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Journal of Vibration Engineering

ISSN:1004-4523

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Indian Banking System: A study of Efficiency using Data Envelopment Analysis

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Abstract: *In the paper we have emphasized on study of Indian Banks' Performance. We have considered nineteen banks for our study. The study contains 7banks owned by Private Sector and 12 banks owned by Public Sector in the year 2012-2013 by finding out the efficiency of banks while using DEA for earning goodwill from the investors and give them ranks accordingly. The findings suggest that public sector banks work better as compare to the private sector banks. The efficiency level of Private sector banks in 2013 was consistent.*

Introduction:

The Indian banking sector is a blend of public, private along with foreign ownerships. The sector have faced augmentation in investments and deposits in recent past. Liberalization have played an important role in financial sector and economic development in Indian Banking Sector. The empowered financial intermediaries are Indian banks, resulting high quality progress during the last recent years, considering factors i.e. augmentationin deposits and investments.

India counted as the faster growing economies are dependent on financial policies and efficientmarket of the industrial sector. In the era of19s financial sector of India has gone through the drastic change. Reserve Bank of India have originated with many reforms in the year 1992. These Reforms were introduced with motive to enhance competition and also to bring efficiency to the system i.e. branch relicensing, motivating the public sector banks to augment up to 49% of their equity in capital market resulting a good competition in the banking sector. Eventually, Introduction of Reforms have brought a massive demand of ATM machine, internet banking, transparent balance sheets, and product diversification and high demand of housing and consumer credit.

We have used data envelopment analysis (DEA) which is a non-parametric approach because it does not show any specification of arbitrary functional forms, and it can eliminate all the effects of scale inefficiencies as well as productive inefficiencies which is necessary to calculate scale economies. In developed countries the scope of DEA is wide, but in developing countries, it is narrow

Literature review

In Turkish Banks, (Mehmet Hasan EkenSuleyman Kale, A J B M vol. 5(3) PP 889-901, 4 Feb, 2011), it is evident that branch size of the bank and scale efficiency are directly proportional to each other. With the increase in branch size, scale efficiency also increases. The efficiency starts decreasing after reaching to the most productive scale size. Al-Shammari and Salimiin (1998) had suggested that the comparative operational efficiency of Jordanian commercial banks from 1991-1994 using a modified version of DEA and have found that the majority banks werefairly inefficient during 1991-1994. Noulas (2001) used both DEA model and the traditional approach in order to study the impact of deregulation on private as well aspublicsectorbanks. The input variables are interest expense and non-interest expense whereas the interest revenue and non-interest revenue considered as output variables. The result was revealed during the study period.

Studies based upon Efficiency Analysis using DEA in India. Bhattacharya et al (1997) used DEA to compute productive efficiency for Commercial banks in India from late 80s to early 90s. In 1980s, the effects of this policy on liberalizing measures weretaken into account bytakingthe performance of various categories of banks. As per their study, the performance of Indian Public banks was the best as the banking sector empires Indian public sector banks whereas new private sector banks were not emerged wholly at that time in the Indian banking scenario.

In late 1990s, Sathye (2001) examined about the relative efficiency of Indian banks. Hemade a comparison between the efficiency of Indian banks and banks of other countries. He observed that the public sector banks have a greater mean productivity score as compared to the private sector banks in India; however he got blended outcomes when examination was made between public sector and foreign banks in India. He also concluded that the foreign banks in India are efficient

Noulas and Ketkar (1996) also used DEA while calculating the efficiency of public sector banks of India. The study took 18 public sector banks and the relevant information provided by the RBI in its publication for the year 1993. The study revealed that pure technical efficiency was 1.5 percent and scale inefficiency was 2.25 percent and none of the bank was operating under decreasing returns to scale in India.

The latest study done by Das and Drine in (2011)exhibit that the public sector banks as well as the private banks have greater mean efficiency when it was compared with all banks mean efficiency. Among the all Bank Groups, when comparisons was done the foreign banks were at the lowest position in terms of efficiency whereas the efficiency of the public sector banks is the highest level followed by the domestic private banks.

Das and Ghosh (2006) and Ghosh (2009) studied about the inequality in the technical efficiency of the banks over a long period of time. They identified the decreasing trend in the technical efficiency score during the sample period (1992-2002). Further they have identified that efficiency of costs is of high level and lower levels in profits, highlighting the importance of inefficiencies relating to revenue of banks. Study recommendedthat the performance of big state-owned banks was good and are generating higher level of profit efficiency.

Karimzadeh, Majid (2012) examinedIndian commercial bank's efficiencyfor the period of ten years with the use of DEA.With the Use of VRS and CCR, performance of eight banks was measured and it was revealed that Bank of India and ICICI Bank are efficient.Consequently, Public Sector Banks are having the more efficiency than the Private Sector Banks.

Kumar and Gulati (2008) compute (PTE) pure technical efficiency and (SE) scale efficiency of the nationalized banksof India and they have found that the technical efficiency is not affected by the asset quality in Indian Banking Sector. Sarkar et al. (1998) had suggested that in order to increase the efficiency in the sector,introduction of private banks is very important. However, Ray and Das (2009) gave the criticism regarding the efficiency of the Indian banking sector has not been increased due to Privatization because the stock market and other forms of financial markets have not grown up yet.

Avkiranconsideredtook input variables as interest expense and non-interest expense and output variables as interest income and non-interest income. Using DEA model to determine the efficiency of Australian trading banks between 1986 to 1995 and come up with the conclusion that the efficiency rises in the post regulation period and acquiring banks were more efficient than target banks. Chen and Yeh (1998) considered 34 commercial banks of Taiwan's and further calculated their operating efficiencies using the DEA model where staff employed and interest expense are input variables output variables contains loans investment, non-interest and

interest revenue, and bank assets. The author concluded that a bank which is having better efficiency does not always mean that it has better effectiveness.

Research Methodology:

Nowadays, the researcher of all over the world, are interested to analyze the efficiency of banking sector.

The current study considers nineteen banks in total as DMU's. Out of these, Out of 19 banks, 12 are PSU's and 7 banks are owned by private sector. It is not easy to determine input and output which are to be considered for study. This paper considers only one input i.e. number of employees and two outputs i.e. investments and deposits. The data was available at RBI website (www.rbi.org.in) for the year 2012-2013.

DEA is a non- parametric approach which is used to calculate efficiency of similar companies known as Decision Making Units (DMU) where there exists more than one inputs or outputs. Earlier it's a non-parametric approach which is used to find the operational efficiency.

DEA was established by Charnes, Cooper and Rhodes in 1978. They explained efficiencyas relation or ratio of weighted sum of outputs to a weighted sum of inputs, and the structure of weights are calculated by means of mathematical programming and constant returns to scale (CRS) are assumed. Later in 1984, Banker, Charnes and Cooper developed a model with variable returns to scale (VRS).

In this study, we have applied input oriented DEA- CRS model. Generally we can find Efficiency= output/input where there is only one output and input, but we can also apply DEA when the input-output transformation is not known and allows for the following relative efficiency measurement.

Efficiency= weighted sum of outputs/ weighted sum of inputs

For this Study Following Public and Private Sector banks have been considered:

Public banks	**Private banks**
IDBI	Axis bank
Corporation bank	Development Credit bank
Bank of Baroda	HDFC Bank
Oriental Bank of Commerce	ICICI Bank
Bank of India	Indus land bank
Dena bank	Kodak Mahindra
Punjab& Sind bank	Yes Bank
Uco Bank	
Punjab National Bank	
State Bank of India	
Allahabad Bank	
State bank of Patiala	

Scores of efficiency for private banks

Unit name	**Score**
Yes bank	100
Axis bank	69.92
ICICI bank	49.46
Indus land Bank	49.36
HDFC bank	44.78
Development Credit Bank	39.52
Kotak Mahindra	39.3

These scores define the percentage of efficiency of each and every bank.

Scores of efficiency for public banks

Unit name	Score
IDBI bank ltd.	100
Corporation Bank	76.28
Bank of Baroda	74.85
Oriental bank of commerce	63.4
Bank of India	61.4
Dena bank	59.67
Punjab&Sind bank	56.37
Allahabad bank	53.96
UCO bank	48.98
Punjab national bank	42.13
State Bank of Patiala	41.82
State Bank of India	35.87

Results and Findings:

DEA (Data Enveloping Analysis) software here for our research that checked the efficiency of both private and public sector banks. With the use of this software it was found that in public sector banks : IDBI bank contains the 100 % efficiency and in the private sector banks : Yes bank contains the 100% efficiency after considering the following input and outputs. Where Input- Number of employees and Output- deposits and investments

Table 1. Change in the number of employees of Public banks

Unit name	Actual no. of employees	Target no. of employees	% change in no. of employees
IDBI bank ltd.	15465	15465	0
corporation bank	14819	11303.78	-23.7
Bank of Baroda	43108	32268.04	-25.1

Oriental bank of commerce	18891	11977.35	-36.6
Bank of India	42348	26000.53	-38.6
Dena bank	11093	6619.11	-40.3
Punjab & Sind bank	8533	4810.18	-43.6
Allahabad bank	22557	12171.02	-46
UCO bank	24109	11809.4	-51
Punjab national bank	63292	26662.43	-57.9
State Bank of Patiala	14439	6037.93	-58.2
State Bank of India	228296	81897.92	-64.1

Table 2. Change in the investments of public banks

Unit name	**Actual investments**	**Target investments**	**% change in investments**
IDBI bank ltd.	988009	988009	0
corporation bank	581645	722162.1	24.2
Bank of Baroda	1213937	2061501.32	69.8
Oriental Bank of Commerce	585547	765194.57	30.7
Bank of India	946134	1661090.06	75.6
Dena bank	343431	422873.67	23.1
Punjab & Sind bank	225425	307306.77	36.3
Allahabad bank	583059	777567.06	33.4
UCO bank	522449	754464.73	44.4
Punjab national bank	1298962	1703376.47	31.1
State Bank of Patiala	239567	385744.02	61
State Bank of India	3509273	5232193.83	49.1

Table 1 and Table 2 show that the percentage of employees should be decreased and percentage of investment should be increased by the banks to become efficient banks.

The Banks like, Corporation Bank, Bank of Baroda, Oriental Bank of Commerce, Bank of India, Dena bank, Punjab and Sind bank, Allahabad Bank, UCO Bank, Punjab National Bank, State Bank of Patiala and State Bank of India should decrease their percentage of employees by 23.7, 25.1, 36.6, 38.6, 40.3, 43.6, 46, 51, 57.9, 58.2, and 64.1 respectively. It shows that Percentage of investments should be increased for corporation bank, Bank of Baroda, Oriental Bank of Commerce, Bank of India, Dena bank, Punjab and Sind bank, Allahabad Bank, UCO Bank, Punjab National Bank, State Bank of Patiala and State Bank of India by 24.2, 69.8, 30.7, 75.6, 23.1, 36.3, 33.4, 44.4, 31.1, 61, and 49.1 respectively.

Table 3. Change in the number of employees of PrivateBanks

Unit name	Actual no of employees	Target no of employees	% change in no. of employees
Yes bank	7024	7024	0
Axis bank	37901	26500.52	-30.1
ICICI bank	62065	30696.73	-50.5
Indusland Bank	11502	5677.13	-50.6
HDFC bank	69401	31077.89	-55.2
Development Credit Bank	2220	877.41	-60.5
Kotak Mahindra	13620	5353.19	-60.7

Table 4. Change in the investments of Private Banks

Unit name	Actual investments	Target investments	% change in investments
Yes bank	429760	429760	0
Axis bank	1137375	1621421.07	42.6
ICICI bank	1713936	1878164.35	9.6

Indusland Bank	196542	347352.47	76.7
HDFC bank	1116136	1901485.62	70.4
Development Credit Bank	33587	53683.74	59.8
Kotak Mahindra	288734	327532.53	13.4

Table 3 and 4. Shows that the percentage of employees should be decreased and percentage of investment should be increased by the banks to become efficient banks.

Percentage of employees should be decreased for Axis Bank, ICICI Bank, and Indus land Bank, HDFC Bank, Development Credit Bank and Kotak Mahindra by 30.1, 50.5, 50.6, 55.2, 60.5, and 60.7 respectively.

Percentage of investment that should be increased for Axis Bank, ICICI Bank, Indus land Bank, HDFC Bank, Development Credit Bank and Kotak Mahindra by 42.6, 9.6, 76.7, 70.4, 59.8, and 13.4 respectively.

Conclusion:

The efficiency of public sector banks are always found to be the highest in all times. IBDI bank (public sector bank) and Yes Bank (private sector bank) respectively are performing well. But if we compare both sectors on the basis of Business Per Employee IDBI Bank contain 256.44 and Yes bank contain 177.42. This leads to conclusion that public sector banks are performing better than Private Sector banks. Private sector banks (kotakMahindra bank on 68.6 and Development credit bank on 67.4) are the least ones and on the other side in public sector banks (SBI bank on 101.97).

In Public sector banks IDBI Bank which holds the position of 100% efficient bank while on the other side SBI bank is the most inefficient bank with 35.87% by considering the above parameters.

In Private sector banks Yes bank holds the position of 100% efficient bank and also if we talk about the most inefficient bank that is kotak Mahindra bank with 39.3% and Development credit bank with 39.52%.

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