
Efficiency of Public Sector Banks in India (2007-09): A Non-Parametric Approach (DEA)

**Gurjinder Singh*
***Amandeep Verma*

ABSTRACT

Commercial banks in India constitute the most dominant segment of the financial sector, commanding about two third of its assets. The public sector banks in India continue to be a dominant part of the banking system. The objective of this study is to analyze the changes in the efficiency of Indian Public sector banks during the period of 2007 to 2009. The potential benefits of increased productivity in intermediate sectors such as banking and finance can be substantial, given the impact of their services in resource allocation and competitiveness in the broader economy. The measurement of efficiency of banking institutions serves two important purposes. It helps to benchmark the relative efficiency of an individual bank against the 'best practice' bank(s) and secondly, it helps to evaluate the impact of various policy measures on the efficiency and performance of these institutions. For the measurement of efficiency of public sector banks, we have included nineteen public sector banks excluding State Bank group. Productivity is measured by the Malmquist productivity index using a Data Envelopment Analysis (DEA) technique. The Malmquist productivity measures are decomposed into two components: efficiency change and technical change. Efficiency change is further decomposed into pure efficiency change and scope efficiency change. The overall results show that there is slight improvement in the total factor productivity change of these banks in which technical efficiency change is found be more important source of productivity growth. Negative scope efficiency changes imply that there is need to diversify banking activities to bring improvement is the functioning of banks.

Keywords: *Data Envelopment Analysis (DEA), Malmquist index, Bank efficiency, nationalized banks.*

INTRODUCTION

Commercial banking system in India is categorized in to scheduled and non-scheduled banks on statutory basis, and further into public and private sector banks on ownership criteria. In 1950-51, there were 430 commercial banks but the number declined due to Reserve Bank of India's (RBI) policy of mergers and amalgamations to strengthen the banking system. In the period following nationalization in 1969, one of the major objectives of developmental credit policy was to extend the reach of bank credit, both geographically and functionally the under-banked regions of the country especially the rural hinterland and to extend credit to agriculture, small industry and the self-employed. Functional expansion obviously needs a physical presence and this was the logic behind the massive effort at branch expansion. But directed credit programmes induced pre-emption of bank resources to the public sector thus impinging on banks' not earning capacity. The erosion profitability weakened the inherent strength of the system. The absence of an operational flexibility arising out of excessive degree of regulation of various aspects of operations of the institutions affected their ability to respond quickly and adequately to emerging needs. With the movement towards deregulation as a precursor to liberalization of the economy

in 1991, financial sector reforms were based on there inter related premises:

- ❖ Spirit of competitive efficiency to cover the financial sector;
- ❖ A healthy and profitable financial system;
- ❖ Operational flexibility and autonomy in decision-making free from any type of extraneous pressures.

As a result of banking deregulation, banks like most other firms in the economy, set then own internet rates and vigorously compete with one another for depositors and loan customers. These recent changes in terms of performance of public sector banks in India during 2007-09 have been analyzed at length taking up the Non-Parametric Approach in the paper titled "Efficiency of Public Sector Banks in India (2007-09): A Non-Parametric Approach (DEA).

REVIEW OF LITERATURE

The studies conducted in the context of performance of commercial banks in the pre and post reform periods have been discussed as under:

Shah (1979), emphasized that profitability cannot improve merely by increasing the margin between lending and borrowing rates by rationalizing their cost structure.

* Assistant Professor Commerce Department, Kirori Mal college, Delhi University, Delhi

** Research Scholar, Department of Economics Panjab University, Chandigarh

Karkal, G (1982), found that the loss making branches had a lower percentage of current deposit, a lower percentage of other income to total income and a higher percentage of salary expenditure to total expenditure in comparison to Profit making branches.

Chakroborty Committee (1985), recommended that in order to step up the operational efficiency of banks, autonomy and market-orientation of the banking system are a pre-requisite.

Singh (1989), attributed the decline in profitability due to the persistent emphasis on priority sector lending, increasing incidence of industrial sickness, rapid branch expansion particularly in rural areas, unfavorable increase in deposit mix of banks and the growing incidence of financial disintermediation.

Narasimham Committee (1991), pointed out that although the banking system in our country had made rapid progress during the last two decades, still there is a decline in productivity and efficiency and erosion of profitability. The Committee suggested that the government policy with regards to allowing foreign banks to open offices/branches in India should be more liberal.

Das (1997), Sarkar, S and Bhaumik, S .K (1998), Ram Mohan (2004), Das and Ghosh measured the efficiency of banks and found a strong ownership effect on a bank's performance.

Sathye, M. (1998), used DEA Approach to show how efficiency scores vary with a change in inputs and outputs.

Kosimdou and Zopounidis (2004), evaluated the performance of commercial and cooperative banks in Greece during (2003-04) and found that banks tend to increase their accounts to attract more customers and ameliorate their financial indices thereby becoming more competitive.

Ataullah et al. (2004), in "Financial liberalization and Bank Efficiency: A Comparative Analysis of India and Pakistan (1988-98)" used Data Envelopment Analysis and employed two input output specifications for efficiency measurement. In one specification (Loan Based Model), Operating and interest expenses were used as inputs while interest and non-interest income worked as outputs of the commercial banks. In the second specification (Income Based Model), operating and interest expenses were considered as outputs of the commercial banks. They decomposed technical efficiency into pure technical efficiency and scale efficiency. They found that the efficiency score in loan based model was much higher as compared to the income-based model. At the same time, results also indicated the presence of space for improvement in the efficiency of banks in these countries.

Das, Ray and Nag (2005) in "Liberalization, Ownership and Efficiency in Indian Banking: A Non-Parametric Analysis", used DEA to measure labour-use efficiency of individual branches of a large public sector banks with several thousand branches across India for the period 1997 to 2003. The study revealed a considerable variation in the average levels of efficiency across the four metropolitan regions taken up. In this context, they introduced the concept of area or spatial efficiency for each region relative to the nation as a whole. Their findings suggest that the policies, procedures and incentives handed down from the corporate level cannot fully neutralize the local work culture in the different region.

Zhao, Casu and Ferrari (2005) in "Deregulation and Productivity Growth .A Study of Indian Commercial Banking," examined the impact of regulatory reforms on performance of Indian commercial banks using a balance panel data (1992-2004) and employing a DEA based Malmquist index of total factor productivity change. The study revealed that after an initial adjustment phase, the Indian banking industry experienced sustained productivity growth driven mainly by technological progress.

Varadi, Mavaluri and Bopamma (2006) estimated the efficiency of Indian Commercial Banks for the period 1999 to 2003 using four indicators viz., productivity, profitability, financial management and asset quality.

METHODOLOGY

To investigate the performance of Public Sectors Banks in India during the years 2007-09, Non-Parametric Approach pertaining to the following has been used:

DEA (Data Envelopment Analysis) based Malmquist Index have been constructed as per Coello Programme (1996), called DEAP version 2.1. to construct a best practice frontier without specifying production technology, Cooper and Rhodes (1978) developed DEA. Using a Non-Parametric linear programming technique, DEA takes into account all inputs and outputs along with the differences in technology and then compares each DMU (Decision making Units) with the best practice or frontier DMU.

The performance of DMU that is each bank was assessed using the concept of efficiency or productivity that is, the ratio of total outputs to total inputs. Efficiencies estimated are relative to the best performing DEA. The best performing DMU was assigned an efficiency score of 100 percent or unity. The performance of other DMU's varied between 0 and 100 percent relative to the best performing DMU or DMU's.

In the present study two inputs were taken, that is interest expenses and non-interest expenses and two outputs,

that is, income and non-interest income. The production and intermediation approaches were used in the choice of selection of inputs and outputs. The former approach pertained to number of accounts of deposits or loan as inputs outputs respectively. The intermediation approach considered banks as financial intermediaries and use volume of deposits, loans or other variables as inputs and outputs. The present study total up the intermediation approach as most of the DEA studies follow this approach. The efficiency of DMU's has been measured using output –oriented variable returns to scale.

A sample of nineteen public sector banks had been taken excluding State Banks of India because of its relatively large size which would have affected the scores of other public sector banks operating in India.

The CCR Model introduced by Charnes, Cooper and Rhodes (1978), was taken up to measure the efficiency of each DMU obtained as a maximum of ratio of total sum of weighted outputs to total sum of weighted inputs.

The weights for the ratio were determined by the restriction that similar ratio for every DMU had to be less than or equal to unity. Thus multiple inputs and outputs were reduced to 'virtual inputs' and 'virtual outputs' without assigning any weight. In case there were no DMU's each with 'm' inputs and 's' outputs, relative efficiency score of a given DMU was obtained by solving the linear programming model.

RESULTS AND ANALYSIS

The Malmquist Productivity Index used to measure efficiency of the banks during the period 2007 to 2009 revealed a change in the efficiency of nineteen Public Sector Banks under variable returns to scale. Values of unity imply that the firm is on the industry frontier in the associated year. Values less than unity imply that the firm is below the frontier technically inefficient as indicated in table I.

As seen in the table there is at least seven banks namely, Bank of India, Canara Banks, Corporation Banks, Indian Banks, Oriental Banks of Commerce (OBC), Punjab National Banks (PNB), Punjab and Sind Banks, having values of unity in all the three years implying consistent technical efficiency under VRS. On the other hand Andhra Bank, Bank of Baroda, banks of Maharashtra, Central Bank of India, Syndicate Bank, UCO bank and United Bank of India having less than unity value indicates technical inefficiency under VRS for all three years. In the case of Andhra Bank has declined during the study period. The VRS TE in the context of Bank of Maharashtra, Indian Overseas Bank and United Bank of India and Vijaya Bank was statistically significant in the year 2007 to 2008. Subsequently their RS

TE declined in the year 2009. The overall mean VRS TE of the entire group has declined during the years 2007 to 2009.

Table I : Technical Efficiency of Public Sector Banks (2007-09)

Public sector Banks	VRS TE(2007)	VRS TE(2008)	VRS TE(2009)
Allahabad Bank	0.984	1.00	0.961
Andhra Bank	0.980	0.977	0.953
Bank of Baroda	0.965	0.991	0.998
Bank of India	1.00	1.00	1.00
Bank of Maharashtra	0.945	0.964	0.932
Canara Bank	1.00	1.00	1.00
Central Bank of India	0.922	0.907	0.938
Corporation Bank	1.00	1.00	1.00
Dena Bank	1.00	1.00	0.985
Indian Bank	1.00	1.00	1.00
Indian Overseas Bank	1.00	0.989	0.942
Oriental Bank of Commerce	1.00	1.00	1.00
Punjab & Sind Bank	1.00	1.00	1.00
Punjab National Bank	1.00	1.00	1.00
Syndicate Bank	0.940	0.934	0.972
UCO Bank	0.904	0.899	0.920
Union Bank of India	1.00	1.00	0.992
United Bank of India	0.961	0.881	0.911
Vijaya Bank	1.00	1.00	0.985
Mean	0.979	0.976	0.973
VRS: Variable Returns to Scale			

Note: Figures in columns (2), (3) and (4) have been estimated using DEAP version 2.1

TE: Technical Efficiency

Table II exhibits the performance of banks in terms of total factor productivity changes and its two subcomponents viz., technical and efficiency changes respectively. The value of Malmquist TEP productivity index and its components of less than unity imply a decrease or deterioration and value greater than unity indicate improvements in technical and efficiency changes. The average increase or decrease per annum for the relevant time period and relevant performance measure the performance relative to the best practice in the relevant performance or relevant to the best practice in the sample.

Table II: Malmquist Index: Summary of Public Sector Banks Exhibiting Mean Values

Public sector Banks	Efficiency change	Technical efficiency change	Pure efficiency change	Scope efficiency change	Total factor productivity change
Allahabad Bank	0.999	1.048	0.988	1.010	1.047
Andhra Bank	0.985	0.997	0.986	0.999	0.982
Bank of Baroda	1.029	0.970	1.017	1.011	0.998
Bank of India	1.036	1.055	1.00	1.036	1.093
Bank of Maharashtra	0.985	0.979	0.993	0.992	0.965
Canara Bank	1.007	1.039	1.00	1.007	1.046
Central Bank of India	1.00	0.982	1.009	0.992	0.982
Corporation Bank	1.00	1.093	1.00	1.00	1.093
Dena Bank	0.969	0.995	0.992	0.977	0.965
Indian Bank	1.00	0.961	1.00	1.00	0.961
Indian Overseas Bank	0.970	1.018	0.971	1.00	0.987
Oriental Bank of Commerce	1.00	1.068	1.00	1.00	1.068
Punjab & Sind Bank	0.981	0.969	1.00	0.981	0.950
Punjab National Bank	0.986	0.969	1.00	0.986	0.955
Syndicate Bank	1.013	1.008	1.017	0.996	1.021
UCO Bank	1.010	1.016	1.009	1.001	1.026
Union Bank of India	0.996	1.036	0.996	0.999	1.032
United Bank of India	0.963	0.990	0.973	0.989	0.953
Vijaya Bank	0.983	1.053	0.992	0.991	1.035
Mean	0.995	1.012	0.997	0.998	1.007

[Note that All Malmquist Index Averages are Geometric Means]

Note: Columns 2 to 6 have been estimated using DEAP Version 2.1

Further, it has been observed that Bank of India, Canara Bank, OBC, UCO and Corporation Bank have more than unity for TEP index and its sub-components, that is, efficiency change and technical change Allahabad bank has also shown more than unity TFP change. However, efficiency change is less than unity. Bank of Maharashtra, Andhra Bank, Dena Bank, Punjab and Sind Bank and Punjab National Bank, United Bank of India have efficiency, technical and TEP changes less than unity. Syndicate bank has TFC change greater than unity. However scope efficiency denotes less than unity change indicating inefficiency of the bank on this count. Similarly, although Vijaya Bank has exceeding unity, its efficiency change is less than unity.

CONCLUSION

Despite the fact that total factor productivity changes particularly technical changes in the context of a large

number of commercial banks exhibited a positive trend and scope and pure efficiencies not very statistically significant, during the study period of three consecutive years (2007-09), contingency planning in terms of the following is imperative to meet the international financial standards and codes :

- ❖ safeguards against increasing loan delinquencies and its deleterious efforts on the quality of loan port folio;
- ❖ Inadequate operational flexibility impairing efficient credit decision making;
- ❖ an urgent need to look into the problems faced by the banking and financial system effecting its productivity, efficiency and profitability arising from a combination of factors, both internal and external in the form of organizational and managerial weaknesses, policy directions and political and administrative interferences

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