# Cost Efficiency of Public Sector Banks in India: An Empirical Study

**Nitashree Burman***
**Dr Kingshuk Adhikari****
**Dr Nikhil Bhusan Dev*****

*(*Research Scholar, Department of Commerce,Assam University (A Central University), Silchar, India,*
***Assistant Professor, Department of Commerce, Assam University (A Central University), Silchar, India*
**** Professor, Department of Commerce, Assam University (A Central University), Silchar, India)*

**Abstract**

The present paper aims to estimate cost efficiency of twenty five public sector banks in India for the period 2002-03 to 2011-12 with the help of Data Envelopment Analysis (DEA) model.The study reveals that the banks, on an average, could have saved 7.2 per cent of actual cost incurred. Corporation Bank has been found to be the most cost efficient bank,whereas United Bank of India has proved to be most inconsistently cost inefficient bank during the study period. Further, the study has also investigated the influence of select factors on cost efficiency. The study concludes that higher capitalisation, poor asset quality and higher volume of liquid assets adversely affect cost efficiency of the banks. On the other hand, business per employee, off-balance sheet exposure, profitability, size and market competition positively affect cost efficiency of the banks. However, the influence of size and market competition is not statistically significant.

**Keywords**: DEA, Capital Adequacy, Asset Quality, Liquidity, Off-Balance Sheet Exposure

## Introduction

Management always looks after the effectiveness, efficiency and productivity of firm as sound performance and efficiency indicates the success of management objectives and goals of a firm. In a similar manner performance of any economy depends upon the efficacy and efficiency of its financial system (Sharma, Sharma &Barua 2012). The financial system in a country serves to link up the savings of households with the investment objectives of firms and improves welfare by redistributing risk across the economy (Shah & Thomas 1999). This sector of an economy is a multi-dimensional which refers to the whole gamut of legal and institutional arrangements, financial intermediaries, markets and instruments with both domestic and external dimensions (Tapiawala 2010). The banking sector is the core of a financial system of any economy. Banks mobilise resources from all the sectors of the community by way of deposits and channelize them to industries and others by way of granting loans (Krishna &Rao 2008). The most efficient a banking system is in such resource generation and in its allocation, the greater is its contribution to productivity and economic growth (Mohan 2006).

Public sector banks are considered as the most important group of financial intermediaries in India as they perform in accordance with the government's economic plans, priorities and targets. In the present

era, they are on the threshold of achieving the objectives of two fold,*viz.*, (i) to enhance their level of efficiency and (ii) to contribute towards economic development through financing developmental activities of government. These banks have diversified themselves to activities such as mutual fund, merchant banking, leasing, hire purchase, factoring and venture capital funding. During the post deregulation period, they have greater degree of freedom to frame their individual business strategy meaning thereby greater scope for increasing level of operational performance. Thus, the present agenda of the banks is mainly to enhance the profit earning, enlargement of customer base, maximization of economies of scale and use of technology in the competitive banking environment. There are various factors which influence the performance of banks. However, doing business to survive in the competitive environment compels bank management to concentrate more on efficient performance rather than only good performance. In this context, efficiency analysis of public sector banks is imperative to be carried out.

The present paper intends to analyse cost efficiency of public sector banks. Since the production technologies of banks are unknown a priori, efficiency is estimated as the deviation from the efficient cost where best practice banks operate. Cost efficiency refers to the cost performance of a banking firm relative to the best practice bank that produces the same output under the same exogenous conditions (Sensarma, 2005). Thus, it can be defined as the ratio between the minimum amount of cost incurred by bank in the frontier and the actual amount of cost of the bank whose performance has been evaluated. The cost efficiency measure provides how close a bank's cost is to what a best practice bank's cost would be for producing the same bundle of outputs (Weill, 2004). It captures failure to save cost at a given scale and /or a given level of product mix (Gardener &Linh, 2011). A bank is said to be cost efficient when it is able to produce the given level of output with minimum possible usage of inputs as well as with optimal mix of inputs considering input prices i.e. optimal combination of inputs that minimize the cost of production. That is why, it also called total overall or economic or X efficiency. Thus, it consists of two components such as physical and price component. It can be expressed as the product of technical (physical component) and allocative efficiency (price component).

**Review of Literature**

Performance evaluation of banks with the technique of frontier analysis is becoming familiar among the researchers in India as well as abroad. The frontier technique gets its greater degree of importance in the context of the present competitive banking environment as it is essential to know about the bank's own position relative to best practice counterparts by comparing actual performance with the optimum level of performance underlying the interest of survivability. Some of the findings of the studies using frontier technique of analysis are summarized as follows:

Gulati (2011) found that public sector banks have benefited from the reform process as compared to other bank groups as evident by improved cost efficiency during 1998-99 onwards. Kaur & Kaur (2010) observed the

positive impact of merger on the cost efficiency of Indian commercial banks. Further, the study suggested that merger should not be restricted to the restructuring of weak and financially distressed banks because this type of merger adversely affects the asset quality of the participating banks. On the other hand, it protects the interest of depositors of weak banks. Das (1999) experienced that the PSB industry is less efficient in dealing with the distribution of mobilized resources meaning thereby the deployment of resources to selected asset portfolio fails to generate maximum revenue and the relative price paid for the selected inputs combination are not optimal.Raina& Sharma (2013) found that inefficient allocation mechanism of the banks caused to their high cost incurrence. Further, the study investigated the determinants of the efficiency and found that the increase in the number of branches both in rural and urban areas would enhance the performance by means of increased customers as well as transactions. On the other hand, it would increase risk with their advances having negative impact on the performance. Mahesh (2006) found that public sector banks weremost efficient in terms of cost. The reason might be due to incurrence of comparatively lesser establishment expenditure and cost of fund. The study found bank size and competition measured by Herfindahl Index positively relates to the level of efficiency. Karimzadeh (2012) suggested that Indian banks would need to improve their technological orientation in order to reduce the percentage of non-performing assets and expand the possibilities for augmenting their financial activities in order to improve their efficiency.Yeh (1996) concluded that the efficient banks were less leveraged and more aggressive in employing their deposits and assets to generate revenues than those who were less efficient. Lin (2005) found that factors, such as, non-performing loan ratio, loan-to-deposit ratio, gross assets, and mergers were responsible for the estimated cost inefficiency of the banks. Matousek&Taci (2004) stated that the privatisation and foreign entry were likely to pressure banks to reduce costs and to merge with more efficient banks or to exit the industry.

It is observed from the review of literatures that studies relating to efficiency are different from each other in respect of selecting methodology either parametric or non-parametric, combination of different set of input and output variables, approaches for selecting variables and period chosen for the study. Further, another area of doing research other than the estimation of efficiency is the investigation of determinants of efficiency.

**Objectives of the study**

1. To analyse the cost efficiency of public sector banks in India.
2. To investigate the influenceof select factors on cost efficiency of public sector banks in India.

**Data and Methodology**

The present study covers a period of ten yearsi.e. from 2002-03 to 2011-12.The requisite secondary data have been collected from Annual Reports of the respective banks, Performance Highlights of Public Sector Banks in India published by Indian Banks' Association and Statistical Tables relating to Banks in India published by Reserve Bank of India. The efficiency study has been carried out on twenty five public sector banks operating in India during the study period.

In order to estimate the efficiency level of banks, Data Envelopment Analysis (DEA) has been employed. It is a mathematical linear programming technique most popularly used in analyzing relative efficiency of Decision Making Units (DMUs). DEA measures the degree to which the DMUs under analysis have produced more outputs for its given inputs levels (output orientation) or the degree to which it have used less amount of inputs for its given output levels (input orientation) as compared to the other DMUs in the sample. The 100% efficient DMUs are situated on the best-practice frontier retaining a value of 1 and all others are inefficient relative to them having values between 0 and 1.The orientation in which efficiency is measured affects the results obtained and the selection of orientation is based on whether the management has more control over inputs or output levels. Under the study, it is assumed that bank management has more control over inputs rather than over outputs.

DEA estimates efficiency score by means of linear programming technique to construct efficient frontiers. In the present study, input oriented DEA model which are based on assumption of constant returns to scale has been employed.

Let us consider that there are n Decision Making Units (DMUs) to be evaluated [DMUs (j) (j=1, 2,,....,n)]. Each DMU consumes 'm' different inputs of identical nature for all decision making units [Inputs($x_{ij}$) (I =1,2,.....,m)] to produce 's' different outputs of identical nature for all decision making units [Outputs ($y_{rj}$) (r=1,2,.....,s)] and each DMU pay prices for the inputs used [Prices ($p_{ij}$) (I =1,2,....m)]. The technology is defined by the following production possibility set

P= {(x, y): y can be produced from x}

The underlying assumptions are as follows:

- All observed input-output combinations are feasible.
- The production possibility set P is convex.
- Inputs and outputsare freely disposable.

Given the input prices, the cost minimizing input quantities for DMU 'jo' can be estimated by solving the following linear programming problem:

$$Minimum\ Cost = min \sum_{i=1}^{m} p_{ijo}\, x^{*}_{ijo}$$

Subject to

$$\sum_{j=1}^{n} \lambda_j x_{ij} \leq x^{*}_{ijo} \quad i = 1,2,\ldots..m$$

$$\sum_{j=1}^{n} \lambda_j y_{rj} \geq y_{rjo} \quad r = 1,2,\ldots\ldots s$$

$$\lambda_j \geq 0 \quad j = 1,2,\ldots\ldots n$$

The cost efficiency of DMU 'jo' can be calculated as follows:

$$CE_{jo} = \frac{Minimum\ Cost}{Actual\ Cost} = \frac{\sum_{i=1}^{m} p_{ijo}\, x^{*}_{ijo}}{\sum_{i=1}^{m} p_{ijo}\, x^{*}_{ijo}}$$

In the existing efficiency related literature, basically two types of approaches viz., production and intermediation approach are commonly used for selecting input and output variables. Under the production approach, banks are viewed as the producer of deposits and advances with the use of labour and physical capital. It considers only the operating cost and ignores interest cost in calculating total cost. The major problems associated with this approach are that it fails to detain important role of financial intermediation of banks; and ignorance of interest cost as it considers only cost of physical inputs which in turn results underestimation of total cost.

The intermediation approach covers the shortcomings of the production approach. Under this approach, financial institutions are thought of as primarily intermediating funds between savers and investors. The intermediation role played by banks is considered in defining input and output variables. It includes both operating and interest cost in measuring total cost. Hence, it is more appropriate as compared to production approach in the estimation of bank level efficiency.

As the present study is bank level the intermediation approach has been considered. Accordingly, labour, physical capital and loanable funds are considered as input variables and earning assets and non-interest income as output variables. Price of labour is defined as ratio of personnel expenses on employees divided by total number of employees. Price of physical capital is defined as the ratio of capital expenditure on fixed assets to total volume of fixed assets. Price of loanable funds is defined as total amount of interest expenses on deposits and borrowings divided by total amount of loanable funds.

In addition to above, mean, standard deviation, coefficient of variation and log-linear growth rate have been used for the analysis of efficiency score of the banks. The present study has also investigated the influence of select factors on cost efficiency of the banks and for this purpose the Tobit regression model has been employed becausethe dependent variable i.e. cost efficiency score lies between zero and one which is censored in nature.The following random-effects Tobit regression model is estimated:

**Table 1: Operational definition of Independent Variables**

| Sl. No. | Factors | Operational Definition |
|---|---|---|
| 1 | Capital Adequacy (CADY) | ((Paid up Equity Capital+Reserve and Surpluses))/(Total Assets) ×100 |
| 2 | Asset Quality (AQTY) | (Net Non-Performing Assets)/(Net Advances)×100 |
| 3 | Business per Employee (BPE) | (Total volume of Business)/ (Total number of Employees) ×100 |
| 4 | Off-Balance sheet Exposure (OBE) | (Non-Interest Income)/(Total Income)×100 |
| 5 | Profitability (PRTY) | (Net Profit)/(Total Average Assets)×100 |
| 6 | Liquidity (LQTY) | (Total Liquid Assets )/(Total Assets)×100 |
| 7 | Size (SIZE) | Natural logarithm of Total Assets |
| 8 | Market Competition (MCOP) | Herfindahl-Hirschman Index (HHI)= |

*Source*: Compiled from literature

**Empirical Analysis**

Table 2 reveals descriptive statistics of cost efficiency score of public sector banks in India for the period 2002-03 to 2011-12. It is found that, in 2002-03, an average bank obtained cost efficiency score of 0.914 with standard deviation of 0.062 which increased to 0.944 with standard deviation of 0.028 in 2011-12. This in turn indicates that the level of cost inefficiency has been decreased by 3 per cent along with decline in variation across the banks by 2.4 per cent between first and last year of the study period. The lowest cost efficiency score of 0.897 has been observed in the year 2003-04 alongwith highest standard deviation of 0.070,while highest efficiency score of 0.947 in the year 2007-08. The lowest degree of variation across the banks has been observed in the last year of the study period.

During the study period, the cost efficiency score of the industry has been resulted to 0.928 with standard deviation of 0.016. Thus, on an average, the banks could have produced the same level of outputs using only 92.8 per cent of the cost actually incurred, if it was producing on the cost frontier rather than its current location. In other words, the extent of cost inefficiency has been estimated to the tune of 7.2 per cent. The cost efficiency of the industry grew at 0.390 per cent per annum over the entire study period. Moreover, the number of cost efficient banks ranged from two to four. Efficiency scores of the sample banks have been observed to be highly concentrated towards the interval of (0.836-1.008) in the year 2006-07 as exhibited by the highest percentage of banks whose efficiency score fall within this interval.

**Table 2: Average Cost Efficiency Score of Public Sector Bank in India**

| Year | Mean | SD | No. of Cost Efficient Banks | Interval (Mean-SD, Mean + SD) | No. of banks in the interval |
|---|---|---|---|---|---|
| 2002-03 | 0.914 | 0.062 | 4 (16) | (0.852-0.976) | 14 (56) |
| 2003-04 | 0.897 | 0.070 | 3 (12) | (0.827-0.967) | 17 (68) |
| 2004-05 | 0.920 | 0.053 | 2 (8) | (0.867-0.972) | 17 (68) |
| 2005-06 | 0.917 | 0.063 | 3 (12) | (0.854-0.981 | 15 (60) |
| 2006-07 | 0.922 | 0.086 | 3 (12) | (0.836-1.008) | 22 (88) |
| 2007-08 | 0.947 | 0.040 | 4 (16) | (0.906-0.987) | 17 (68) |
| 2008-09 | 0.937 | 0.036 | 2 (8) | (0.902-0.973) | 16 (64) |
| 2009-10 | 0.943 | 0.032 | 2 (8) | (0.911-0.974) | 18 (72) |
| 2010-11 | 0.914 | 0.035 | 2 (8) | (0.880-0.949) | 20 (80) |
| 2011-12 | 0.944 | 0.028 | 2 (8) | (0.915-0.972) | 16(64) |
| **2002-03 to 2011-12** | **0.928** | **0.016** | -- | -- | -- |
| **Growth Rate (%)= 0.390** | | | | | |

*Note*: 1. Based on relevant data obtained from
(i) Annual Reports of the respective banks *(various issues)*
(ii) Performance Highlights of Public sector Banks in India*(various issues),* IBA, Mumbai
(iii) Statistical Tables Relating to Banks in India *(various issues),* RBI, Mumbai
2. Figures in parentheses indicate percentage of banks

Table 3 depicts bank and year wise analysis of cost efficiency. It is revealed that two banks, namely, Corporation Bank and State Bank of India are found to be efficient five times which is observed to be highest frequency during the study period. Thus, these banks have outperformed the other public sector banks in respect of producing the given level of outputs with minimum possible incurrence of cost followed by State Bank of Travancore. Out of the remaining banks, total fourteen banks, namely, Allahabad Bank, Bank of Baroda, Bank of India, Bank of Maharashtra, Canara Bank, Central Bank of India, Indian Overseas Bank, Punjab & Sind Bank, Punjab National Bank, Syndicate Bank, UCO Bank, Union Bank of India, United Bank of India and Vijaya Bank could not obtain score one in any year. Thus, during the study period, these banks are found to be the consistently inefficient throughout the study period.

**Table 3: Bank wise Cost Efficiency Score of Public Sector Banks in India**

| Code | Name of Banks | No. of times of being efficient | Growth Rate (%) | Average Efficiency score | Average Inefficiency score (%) | CV (%) |
|---|---|---|---|---|---|---|
| B1 | ALB | 0 | 1.046 | 0.914 | 8.6 | 3.78 |
| B2 | ANB | 2 | -0.558 | 0.955 | 4.5 | 3.22 |
| B3 | BOB | 0 | 0.086 | 0.905 | 9.5 | 2.82 |
| B4 | BOI | 0 | 0.433 | 0.919 | 8.1 | 3.55 |
| B5 | BOM | 0 | 0.150 | 0.895 | 10.5 | 2.57 |
| B6 | CNB | 0 | 0.414 | 0.925 | 7.5 | 2.29 |
| B7 | CBI | 0 | 1.165 | 0.853 | 14.7 | 4.09 |
| B8 | COB | 5 | 0.269 | 0.989 | 1.1 | 1.91 |
| B9 | DNB | 1 | -0.537 | 0.935 | 6.5 | 3.95 |
| B10 | INB | 1 | 1.476 | 0.913 | 8.7 | 6.36 |
| B11 | IOB | 0 | 0.616 | 0.910 | 9.0 | 3.30 |
| B12 | OBC | 2 | -0.169 | 0.968 | 3.2 | 3.51 |
| B13 | P&SB | 0 | 2.282 | 0.869 | 13.1 | 8.60 |
| B14 | PNB | 0 | 1.130 | 0.899 | 10.1 | 5.03 |
| B15 | SBI | 5 | 1.012 | 0.973 | 2.7 | 3.41 |
| B16 | SBBJ | 1 | 0.004 | 0.947 | 5.3 | 2.94 |
| B17 | SBOH | 2 | -0.207 | 0.979 | 2.1 | 1.74 |
| B18 | SBOM | 2 | -0.800 | 0.948 | 5.2 | 4.25 |
| B19 | SBOP | 2 | -0.950 | 0.965 | 3.5 | 3.78 |
| B20 | SBOT | 4 | -0.669 | 0.984 | 1.6 | 2.57 |
| B21 | SYNB | 0 | 1.292 | 0.881 | 11.9 | 5.83 |
| B22 | UCO | 0 | 1.259 | 0.899 | 10.1 | 4.79 |
| B23 | UBOI | 0 | 0.025 | 0.936 | 6.4 | 2.02 |
| B24 | UNBI | 0 | 1.372 | 0.849 | 15.1 | 11.76 |
| B25 | VIB | 0 | 0.388 | 0.928 | 7.2 | 2.70 |

*Note*: Based on relevant data obtained from
(i) Annual Reports of the respective banks *(various issues)*
(ii) Performance Highlights of Public sector Banks in India *(various issues),* IBA, Mumbai
(iii) Statistical Tables Relating to Banks in India *(various issues),* RBI, Mumbai

Besides, the growth analysis shows that the cost efficiency score of Punjab & Sind Bank grew at a comparatively higher rate of 2.282 per cent per annum over the study period followed by Indian Bank (1.476 per cent). On the other hand, the growth rates of seven banks, *viz.*, Andhra Bank (0.558 per cent), Dena Bank (0.537 per cent), Oriental Bank of Commerce (0.169 per cent), State Bank of Hyderabad (0.207 per cent), State Bank of Mysore (0.800 per cent), State Bank of Patiala (0.950 per cent) and State Bank of Travancore (0.669 per cent) are found to be negative. Further, it is found that during the study period, among the total banks, Corporation Bank has obtained highest average cost efficiency score of 0.989 with coefficient of variation of 1.91 per cent followed by State Bank of Travancore with efficiency score of 0.984 and coefficient of variation of 2.57 per cent. United Bank of India is found to be the most inconsistently cost inefficient bank which is evident from its highest level of inefficiency of 15.1 per cent and highest coefficient of variation of 11.76 per cent.

**Table 4: Classification of Public Sector Banks based on Average Cost Efficiency Score**

| Status | Efficiency Range | Name of Banks | No. of Banks |
|---|---|---|---|
| Excellent Performers | 0.955 =AOE = 0.989 | Corporation Bank, Oriental Bank of Commerce, State Bank of India, State Bank of Hyderabad, State Bank of Patiala, State Bank of Travancore | 6 (24) |
| Good Performers | 0.925 = AOE<0.955 | Andhra Bank, Canara Bank, Dena Bank, State Bank of India, State Bank of Mysore, Union Bank of India, Vijaya Bank | 7 (28) |
| Fair Performers | 0.899 =AOE<0.925 | Allahabad Bank, Bank of Baroda, Bank of India, Indian Bank, Indian Overseas Bank, UCO Bank | 6 (24) |
| Poor Performers | 0.849 = AOE<0.899 | Bank of Maharashtra, Central Bank of India, Punjab & Sind Bank, Punjab National Bank, Syndicate Bank, United Bank of India | 6 (24) |

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*Note*: 1. Based on relevant data obtained from
(i) Annual Reports of the respective banks *(various issues)*
(ii) Performance Highlights of Public sector Banks in India *(various issues),* IBA, Mumbai
(iii) Statistical Tables Relating to Banks in India *(various issues),* RBI, Mumbai
2. Figures in parentheses indicate percentage of banks

Table 4 provides the classification of banks on their average cost efficiency score. During the study period, 24 per cent of the total banks have shown excellent performance as evident by their cost efficiency score falling within the highest range of efficiency score. These excellent banks are Corporation Bank, Oriental Bank of Commerce, State Bank of India, State Bank of Hyderabad, State Bank of Patiala and State Bank of Travancore. On the other hand, the performance of Bank of Maharashtra, Central Bank of India, Punjab & Sind, Bank, Punjab National Bank, Syndicate Bank and United Bank of India is found to be poor because of their efficiency score falling into lowest range of efficiency score. Besides, Andhra Bank, Canara Bank, Dena Bank, State Bank of India, State Bank of Mysore, Union Bank of India and Vijaya Bank are recognized as good performers. The banks whose performances are to be fair are Allahabad Bank, Bank of Baroda, Bank of India, Indian Bank, Indian Overseas Bank and UCO Bank.

Table 5 revealsresult of random effect Tobit regression analysis. The value of coefficient of capital adequacy is found to be (-.0055).The variable is statistically significant at 1% level of significance. The result indicates that higher degree of capitalization negatively affects cost efficiency of public sector banks in India. The empirical finding concludes that lesser amount of fund available for the disbursement of loans and investment may erode the earning power of banks, which in turn results to opportunity cost. Thus, it is suggested to the cost inefficient banks to posses optimum proportion of both equity and debt capital in their capital structure in order to become cost efficient.

With regard to asset quality, the value of coefficient of the variable is found to be (-.0064) and it is statistically significant at 5% level of significance. Thus, there exists a significant negative relationship between non-performing assets and cost efficiency.The result indicates that cost efficient banks earn more interest income by means of loan disbursement, which makes them able to reduce the cost burden in general and compensate the cost of working fund in particular. Earning of interest income is blocked in asset declared as non-performing which ultimately increase the operating cost burden of banks.

The coefficient of business per employee is found to be (.0145) which is found to be statistically significant at 1% level of significance. The result indicates that cost efficient public sector banks possess productive labour force. Thus, the empirical finding concludes that a higher volume of business per employee increases the capability of banks to lead the market, i.e., the competitive advantage and reduce operating cost of business. The result suggests that management of the cost inefficient banks need to streamline the human resource management policy and enhance the productivity level of labour by means of either retraining them or by other means.

The coefficient value of off-balance sheet exposure is worked out to be (.0096) which is observed to be highly significant at 1 % level of significance. Thus, the empirical findings have witnessed the strong positive impact of non-traditional business activities on cost efficiency level of the public sector banks in India. This finding suggests that the cost inefficient banks should indulge themselves more in risk free earning, i.e., non-interest income, along with interest income in order to minimize the cost of business operations.

**Table 5: Result of Random Effects Tobit Regression Analysis**

| Determinants | $\beta$value | $p$ value |
|---|---|---|
| Constant | 0.7590* | 0.001 |
| Capital Adequacy (CADY) | -0.0055* | 0.007 |
| Asset Quality (AQTY) | -0.0064** | 0.026 |
| Business Per Employee (BPE) | 0.0145* | 0.001 |
| Off-Balance Sheet Exposure (OBE) | 0.0096* | 0.001 |
| Profitability (PRTY) | 0.0249** | 0.042 |
| Liquidity (LQTY) | -0.0102* | 0.001 |
| Size (SIZE) | 0.0007 | 0.861 |
| Market Competition (MCOP) | 0.0055 | 0.722 |
| Wald $\chi^2$ | 171.89* | 0.001 |
| No. of Observations | 250 | |
| Log likelihood | 346.00 | |
| | | |

*Note:* 1. Based on relevant data obtained from
(i)Annual Reports of the respective banks *(various issues)*
(ii) Performance Highlights of Public Sector Banks in India*(various issues),* IBA, Mumbai
(iii) Statistical Tables Relating to Banks in India*(various issues*), RBI, Mumbai
2. * indicates significant at 1% level of significance
3. ** indicates significant at 5% level of significance

The value of profitability coefficient is resulted to (.0249) and it is found to be significant at 5 % level of significance. Therefore, the result implies that the higher level of profitability of banks leads towards increasing the level of cost efficiency of banks. It provides the evidence of positive feedback of all sorts of efforts put forward for cutting down the operating cost to the extent possible as well as healthy employment of funds in productive or income generating assets.

The value of liquidity coefficient is resulted to (-.0102) and it is found to be significant at 1 % level. Thus, the results shows that liquidity is proved to be one of the major factors of cost inefficiency of public sector banks in India. Its negative influence is due to possession of higher level of liquid Banks negatively affects the interest margin, which in turn increases the cost burden of banks.

The coefficient value of size has worked out to be (.0007). For this positive influence the reason may be due to fact that the large sized banks enjoy the advantages of economies of scale by making investment more on technology thereby reducing cost per unit. But its impact is noted to be statistically insignificant. Thus, it is revealed that size has weak positive influence on cost efficiency.

The coefficient of market competition is estimated to be (.0055). The positive influence of the variable on the cost efficiency score implies that the lesser degree of competition increase efficiency level of the banks and it is due to the fact that as the level of competition decreases the banks gain the share of market power which leads towards saving cost of banking operation. However, its influence is not statistically significant indicating thereby that competition has positive effect also as because in the competitive market environment, banks are compelled to perform efficiently otherwise they will be no longer to survive, which boost them to frame market oriented business strategy so as to gain competitive advantage.

**Conclusion**

Since during the post deregulation period, the banking sector has transformed towards the path of vibrant and dynamic nature due to the effect of competition and other regulatory measures as well as reform measures, banks are now under the pressure of reducing the level of cost incurrence to the extent possible. The present study estimates the cost efficiency of public sector banks in India for the period 2002-03 to 2011-12 with the help of Data Envelopment Analysis model. The findings of the study reveals that cost efficiency score of the public sector banks ranges from0.897 to 0.947. On an average, it has turned out to be 0.928 during the study period. Thus, the banks in the industry could have saved 7.2 per cent of actual cost incurred. The cost efficiency of the industry grew at 0.390 per cent per annum over the entire study period. Among the total banks, Corporation Bank has been found to be the most cost efficient bank,whereas United Bank of India has proved to be the most inconsistently cost inefficientbank. Further, the investigation of factors influencing cost efficiency reveals that higher capitalisation, poor asset quality and higher volume of liquid assets adversely affect cost efficiency of the banks. On the other hand, business per employee, off-balance sheet exposure, profitability, size and market competition positively affects cost efficiency of the banks. However, the influence of size and market competition is not statistically significant.

Thus, in order to enhance the level of efficiency and thereby the level of competition in the industry, the banks need to concentrate on the factors like labour productivity, off-balance sheet exposure and all sorts of factors which have important bearings on profit earning capacity. At the same time, the cost inefficient banks are suggested to increase the volume of loanable funds as well as to invest the funds in productive avenues, management of optimum amount of liquid assets and improve the asset quality by means of reducing the NPA burden.

It is difficult to incorporate all the issues and elements into one study, so each and every study provides scope for future research. The study has been carried out on the public sector undertaking banks only. So there is scope for future research to be carried out on

branch of the respective banks and also the comparison with other bank groups such as Indian private sector banks and foreign banks with the combination of same input and output variables and other similar methodology of the study. Moreover, there is a scope for investigating the influence of other bank specific and external factors which are notconsidered in the present study.

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