.635	1.000	0.920	0.546	0.752	0.876
15	State Bank of Mauritius	1.000	0.334	0.832	0.455	0.906	0.853
	Mean	**0.562**	**0.653**	**0.766**	**0.589**	**0.895**	**0.812**
	Median	**0.610**	**0.826**	**0.832**	**0.569**	**0.906**	**0.853**
	SD	**0.284**	**0.307**	**0.226**	**0.243**	**0.083**	**0.154**
	MAX	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**
	MIN	**0.128**	**0.107**	**0.239**	**0.210**	**0.752**	**0.541**

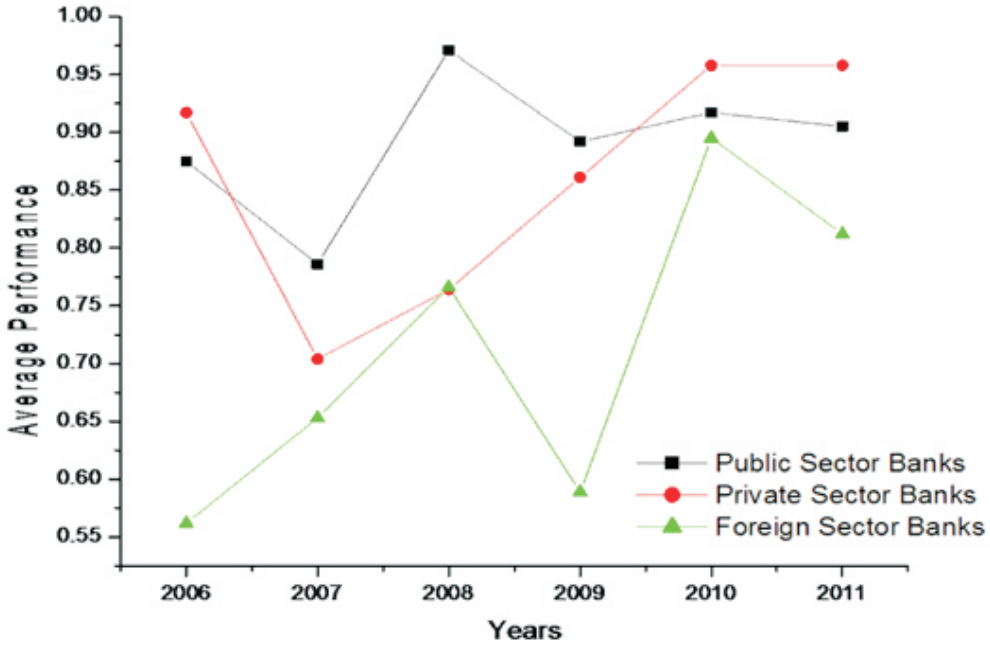
Source: Authors own compilation and computation.

Table: VII Overall performance of Commercial Banks in India for the period 2006 to 2011

Name of the Banks	2006	2007	2008	2009	2010	2011
Public Banks	0.874	0.785	0.971	0.892	0.916	0.904
Private Banks	0.917	0.703	0.763	0.860	0.957	0.957
Foreign Banks	0.562	0.653	0.766	0.589	0.895	0.812
Overall Mean	**0.786**	**0.714**	**0.837**	**0.783**	**0.923**	**0.891**

Source: Authors own compilation and computation.

Graphical Representation of average performance level of Commercial Banks during study period



According to Table: VII, the overall mean efficiency range between 71% - 92%, which clearly explains, all bank groups are having more than average efficiency and are much close to achieve the optimal level of performance. However, in the case of foreign banks' it ranges between 56%- 89% implies low efficiency level as compared with public and private banks, particularly in the year 2006 & 2009. The reasons might be explained by their advances and assets are not increasing in the same line with public sector banks. Although private sector banks are lagging behind to public sector banks to half of the study period but during 2006, 2010 and 2011 private sector banks have surpassed over public sectors banks in terms of mean average performance level achieved during this particular time period. The Figure: I clearly indicate how public sector banks have performed well during the middle of the study period. It also depicts how foreign sector banks are lagging behind for five years during the study period except in the year 2008 where it has surpassed over private sector banks.

Conclusion

In this study, Data Envelopment Analysis (DEA) is utilized to analyze the relative efficiency of Indian Commercial Banks during 2006 – 2011. Overall, the analysis leads to the conclusion that Public and Private Sector Commercial Banks have adequately performed during the six years study period though the Public Sector Banks have taken over Private sector banks in 2007, 2008, 2009 in terms of achieving higher mean level performance. However, Private Sector Banks have also performed better than public sector banks for rest of time during the study period. Hence, it is difficult to conclude that the Private Sector Banks performs better over Public Sector Banks and vice versa. The Foreign Banks on the other hand are seen far behind from both Public as well as Private Sector Banks during the study period although the overall mean of total banking industry is observed quite reasonable. Nevertheless, it is important to mention here that this article just examines the relative efficiency of Indian Commercial Banks not the absolute efficiency. This means that the Commercial Banks, which have gained efficiency scores in this study, could be seen as best banks in comparison to the other. It is thus possible that the efficient banks in this study could become inefficient when new variables are added to the study.

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