

An empirical study on measurement of efficiency of selected banks in India

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Abstract

Objective: The study is to examine the efficiency of the selected banks in India.

Methods/Statistical analysis: The requisite data for DEA analysis are on deposits, borrowings, payment to employees, other operating expenses, total advances, investments and net interest margin. All these data have been collected for each of the individual sample banks as well as for the Nationalized Banks, State Bank of India and its Associates, Private Banks and Foreign Banks as a whole for a period of 15 years i.e. from 2000-01 to 2014-15. The sources of these data are (i) Statistical Tables Relating to Banks in India, and (ii) Report on Trend and progress of Banking in India. In this study, an attempt has been made to measure the efficiency of the banks group-wise and individually for the years 2000-01 to 2014-15 through Data Envelopment Analysis (DEA) by considering the output maximization principle. In the output maximization principle the banks are required to maximize their output bundle with the help of the given input bundle and then mean technical efficiencies have been computed for all the selected banks during the study period. In our study, those banks are categorized as efficient banks whose technical efficiency score is 100%. If efficiency score varies from 80% to less than 100%, the bank concerned is taken as moderately efficient. We have identified a bank as inefficient if its technical score is less than 80%.

Findings: The Foreign Banks as a group is the most efficient ones among the different banking groups whereas the group of State Bank of India and its Associates is found to be in the moderately efficient category. Among the sample PSBs, State Bank of India and Punjab National Bank have been moderately efficient maximum number of times during the study period. UCO Bank and Allahabad Bank have turned out to be the most inefficient ones among the sample PSBs. Bank of Rajasthan is found to be a moderately efficient bank, whereas Dhanalakshmi Bank has turned out to be an efficient. Among the sample private banks, therefore, Bank of Rajasthan has relatively turned out to be the most efficient one. All the foreign banks taken in the sample are efficient in comparison to the other sample public sector and private sector banks as established by their computed efficiency results. Again, among the sample foreign banks ABN Amro Bank, Standard Chartered Bank, Hong Kong and Shanghai Bank have been efficient for maximum number of times during the study period.

Application/Improvements: It may be said that the fulfillment of social objectives thrust on the PSBs, may be the root cause of inefficiency of the PSBs. They have met the requirements of priority sector lending along with the opening up of rural branches and have been the bank for the Indian masses. All these may be the root cause of inefficiency of the PSBs which needs further intensive study in order to revive them.

Keywords: Technical efficiency, DEA.

1. Introduction

The PSBs were formed with the objective of nation-building and socio-economic uplift of the Indian masses. Over the years they have catered to the need of banking of the Indian masses but several inefficiencies have crept up in them. So is this fulfillment of social objective becoming an increasing burden to the PSBs? If this is to be answered we need to make a measurement on the efficiency of the banks. In order to judge the efficiency of the banks we have used Data Envelopment Analysis (DEA) which is a modern technique of efficiency measurement.

DEA has become a popular measure of efficiency in general and in the financial services sector in particular. It has been widely used to measure the efficiency of performance of individual banks and also peer group performance. A number of studies have been conducted in this area of efficiency, to name a few; the studies of [1-12] are worth mentioning in the arena of efficiency measurement.

2. Objectives

The main objective of our study is to examine the efficiency of the selected banks in India. The other objectives of the study are as follows:

1. To compute the technical efficiency of selected banks in India.
2. To compare among the public sector banks, private sector banks and foreign banks in India.

3. Hypotheses

The following hypotheses have been considered for the purpose of the study:

1. The public sector banks are more efficient than private sector banks in India.
2. The public sector banks are more efficient than foreign banks in India.

4. Database

The requisite data for DEA analysis are on deposits, borrowings, payment to employees, other operating expenses, total advances, investments and net interest margin. All these data have been collected for each of the individual sample banks as well as for the Nationalized Banks, State Bank of India and its Associates, Private Banks and Foreign Banks as a whole for a period of 15 years i.e. from 2000-01 to 2014-15. The sources of these data are (i) Statistical Tables Relating to Banks in India [13], and (ii) Report on Trend and progress of Banking in India [14].

5. Methodology

DEA [Data Envelopment Analysis] has been one of the widely used measures of efficiency, in the banking sector as it allows comparison of relative efficiency of individual banks and also peer group performances. Data Envelopment Analysis is a non-parametric mathematical programming technique used for assessing / evaluating and comparing the relative performances of economic units, with minimal prior assumption on input-output relation. The methodology on DEA was originally developed by [15]. The economic units are called Decision Making units (DMUs). In banking sector, each bank is a DMU. The resources used by the units are called the inputs. A unit or a DMU converts the inputs into output. From the set of available data, DEA identifies (a) reference points (relatively efficient DMUs) that define the efficient frontier (as the best practice production technology) and evaluate the inefficiency of others (b) interior points (relatively inefficient DMUs) that are below the frontier. Efficiency is equal to ratio of total sum of weighted outputs to total sum of weighted inputs. Efficiency = (Weighted sum of Outputs / Weighted sum of Inputs).

One of the basic choices in selecting a DEA model is whether to use input orientation or an output orientation". In our study we have used the CRR model (i.e., Charnes, Cooper and Rhodes model) which is an output oriented model. The DMUs produce the highest possible amount of output with the given amount of input. The CRR model measures efficiency of each DMU as the ratio of weighted outputs to weighted inputs. "The weights for the ratio are determined by a restriction that similar ratios for every DMU have to be less than or equal to unity, thus reducing multiple inputs and multiple outputs to single "virtual" input and single "virtual" output without requiring pre-assigned weights. The efficiency measure is then a function of weights of the „virtual" input-output combination. Formally the efficiency measure for the DMU can be calculated by solving the following mathematical programming problem:

Max. $h_0(u,v) = \{ \sum_{r=1}^s U_r Y_r^0 \} / \{ \sum_{i=1}^m V_i X_{ij}^0 \}$ – Equation (i)

Sub.to $\{ \sum_{r=1}^s u_r Y_{rj} \} / \{ \sum_{i=1}^m V_i X_{ij} \} < 1, j=1,2, \dots, n$ – Equation (ii).

$U_r > 0, r = 1,2, \dots, s$.

$V_i > 0, i = 1,2, \dots, m$

Where x_{ij} = observed amount of input of the i^{th} type of the j^{th} DMU ($X_{ij} > 0, i = 1, 2, \dots, m, j = 1, 2, \dots, n$) and y_{rj} = observed amount of the r^{th} type of the j^{th} DMU ($y_{rj} > 0, r = 1,2, \dots, s, j = 1, 2, \dots, n$). The variables U_r and V_i are the weights to be determined by the above programming problem. ‘S’ is the total number of input variables and ‘m’ is the total number of output variables.”

In our study, we have used total investment, total advances, net interest margin (difference between interest earned and interest expended) as the output variables and total deposits and payment to employees as the input variables. We have calculated the technical efficiency of the 15 banks by assuming the presence of constant returns to scale. Further, individual sample banks are taken into consideration along with bank groups in DEA to get the figures of DMUs as 15 which is more than twice the figure of total output and input variables (i.e., 5 in number) because in a study it is pointed out that “usually, the total number of DMUs should be at least twice the number of inputs plus output factors” [6]. “Technical efficiency means the ability to avoid waste by producing as much output as input usage allows, or by using as little input as output production allows” [16]. We have calculated the technical efficiencies of all the 15 banks of our study for each of the years 2000-01 to 2014-15 and then mean technical efficiencies have been computed for all the selected banks during the study period. In our study, those banks are categorized as efficient banks whose technical efficiency score is 100%. If efficiency score varies from 80% to less than 100%, the bank concerned is taken as moderately efficient. We have identified a bank as inefficient if its technical score is less than 80%.

6. Results and Discussions

In this study, an attempt has been made to measure the efficiency of the banks group-wise and individually for the years 2000-01 to 2014-15 through Data Envelopment Analysis (DEA) by considering the output maximization principle. In the output maximization principle the banks are required to maximize their output bundle with the help of the given input bundle.

Data Envelopment Analysis has been carried out for all the banks group-wise and for the sample banks individually for each of the years under study. The DEA scores thus computed bank-wise for all the years of the study are not presented separately. However, the results on banking efficiency (mean values of technical efficiency during the study period) are presented in a summarized form in Table 1 in order to facilitate the analysis on it.

The Foreign Banks as a group is the most efficient ones among the different banking groups whereas the group of State Bank of India and its Associates is found to be in the moderately efficient category.

Among the sample PSBs, State Bank of India and Punjab National Bank have been moderately efficient maximum number of times during the study period. UCO Bank and Allahabad Bank have turned out to be the most inefficient ones among the sample PSBs.

Bank of Rajasthan is found to be a moderately efficient bank; whereas Dhanalakshmi Bank has turned out to be an inefficient. Among the sample private banks, therefore, Bank of Rajasthan has relatively turned out to be the most efficient one.

All the foreign banks taken in the sample are efficient in comparison to the other sample public sector and private sector banks as established by their computed efficiency results. Again, among the sample foreign banks ABN Amro Bank, Standard Chartered Bank. Hong Kong and Shanghai Bank have been efficient for maximum number of times during the study period.

To conclude, it may be said in terms of year wise computed DEA scores that (i) the group of Foreign Banks is the most efficient one among the different categories of banks, (ii) among the sample banks, ABN Amro Bank has been the most efficient one and also individually all the sample foreign banks have shown good efficiency results, and (iii) PSBs, in general are the poor performers.

Table 1. Bank-wise mean efficiency scores for the year 2000-01 to 2014-15

Banks	Mean T.E. (C.R.S.)	Result+(Relative Efficiency)
ALL SCHEDULED COMMERCIAL BANKS	84.5	Moderately Efficient
NATIONALISED BANKS	74.24	Inefficient
STATE BANKS AND ITS ASSOCIATES	97.16	Moderately Efficient
PRIVATE BANKS	76.37	Inefficient
FOREIGN BANKS	100	Efficient
STATE BANK OF INDIA	100	Efficient
ALLAHABAD BANK	76.76	Inefficient
PUNJAB NATIONAL BANK	100	Efficient
UNITED COMMERCIAL BANK	79.94	Inefficient
ICICI BANK	100	Efficient
BANK OF RAJASTHAN	94.75	Moderately Efficient
DHANALAKSHMI BANK	100	Efficient
ABN AMRO BANK	100	Efficient
HSBC BANK	100	Efficient
STANDARD CHARTERED BANK	100	Efficient

Notes: C.R.S. = Constant Returns to Scale; T.E. = Technical Efficiency. + Efficiency Scores of 100% implies efficient, Efficiency Scores of 80% and above (but less than 100%) implies moderately efficient and Efficiency Scores below 80% implies inefficient

Source: Author's calculation based on DEAP

7. Conclusion

For measuring efficiency of the banks, group-wise and individually for the sample banks for each of the years of the study Data Envelopment Analysis (DEA) is used. DEA results have been studied year-wise. From the results on efficiency measures of the banks it is observed that the Foreign Banks as a group is the most efficient one. Again ABN Amro Bank has performed the best among the sample banks. It is further noticed that Private Banks are the most inefficient ones followed by the Nationalized Banks. To conclude, it may be said that the fulfillment of social objectives thrust on the PSBs, may be the root cause of inefficiency of the PSBs. They have met the requirements of priority sector lending along with the opening up of rural branches and have been the bank for the Indian masses. All these may be the root cause of inefficiency of the PSBs which needs further intensive study in order to revive them.

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