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Research Paper Economics



An Analysis of the Efficiency of Selected Public and Private Banks in India during 2005-2011

* Dr.Dinesh Kumar **Sanjeev

* Assistant Professor, Department of Economics, Ch.Charan Singh University, Meerut ,U.P (India)

** Research Scholar, Department of Economics, Ch.Charan Singh University, Meerut , U.P (India)

INTRODUCTION

Banking Sector has emerged to be the largest and fastest growing sector in the world contributing more to the global output. Banking sector is the most crucial constituent of service sector in Indian economy. It plays a pivot role in the overall economic development of India. Most of economies in the world have developed this sector primarily by making best use of credit availability in their system. The present paper is an attempt to measure the input & output efficiency of selected public and private banks during 2005-2011 using the DEAP approach developed by Tim Coelli. The study indicates that average input efficiency in public selected banks is better than private selected bank in comparison to the output efficiency. It is showing better result for private selected banks during in the same period. The present paper has been organized in five sections. Objectives are discussed in section I. Section II deals with review of literature of selected banks. Data Sources, construction of variables and research methodology are presented in section III. Analysis and findings of this study is explained in section IV. The section V deals with conclusions.

Section-I

Keeping in mind the overall significance of banking sector in the economy, the present study has been conducted with certain objectives. Some of them are as follows:-

1. To evaluate the extent of Technical Efficiency in selected public sector and private sector banks operating in India.
2. To compare the Technical Efficiency in selected public sector and private sector banks operating in India.

Section-II

REVIEW OF LITERATURE:-

Though, the issue of productive efficiency has been of interest since the days of Adam Smith, a rigorous approach to the measurement of efficiency of production can be said to have originated with the work of Koopmans (1951) and Debreu (1951). In the later years, this area had received considerable attention. Both theoretical as well as empirical works have appeared in the literature on production efficiency. The subject of measuring banking efficiency has been extensively studied.

Shanmugam and Das (2004) studied banking efficiency using stochastic frontier production function models during the reform period, 1942-1999. This study considered four input variables (deposits, borrowings, labor and fixed assets) and four outputs

Variables (viz. net interest income, non interest income, credit and investment). They found that the reform measures that had been introduced in 1992 have not helped the banks in raising their interest margin. Also in general, they found that private and foreign bank performance is better than public banks.

Kumar and Gulati (2007) [4] studied the technical efficiency of public sector banks in India using two data development analysis models. i.e the CRS model VRS Model. Also, Andersen and Petersen's super efficiency models are used. The analysis was performed on a cross section of twenty seven public sector banks in the year 2004-05. The result showed that the technical efficiency scores ranges from .632 to 1 with an average of .885. Thus, the overall level of technical efficiency in Indian public sector banking industry has been found to be around 11.5% efficiency. Finally, Foreign banks are found to be more cost efficient but less profit efficient relative to domestically owned private banks and state owned banks.

Ruchi Gulati (2011)[5] This paper attempted to measure the extent of pure technical and scale efficiencies of Indian domestic banking Industry using the Non parametric technique of data envelopment analysis. The empirical results shows that only 9 of the 51 domestic banks operating in the financial year 2006/7 are found to be efficient and thus define the efficient frontier of the Indian domestic banking industry with technical efficiency score ranges from .505 to 1 with an average. She noted that managerial inefficiency is the main source of overall technical efficiency in Indian domestic banking industry. However the efficiency differences between the private and public sector banks are not statistically significant however, there exists a significant difference between large and medium banks appear with regard to scale efficiency.

Section-III

DATA SOURCES, VARIABLE CONSTRUCTION & METHODOLOGY-

The 14 banks have been selected for the present study out of which public sector banks are 7 and remaining are private banks. The selected variables for inputs are borrowings, deposits and operating expenses and variable for outputs are loans & advances, investments and other incomes. The data have been extracted from the official website of the concerned banks.

(i) CONCEPT OF EFFICIENCY-

Technical efficiency is to transform the labor & capital into output at best level of performance. It is represented in two ways by minimum combination of inputs necessary to produce specific level of outputs and by maximizing the outputs at the given level of inputs, while the allocative efficiency is the ability of a firm to utilize the input in an optimal proportion given their respective price. It is the multiplied value of technical and allocative efficiency which produce economic efficiency.

(ii) CONCEPT OF DATA ENVELOPMENT ANALYSIS (DEA) APPROACH -

DEA is a nonlinear (Non convex) programming model which provided a new definition of efficiency for using and evaluating activities of non- profit entities participated in public programs. A scalar measure of the efficiency of each participating unit is then provided along with methods for objectively determined

weight with reference to observations on data for the multiple outputs and multiple inputs that characterized such programs.

It is an input/output oriented model with constant Return to Scale (CRS) and variable return to scale (VRS). The DEA method seeks to indentify technical efficiency as proportional reduction in input usage. It is also possible to measure technical efficiency as proportional increase in output production which provide same value under CRS but different in VRS.

(iii) THEORETICAL CONSTRUCTION OF DEA SYSTEM-
Theoretical construction of DEA is based on Technical efficiency concepts which is :

Technical Efficienc $\frac{\sum weighted\ ouput}{\sum weighted\ input}$

Mathematically we can express the above relation by the following formula:

Fk = $\frac{\sum_{j=1}^{M} U_j O_j k}{\sum_{j=1}^{N} V_j I_j k}$ 1

Where :
(A) Data :
E^k: Technical efficiency for the DMUk (between zero and one)
E : Number (#) of DMUs in the sample (k = 1, 2, 3. K.)
N: # of inputs used (I = 1, 2, 3, - N)
M: # of the outputs (j = 1, 2, 3, …M)
Ojk : The observed level of output I from DMUk
Iik : The observed level of input I from DMUk.

(B) Models variables.
V_i : The weight of inputs i.

V_j : the weight of output j.

To measure technical efficiency for DMUs by using Linear program the following problem must be solved.

MAX technical efficiency

Subject to

EK ≤ 1 K = 1, 2 . . . . K (2)

Where, technical efficiency is either maximizing output from given inputs or minimizing inputs for a given level of outputs.

The above problem cannot be solved as stated because of difficulties associated with non linear (fraction) Mathematical programming. Charnes, cooper and Rhodes (1978) have cleared a mathematical transformation which converts the above non linear programming to linear which are- Existing duality theory and simples algorithms in linear programming are used to solve the transformed problem

For Linear programming there are two expressions which are dual to each other.

First problem: Modified linear programming:

$$\text{Ma} \times \sum_{j=1}^{M} U_j O_k$$

Subject to

$$\sum_{i=1}^{n} V_i I_k = 1$$
$$\sum_{j=1}^{M} U_j O_j k \leq \sum_{i=1}^{N} V_i I_i I$$
$$\text{Vj, Vi } 71 \sum 70$$

Second problem: Dual of modified Linear programming

$$Q - \sum_{j=1}^{M} S_j + -\sum_{i=1}^{N} S_i$$

Subject to

$$\sum_{k=1}^{K} \lambda_j O_{jk} - S_j^T = O_{Ik}$$
$$\sum_{k=1}^{K} \lambda_k J_{Ik} + S_j^T = OI_{Ik}$$
$$\lambda_k \ 7/0$$

(C) DEA CONDITIONS –
We present some issues which are important while using DEA:

(1) Positive property – Generally the DEA formulation requires that the inputs and output variables should be positive (Greater than Zero)

(2) Isotinicity property- It is required that the functions relating inputs to outputs have mathematical property called isotinicity, which means that an increase in any input result in some output increase and not decrease in any output.

(3) Number of decision making units- A general rule is that the DMUs are required for input and output variables used in the model in order to ensure sufficient degrees of freedom for a meaningful analysis.

(4) Homogeneity of DMUs – DEA requires a relatively homogenous set of entities. That is all entities included in the Evaluation set should have some inputs and outputs in positive amounts.

(5) Control of weight- The weights Uj. Vi are determined by solving DEA model.

These weights are computed in such a way that the organization under evaluation is placed in the best Light possible relation to other units in data set. The weights developed via DEA may not represent the same relative subjective weights that management might apply the relative importance of the variables (especially the output variables) used in the DEA models.

Section- IV
ANALYSIS OF DATA & INTERPRETATOIN:-
Public Sector Banks-
After analyzing the performance of public banks, it was found that the average efficiency of selected inputs i.e borrowing, deposits and operating expenses was highest in case of Canara Bank almost in all selected years except 2008-09 & 2009-10. In these years, it was maximum in case of Central bank. (Table-1)

The average inputs efficiency of Allahabad Bank was 95% in 2009-10, which has performed better during the previous years after 2005-06. The average efficiency of SBI has performed as it was better in most of the years. The input efficiency is of the selected banks is between 60% to 97.5% during the period of study.

The average efficiency of the three selected variables of outputs i.e Investment, Loan & Advances and other Incomes is found to be 100 percent for Allahabad Bank, State Bank of India and Canara Bank in different years. The variation of average output efficiency among all selected banks varies from 73 percent to 100 percent during the selected period.

Table-1 Average Input Efficiency (AIE) & Average Output Efficiency (AOE)* of Public Sector Banks (In percent)

Public Sector Banks	2005-6		2006-7		2007-8		2008-9		2009-10		2010-11	
	AIE	AOE	AIE	AOE	AIE	AOE	AIE	AOE	AIE	AOE	AIE	AOE
ALLAHABAD BANK	78.3	100.0	69.1	96.1	92.1	100.0	70.4	98.5	95.0	99.3	92.9	87.4
CANARA BANKS	97.5	100.0	98.4	100.0	80.7	99.3	70.7	98.0	69.9	90.6	97.3	100.0

CENTRAL BANK	76.9	89.5	67.0	82.5	77.9	96.5	96.6	100.0	96.3	96.6	84.8	90.5
SBI	66.8	96.1	66.8	99.8	70.0	100.0	66.3	100.0	70.5	99.6	79.3	99.4
OBC	65.0	80.5	66.2	85.7	78.2	94.1	69.7	74.2	98.1	97.7	87.9	94.2
PNB	64.5	96.5	59.5	82.6	66.8	93.2	61.4	90.2	75.3	92.5	82.4	73.5
VIJAY BANK	62.9	88.4	64.8	92.8	91.4	97.6	70.2	96.0	85.7	91.4	67.4	99.5

*Average input efficiency is the average three inputs i.e added and average output efficiency is the average of three indicators of output i.e
Source- Author's own calculations.

Private Sector Banks-
The average efficiency of three inputs i.e Borrowing, Deposits and operating expenses is found to be highest in case of HDFC almost all selected years expect 2010-11 in which year it was the maximum in case of Axis bank. The average input efficiency variation in all selected private sector banks varies from 28 percent to 83 percent during the selected period. (Table-2)

Table-2
Average Input Efficiency (AIE) & Average Output Efficiency (AOE)* of Private Sector Banks
(In percent)

Private Sector Banks	2005-6		2006-7		2007-8		2008-9		2009-10		2010-11	
	AIE	AOE	AIE	AOE	AIE	AOE	AIE	AOE	AIE	AOE	AIE	AOE
AXIS BANK	34.0	100.0	60.3	97.1	65.9	87.0	65.1	88.7	60.8	96.8	76.3	98.0
HDFC	28.9	89.2	44.1	89.3	79.1	100.0	83.4	100.0	76.6	100.0	75.8	100.0
ICICI	53.5	95.1	50.8	87.9	67.4	91.9	59.5	92.5	36.5	95.3	63.8	100.0
IDBI	67.4	100.0	67.6	100.0	69.6	100.0	71.7	100.0	64.6	100.0	75.3	100.0
OVERSEAS BANK	59.8	100.0	63.9	100.0	71.2	93.1	64.8	88.7	59.4	97.3	68.9	84.6
KOTAK MAHINDRA	39.8	91.9	45.4	91.6	51.0	94.0	50.7	81.8	42.6	79.1	55.9	85.5
YES BANK	..	..	59.2	94.3	75.4	93.7	72.1	95.0	65.1	98.5	75.6	99.6

*Average input efficiency is the average three inputs i.e ddddd and average output efficiency is the average of three indicators of output i.e
Source- Author's own calculations.

The average output efficiency of the selected variables of outputs i.e investment, loan& advances and other incomes is calculated as highest in case of IDBI i.e 100percent over the study period and HDFC was found to be performed highest during almost all the selected years expect 2005-06 & 2006-07. The variation in average output efficiency is found to be low 79 percent to 100 percent.

it was found that private banks performed better than public banks in terms of average efficiency of both inputs and outputs but one most important things was found that the consistency in terms of average input efficiency was better in case of public banks while the average output efficiency seems to be better for selected private sector banks in India.

CONCLUSION:-
On the basis of the above analysis, it can be concluded that selected public sector banks are utilizing inputs efficiently but on output front, they are not better performer. For the private sector banks, average output efficiency is better than average input efficiency. It can be due to the better competitive environment and better management practices as compared to selected public sector banks in India.

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