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An International Journal of Management Studies

home page: [www.mgmt2day.griet.ac.in](http://www.mgmt2day.griet.ac.in)

Vol.8, No.4, October-December 2018



## Assessment of Revenue Efficiency and Return to Scale of Indian Scheduled Commercial Banks

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### ARTICLE INFO

#### Article history:

Received 09.11.2018

Accepted 25.12.2018

#### Keywords:

Revenue efficiency; allocative efficiency; return to scale; data envelopment analysis; India.

### ABSTRACT

The aim of the paper is to analyze and evaluate Revenue Efficiency scores of Indian Scheduled Commercial Banks (SCBs) in India over a period of 22 years i.e., 1991-92 to 2012-13 by the application of Data Envelopment Analysis (DEA) - a non-Parametric Approach. The paper also identifies the reason for the Revenue Inefficiency among Indian Banks. In addition, the Return to Scale at which the Scheduled Commercial Banks are operating has also been evaluated. The results of the paper depict that Indian Scheduled Commercial Banks have never achieved full Revenue Efficiency score of 1 in any of the years under study. The dominant reason identified behind Revenue Inefficiency is the Allocative Inefficiency. Surprisingly, the results also highlight that Scheduled Commercial Banks (SCBs) in India exhibit higher Revenue Efficiency Scores in Reformatory Phase as compared to the Post Reformatory Phase.

### 1. Introduction

Indian Banking Sector has witnessed many changes on account of Liberalization, Privatization and Globalization (LPG). From 1991 till 2000, many reforms were introduced in the country as interest rate deregulation, privatization, de-licensing of branches, decrease in Cash Reserve and Statutory Liquidity Ratio while the years after 2000 were the years to reap the harvest of these reforms. The reformatory changes in Indian Banking Sector required Indian banks to focus more on revenue maximization rather than cost minimization in order to sustain and survive in the market vis-à-vis their counterparts in the organized as well as the unorganized sector. Moreover, in

today's world, bank managers are given output targets to achieve efficiently by optimizing the use of inputs (Sahoo *et al.*, 2007). Thus the core aim of the bank managers is to increase their revenues as much as they can. Focusing on the revenue maximization objective of the bank, assessing revenue efficiency is an essential factor.

Revenue Efficiency measures the comparative performance of bank as against the best practice bank i.e. the bank which is producing the maximum output from the inputs available under the similar technological conditions as faced by the concerned firm. It is computed by dividing the revenues generated by the given firm to the revenues generated by the wholly efficient firm with the given inputs. In other words, it is the ratio between current revenues and optimal revenues, given the output prices and input and output quantities (Lovell, 1993 and Sanchez *et al.*, 2013). Infinite research articles have investigated the banks' efficiency namely Yue (1992), Bhattacharyya *et al.* (1997), Saha and Ravisankar (1998), Sathye (2003), Niazi (2003), Ataullah *et al.* (2004), Girardone *et al.* (2004), Das *et al.* (2005), Sanjeev (2006), Burki and Niazi (2006), Debasish (2006),

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ISSN: 2348-3989 (Online)

ISSN: 2230-9764 (Print)

Doi: <http://dx.doi.org/10.11127/gmt.2018.12.06>

pp. 336-345

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Varadi *et al.* (2006), Atallah and Le (2006), Sahoo *et al.* (2007), Chakrabarti and Chawla (2008), Gupta *et al.* (2008), Kumar and Gulati (2008), Ioannis *et al.* (2008), Ketkar and Ketkar (2008), Dash and Charles (2009), Tandon *et al.* (2009), Chauhan and Pal (2009), Joshi and Bhalerao (2011), Gulati (2011), Bala and Kumar (2011), Gupta and Garg (2011), Dwivedi and Charyulu (2012), Prabhakar *et al.* (2012), Sharma *et al.* (2012), Chhikara and Bhatia (2012), Raina and Sharma (2013), Singh and Gupta (2013), Zeitun and Benjelloun (2013), Jayaraman and Srinivasan (2014), Kamarudin *et al.* (2014), Bhatia and Mahendru (2015), Okorie and Agu (2015) and Bhatia and Mahendru (2016). By reviewing the literature, it seems that scanty literature exists that consider revenue efficiency of banks. Few studies consider revenue efficiency along with either Cost Efficiency or Profit Efficiency or both. Rogers (1998) estimated the impact of exclusion of non-interest income on Cost, Revenue and Profit Efficiency of 10,000 Commercial Banks operating in US. Das *et al.* (2005) measured technical, cost, revenue and profit efficiency scores of all major Indian Commercial Banks from 1996-97 to 2002-03. Bader *et al.* (2008) compared the Cost Efficiency (CE), Revenue Efficiency (RE) and Profit Efficiency (PE) of 43 Islamic and 37 Conventional Banks operating in 21 countries for the period 1990-2005. Loukoianova (2008) used Data Envelopment Analysis (DEA) to analyze Cost and Revenue Efficiency of Japanese Banks from 2000 to 2006. Wanniarachchige and Suzuki (2011) estimated the Cost and Revenue Efficiency performance of 50 Indian Commercial Banks during 2002-2009. Sufian *et al.* (2012b) tested the effect of Mergers and Acquisitions (M and As) on Malaysian Banks' Revenue, Cost and Profit Efficiency. Sufian *et al.* (2013) analysed Cost, Revenue and Profit Efficiency of Malaysian Islamic Banking Sector during 2006 to 2010. Pančurová and Lyócsa (2013) estimated the Cost and Revenue efficiency of 187 Commercial Banks operating in 11 Central and Eastern European Countries (CEEC) over the period 2005–2008. Kamarudin *et al.* (2014) measured the Cost, Revenue and Profit Efficiency scores for 47 conventional and 27 Islamic Banks in Gulf Cooperative Council. García-Alcober *et al.* (2014) measured both Cost and Revenue Efficiency by applying Free Disposal Hull for the period of 2005 to 2009. Only two studies are available in the literature that evaluated revenue efficiency exclusively namely Ram Mohan and Ray (2004) and Bhatia and Mahendru (2015). Ram Mohan and Ray (2004) compared the revenue efficiency of Public Sector Banks (PSBs), Private Sector Banks and Foreign Banks operating in India for 1991-92 to 1999-2000. The study showed that revenue efficiency scores were higher for PSBs as compared to than Private Sector Banks. The results also showed that State Bank of India was the most efficient bank. On the other hand, Bhatia and Mahendru (2015) analyzed the revenue efficiency of Indian Scheduled Commercial Banks specifically at four points of time i.e. 2000-01, 2004-05, 2008-09 and 2012-13. The study reported that Public Sector Banks had higher revenue efficiency scores than private and foreign sector banks.

No doubt, the above two studies evaluated the revenue efficiency of Indian banks but these are less comprehensive and generate only limited insights into the concept of revenue efficiency. Ram Mohan and Ray (2004) took the time period of 1991-92 to 1999-2000 only i.e. they did not evaluate the performance of banks after the time period the reforms settled down and started showing their impact on banking efficiency. Likewise, Bhatia and Mahendru (2015) evaluated the performance after 2000 however they did not compare the revenue efficiency of 2000s with the earlier years. Thus a reassessment of reforms over a longer period of time, comparing it with the era prior to reforms is required. It would not only provide a holistic view of revenue efficiency of banks but would definitely add novelty to the literature available on banking.

Thus, the foremost aim of the article is to assess the Revenue Efficiency (RE) scores of all Indian Scheduled Commercial Banks over a period of 22 years. The paper also endeavors to identify the reason for the Revenue Inefficiency among Indian Banks. In addition, Scheduled Commercial Banks are operating at which return to scale has also been evaluated.

## 2. Database

The paper is based all the Scheduled Commercial Banks operating in India during 1991-92 to 2012-13. The number of banks in the study differs from year to year as some banks were no longer in existence or some were merged with other banks. Besides, for some banks data was not available. The specific number of banks used for evaluating the efficiency of banks across time is explained in Table-1 as follows:

**Table-1: Sample of the Banks**

Reformatory Phase		Post Reformatory Phase	
Year	No. of Banks	Year	No. of Banks
1991-92	74	2002-03	82
1992-93	71	2003-04	84
1993-94	70	2004-05	83
1994-95	76	2005-06	82
1995-96	88	2006-07	77
1996-97	92	2007-08	74
1997-98	96	2008-09	68
1998-99	94	2009-10	73
1999-2000	96	2010-11	72
2000-01	95	2011-12	76
2001-02	91	2012-13	76

The period of 22 years has been divided into two parts as 1991-92 till 2001-02 representing the Reformatory Phase and 2002-03 till 2012-13 representing the Post-Reformatory Phase. The former time period is termed as Reformatory Phase as it encloses the major reforms in Indian Banking Sector initiated by Narasimham Committee with its first report in 1991 and second report in 1998. Similarly, Basel norms came up with their 3 pillared structure in 1992. In the early 2000s, reforms with respect to electronic fund transfer, net banking and mobile banking were introduced. On the other hand, all these reforms

have been implemented during 2002-03 to 2012-13 thus, referred as Post-Reformatory Phase. The data for analysis has been taken from the official website of Reserve Bank of India (RBI) as well as from banks' annual reports.

### 3. Research Methodology: Data Envelopment Analysis (DEA)

Data Envelopment Analysis is a benchmarking technique which permits to measure firm's efficiency based on inputs used and outputs produced by them. Banker *et al.* (1996) reported that DEA gives superior results at almost all sample sizes. DEA approach is comparatively robust (Seiford and Thrall, 1990). Fethi and Pasiouras (2010) and Sharma *et al.* (2013) in their review based study found that majority of studies adopted DEA to calculate the efficiency scores. Data Envelopment Analysis (DEA) is often used in various studies as it permits to identify the causes of inefficiencies. Charnes, Cooper and Rhodes (1978) developed Data Envelopment Analysis (DEA) which applies linear programming based technique to assess an empirical production technology frontier. It is employed for assessing the relative performance of a set of firms against the best observed firms which forms "The Efficiency Frontier" (Seiford and Thrall, 1990). DEA was originally developed for measuring Technical Efficiency, Pure Technical Efficiency and Scale Efficiency where prices of inputs and outputs are not required. Afterwards, DEA was modified to measure economic efficiency i.e. Cost Efficiency and Revenue Efficiency which requires different input-output combinations as well as their prices (Fried, Lovell and Schmidt, 2008). Farrell (1957) introduced a method to decompose the overall economic efficiency into product of two factors i.e. Technical and Allocative Efficiency to know the causes of inefficiency among the firms. Revenue Efficiency model is an output oriented model that maximizes revenue for a given set of input quantities and output prices. It is evaluating the bank's ability to increase the revenues.

The Mathematical programming equations used to calculate Revenue Efficiency of banks is as follows:

$$\begin{aligned} \text{Max} &= \sum_{r=1}^s q_r^o y_{ro} \\ \text{Subject to} & \sum_{j=1}^n \lambda_j x_{ij} \leq x_{io} \quad i = 1, 2, \dots, m \\ & \sum_{j=1}^n \lambda_j y_{rj} \geq y_{ro} \quad r = 1, 2, \dots, s \\ & \lambda_j, y_{ro} \geq 0 \\ & \sum_{j=1}^n \lambda_j = 1 \end{aligned}$$

where

n = Number of DMUs

j = n<sup>th</sup> DMU

s = output observation

m = input observation

r = s<sup>th</sup> output

i = m<sup>th</sup> input

q<sub>r</sub><sup>o</sup> = unit price of the output r of DMU<sub>o</sub>

p<sub>i</sub><sup>o</sup> = unit price of the input i of DMU<sub>o</sub>

ŷ<sub>ro</sub> = r<sup>th</sup> output that maximise revenue for DMU<sub>o</sub>

ẋ<sub>io</sub> = i<sup>th</sup> input that minimise cost for DMU<sub>o</sub>

y<sub>ro</sub> = r<sup>th</sup> output for DMU<sub>o</sub>

x<sub>io</sub> = i<sup>th</sup> input for DMU<sub>o</sub>

y<sub>rj</sub> = s<sup>th</sup> output for n<sup>th</sup> DMU

x<sub>ij</sub> = m<sup>th</sup> input for n<sup>th</sup> DMU

λ<sub>j</sub> = non-negative scalars

DEA can also help to determine return to scale and tell whether a bank is operating at Decreasing, Increasing or Constant Return to Scale. Decreasing Returns to Scale shows that increase in input by a bank generates relatively less increase in outputs. Increasing Returns to Scale depicts that increase in inputs by a bank produces more than proportional increase in outputs. Lastly, Constant Returns to Scale depicts that increase in inputs by a bank will result in same increase in the outputs.

For calculating the revenue efficiency of banks, selection of inputs and outputs plays an important role. Golany and Roll (1989) state that number of units should be at least twice the number of inputs and outputs considered while Bowlin (1998) mentions that in DEA for calculating efficiency scores, number of DMUs have to be three times as the number of input and output variables. The results of efficiency scores may vary depending on the selection of variables for each of the bank's efficiency (Foroughi and De Zoysa, 2012 and Kamarudin *et al.*, 2014). The basic problem in relation to input and output specification in bank arises due to different treatment of deposits. Some studies consider deposits as outputs while some treat it as inputs. This different treatment of deposits gives rise to diverse approaches namely, Operating Approach and Intermediation Approach. Operating Approach is the contribution of Benston (1965) and Bell and Murphy (1968) which presumes that banks use purchased inputs, i.e. operating cost and interest expenses to produce deposits and loans and advances (Avkiran, 2000). Under Intermediation Approach, banks employ labour, physical capital, and borrowed funds to produce earning assets (Sealey and Lindley, 1977). Berger and Humphrey (1997) and Favero and Papi (1995) pointed out that the Intermediation Approach is most appropriate for banks as a whole because most activities of a bank consist of converting huge deposits and borrowings into loans and advances and investments.

Adopting intermediation approach, the takes present article deposits, borrowings, labour and fixed assets as inputs. On the other hand, investments, loans and advances and non-interest income are taken as outputs. In order to calculate the revenue efficiency, output prices are required. Price of investments is calculated by dividing interest and dividend received from Investments with Investments, Prices of Loan and Advances as Interest received from loans and advances/ Loans and Advances. Price of non-interest income is assumes as unity throughout the years for all banks.

In order to see whether the efficiency scores differs between Reformatory Phase and Post-Reformatory Phase or not, Panel data Tobit Regression is applied. Tobit model is applied due to the censored nature of the dependent variable. The efficiency scores calculated from the first stage of analysis with the help of DEA falls between 0 and 1 thus making the variable a limited dependent variable. Moreover, the work of previous researchers as Niazi (2003), Khanam and Nghiem (2006), Burki and Niazi, (2006), Gupta *et al.* (2008), Ahmed (2008), Gulati (2011a and b), Sharma *et al.* (2012) and Raphael (2013) also suggest that Tobit Model is the best model as it has the ability to handle equations with restricted threshold. The present study is based on 1790 bank year observations for a period of 22 years thus suggesting that Panel Tobit Regression Model is to be used. Time is taken as the dummy independent variable as 1 for Reformatory Phase and 0 for Post-Reformatory Phase. This dummy variable represents that the Post-Reformatory Phase is treated as the benchmark.

**4. Empirical Findings and Discussion: Revenue Efficiency Analysis**

Revenue Efficiency scores for each bank is calculated over the total time period from 1991-92 to 2012-13. Then these scores are aggregated to analyze the performance of Scheduled Commercial Banks. The entire period has been split into two phases as 1991-92 till 2001-02 representing the Reformatory Phase and 2002-03 till 2012-13 representing the Post-Reformatory Phase. Table- 2 represents the revenue efficiency and scores of its components for all Indian Scheduled Commercial Banks. These are presented as below:

**Table-2: DEA Revenue Efficiency Scores of Indian Scheduled Commercial Banks**

Year	No . of Banks	Revenue Efficiency	Allocative Efficiency	Technical Efficiency	Pure Technical Efficiency	Scale Efficiency
<b>Reformatory Phase</b>						
1991-92	74	0.792	0.874	0.910	0.946	0.963
1992-93	71	0.757	0.805	0.939	0.962	0.976
1993-94	70	0.789	0.847	0.930	0.967	0.962
1994-95	76	0.799	0.871	0.914	0.952	0.960
1995-96	88	0.781	0.908	0.861	0.945	0.910
1996-97	92	0.785	0.903	0.868	0.957	0.905
1997-98	96	0.711	0.805	0.873	0.961	0.906
1998-99	94	0.731	0.805	0.910	0.966	0.943
1999-2000	96	0.709	0.795	0.892	0.958	0.930
2000-01	95	0.690	0.807	0.854	0.946	0.902
2001-02	91	0.642	0.718	0.893	0.956	0.933
Mean		0.744	0.831	0.895	0.956	0.935
Standard Deviation		0.051	0.056	0.028	0.008	0.027
Minimum		0.642	0.718	0.854	0.945	0.902
Maximum		0.799	0.908	0.939	0.967	0.976

<b>Post-Reformatory Phase</b>						
2002-03	82	0.614	0.727	0.848	0.959	0.885
2003-04	84	0.662	0.725	0.908	0.974	0.932
2004-05	83	0.658	0.714	0.914	0.968	0.944
2005-06	82	0.524	0.638	0.800	0.945	0.848
2006-07	77	0.797	0.847	0.941	0.975	0.964
2007-08	74	0.772	0.834	0.925	0.975	0.948
2008-09	68	0.722	0.804	0.896	0.979	0.914
2009-10	73	0.648	0.749	0.866	0.983	0.879
2010-11	72	0.679	0.768	0.882	0.961	0.919
2011-12	76	0.612	0.741	0.827	0.968	0.852
2012-13	76	0.572	0.658	0.870	0.965	0.900
Mean		0.660	0.746	0.880	0.969	0.908
Standard Deviation		0.082	0.066	0.043	0.011	0.038
Minimum		0.524	0.638	0.800	0.945	0.848
Maximum		0.797	0.847	0.941	0.983	0.964

As seen from Table- 2, during Reformatory Phase i.e. 1991-92 to 2001-02, estimates of Revenue Efficiency vary from a low of 0.642 to a high of 0.799. Revenue Efficiency score declines from 0.792 in 1991-92 to 0.757 in 1992-93. In the next two consecutive years, these show an improvement and increase to 0.789 in 1993-94, and further to 0.799 in 1994-95. Thereafter, an inconsistent pattern is observed in these scores till 1998-99 when these stand at 0.731. From 1999-2000 till 2001-02, Revenue Efficiency scores follow a declining trend till these lower to 0.642 which is in fact the minimum efficiency score in 11 years of Reformatory Phase. Throughout the Reformatory Phase, all components of Revenue Efficiency demonstrate inconsistent behaviour as observed from their movement in Table- 2. Allocative Efficiency varies from a low of 0.718 to a high of 0.908. Technical Efficiency (output oriented) varies from a low of 0.854 to a high of 0.939. Pure Technical Efficiency varies from a low of 0.945 to a high of 0.967. Similarly, Scale Efficiency shows the same pattern and has the lowest efficiency score of 0.902 and the highest of 0.976. Overall during Reformatory Phase, Scheduled Commercial Banks could generate only 74.4% revenue from their available inputs. Average Allocative Efficiency (Inefficiency) is 83.1% (16.9%) whereas Technical Efficiency (output oriented) (Inefficiency) is 89.5% (10.5%). Pure Technical and Scale Efficiency (Inefficiency) of Scheduled Commercial Banks is 95.6% (4.4%) and 93.5% (6.5%) respectively.

From the above results, a noticeable observation suggests that Revenue Efficiency and its components have never achieved full efficiency score of 1 in any of the years in the Reformatory Phase thus bringing the average of Revenue Efficiency to less than 1. In other words, Scheduled Commercial Banks are not able to generate as much revenue as they are expected to generate from their existing inputs. During the inception of reforms, particularly in 1992-93, there is a decline in the Revenue Efficiency Scores depicting that SCBs did not seem to have taken these massive reforms receptively. Narasimham Committee Report, 1992 seemed to have brought unexpected modifications for the banking sector making it

difficult for banks to adjust with these instantly. However, enlarging the domain of banks by allowing them to diversify in the fee based services as bank guarantees, letter of credit, mutual funds, commission on government bonds and brokPhasege on securities etc, the reforms aided in elevating the Revenue Efficiency scores in 1993-94 and 1994-95 (Report on Currency and Finance, 2006-08). Additionally, SCBs had also been receiving considerable income from Merchant Banking activities at that time (Report on Currency and Finance, 2006-08). The Revenue Efficiency scores show an erratic trend of ups and downs during 1995-96 to 1998-99. Certain reforms favoured the banks while certain other developments marred their performance. The reduction in Statutory Liquidity Ratio (SLR) from 38.5% in 1991-92 to 25% in 1996-97 and Cash Reserve Ratio (CRR) from 15% in 1991-92 to 10% in 1996-97 boosted the liquidity of the banks (Narasimham Committee Report, 1992). Though this reduction was very gradual but it definitely enhanced the availability of funds with banks to some extent. SCBs were able to lend more loans and advances and earn better returns in the form of interest income. Similarly, there was a significant decline in Gross Non-performing Assets (NPAs) to advances from 15.7% in 1995-96 to 14.7% in 1998-99 (Reserve Bank of India, 1998-99). However, competition from their other counterparts in the unorganised sector and growth of Non-Banking Financial Institutions squeezed their share of revenues, hence affecting their Revenue Efficiency scores. The declining trend in Revenue Efficiency Scores is rather confirmed in the later years of Reformatory Phase i.e. from 1999-2000 to 2001-02. It seems that banks were not able to handle the extreme liberty granted to them in the form of deregulation of interest rates. The competitive threats in the financial sector did not allow them to fix higher lending rates and earn higher revenues. Their endeavour of shifting their investments in government securities also did not turn to be much fruitful (Reserve Bank of India, 2002-03). Reforms introduced during this Phase were in fact healthy and competitive, but the banks lacked expertise to handle this transition.

Also as seen from Table- 2, Allocative Efficiency Scores have always been less than Technical Efficiency (output oriented) Scores during Reformatory Phase. Thus the dominant reason behind Revenue Inefficiency is Allocative Inefficiency since Revenue Efficiency is the multiplicative combination of Allocative Efficiency and Technical Efficiency (output oriented). The higher Allocative Inefficiency among SCBs implies that managers of the banks are relatively poor at choosing the revenue maximizing mix of output given the output prices. Bank managers seem uncertain about the output prices due to fluctuations in the interest rates of loans and advances and investments in the Reformatory Phase. On the other hand, higher Technical Efficiency scores (output oriented) in comparison to Allocative Efficiency scores depict that SCBs are to some extent good at utilising their available inputs to produce as much outputs as they can generate. But Technical Efficiency scores are still less than 1 i.e. the benchmark. Thus the detection of Technical Inefficiency

(output oriented) reveals that Scale Inefficiency is constantly higher than Pure Technical Inefficiency among SCBs. Thus SCBs need to enlarge their operations to operate on the optimum scale and thus improve their Revenue Efficiency.

During Post-Reformatory Phase, Revenue Efficiency score of Indian Scheduled Commercial Banks is 0.614 in 2002-03 and it increases to 0.662 in 2003-04. For the next two years, it follows a declining trend at 0.658 and 0.524 in 2004-05 and 2005-06 respectively. Then it increases and reaches its maximum level in 2006-07 showing an efficiency score of 0.797. It once again declines to 0.772 in 2007-08 and further to 0.722 in 2008-09. In 2009-10, Revenue Efficiency score stands at 0.648. In 2010-11, this increases to 0.679 but subsequently declines to 0.612 in 2011-12 and further to 0.572 in 2012-13. In the same way, an erratic pattern is noticed in Allocative Efficiency, Technical Efficiency (Output Oriented), Pure Technical Efficiency and Scale Efficiency. Estimates of Allocative Efficiency deviate from a minimum of 0.638 to maximum of 0.847. Technical Efficiency (output oriented) fluctuates from a low of 0.800 to a high of 0.941 and Pure Technical Efficiency ranges between a low of 0.945 to a high of 0.983. Likewise, Scale Efficiency varies from a low of 0.848 to a high of 0.964 in the Post-Reformatory Phase. On the whole in Post-Reformatory Phase, Scheduled Commercial Banks operating in India could generate only 66.0% of revenue, which is very less than what they were expected to generate from the same inputs. Allocative Efficiency (Inefficiency) is 74.6% (25.4%) whereas Technical Efficiency (output oriented) (Inefficiency) is 88.0% (12%). Pure Technical and Scale Efficiency (Inefficiency) of Scheduled Commercial Banks is 96.9% (3.1%) and 90.8% (9.2%) respectively.

As seen from Table- 2, in the Post-Reformatory Phase as well, the average Revenue Efficiency Score of Scheduled Commercial Banks is less as compared to the target Revenue Efficiency score of 1. Better Revenue Efficiency Scores were expected in the Post-Reformatory Phase, assuming that after the gestation period of Reformatory Phase, banks would settle and would be able to filter and apply the reforms in the best possible manner, but the results of Post-Reformatory Phase show that Scheduled Commercial Banks have low Revenue Efficiency scores intermittently for many years. It seems that utilising the provisions of reforms, banks tried to improve their scale by lowering interest rates. The proportionate increase in the scale seems to have fallen to cover the loss in income via interest. The three consecutive years from 2007-08 till 2009-10 show a declining trend in Revenue Efficiency scores. India too was engulfed in the spillover effect of US recession. Though not directly, still global financial crisis had shaken the confidence of investors as well as that of Financial Institutions. So much so that banks started deviating their investments to low return and low risk securities in order to play safe (Reserve Bank of India, 2008-09). As a result, Revenue Efficiency scores grossly showed a declining trend even till the year 2012-13. As shown in Table- 2 there are also improved Revenue Efficiency scores intermittently. Perhaps, there was a cumulative effect of certain reforms that trailed down in the Post-Reformatory Phase,

bringing an increase in Revenue Efficiency. The Securitisation and Reconstruction of Financial Assets and Enforcement of Security Interest Act (SARFAESI) in 2002 brought a major relief to banks and helped them to control their NPAs (Reserve Bank of India, 2003-04). Similarly, banks invested in higher yield government securities in early 2000s and tried to improve their income from interest (Reserve Bank of India, 2003-04). The gradual but continuous reduction in CRR and SLR ratios, decline in NPAs etc. also became certain contributing factors in improving the Revenue Efficiency of banks.

Also from Table- 2, Allocative Inefficiency seems to be the major cause of Revenue Inefficiency among SCBs even in the Post-Reformatory Phase. Allocative Efficiency Scores are lesser as compared to the Technical Efficiency Scores (output oriented). This depicts that bank managers are still doubtful about the output prices so they are somewhat inefficient in selecting the revenue maximizing combinations. Managers need to pull up their socks and review these lapses minutely. Furthermore, Scale Inefficiency is the major reason of Technical Inefficiency (output oriented) as Scale Efficiency scores among SCBs are inferior to Pure Technical Efficiency scores in the Post-Reformatory Phase. Scale Inefficiency cautions that SCBs need to correct their scale of operations to earn higher revenue.

Revenue Efficiency scores differ during Reformatory Phase and Post-Reformatory Phase in order to check the differences are significant or not Panel Tobit Regressions is used. The results of Panel Tobit Regression are presented in Table- 3 as follows:

**Table- 3: Tobit Regression Results with Time Dummy as independent Variable**

Efficiency	Constant	Dummy 1	Log Likelihood
Revenue Efficiency	0.6808147* (0.0149735)	0.0784739* (0.0095413)	29.287134
Allocative Efficiency	0.7622032* (0.0133846)	0.0791096* (0.0082324)	280.94086
Technical Efficiency (OO)	0.928139* (0.0117241)	0.0190813** (0.0078736)	67.061257
Pure Technical Efficiency	1.078567* (0.012456)	- 0.0205942** (0.0080336)	-150.96767
Scale Efficiency	0.9498548* (0.0095774)	0.0290832* (0.0062398)	361.5176
* ,**Significant at 1% and 5% level of Significance respectively Parenthesis includes Standard Error Value			

The results of Panel Tobit Regression highlight that Revenue Efficiency of SCBs for Reformatory Phase is statistically different and superior to the Post-Reformatory Phase. As the coefficient of time dummy for Revenue Efficiency is 0.0784739 which is positive and significant at 1% level of significance, the coefficient of time dummy for

Allocative and Technical Efficiency (oo) is 0.0791096 and 0.0190813 which is also positive and significant at 1% and 5% level of significance respectively. For Pure Technical Efficiency, time dummy has the coefficient of -0.0205942 with p-value of 0.0104. This depicts that although there is a minute variation, but there is significant improvement in the performance of SCBs in Post-Reformatory Phase in terms of Pure Technical Efficiency. The Scale Efficiency has positive coefficient of time dummy of 0.0290832 which is significant at 1% level of significance.

Thus, the results of Revenue Efficiency and its components depict that Scheduled Commercial Banks (SCBs) exhibit higher Revenue Efficiency Scores in Reformatory Phase as compared to Post-Reformatory Phase. The same is reconfirmed from the results of Tobit regression. In spite of best efforts the macro factors tend to have an impact on the performance of economies. Before banking system could settle with the Reformatory Phase, the global financial crisis decelerated their performance parameters. Banks retreated to safer channels of investments (Reserve Bank of India, 2008-09). In order to channelize liquidity, RBI increased CRR and SLR ratios during recessionary years (Reserve Bank of India, 2008-09) and even the fee based services were offered after satisfying the Know Your Customer (KYC) criterion. These admonitory steps in the Post-Reformatory Phase perhaps reduced the Revenue Efficiency scores of SCBs. Only Pure Technical Efficiency shows improvement in the Post-Reformatory Phase as compared to Reformatory Phase. This shows that to some extent, SCBs are now utilising their available inputs in the best way to produce the maximum outputs without taking into consideration the output prices.

**4.1. Return to Scale (RTS) according to Revenue Efficiency scores**

Since the foremost source of Revenue Inefficiency among Indian Scheduled Commercial Banks seems to be related with Scale Inefficiency- a sub component of Technical Efficiency (Output Oriented). So it becomes vital to evaluate that at which return to scale Indian Scheduled Commercial Banks are operating. In order to evaluate the same, the study determines the number (percentage) of banks operating under different Return to Scale i.e. Constant Return to Scale (CRS), Increasing Return to Scale (IRS) and Decreasing Return to Scale (DRS) in the Reformatory and Post-Reformatory Phase. The results of Return to Scale are summarized in Table- 4.

**Table-4: Number (Percentage) of Scheduled Commercial Banks according to Revenue Efficiency scores**

Year	Total	Decreasing Return to Scale (DRS)	Increasing Return to Scale (IRS)	Constant Return to Scale (CRS)
<b>Reformatory Phase</b>				
1991-92	74	30 (41)	17 (23)	27 (36)
1992-93	71	25(35)	18 (25)	28 (40)

1993-94	70	27 (39)	14 (20)	29 (41)
1994-95	76	40 (53)	7 (9)	29 (38)
1995-96	88	55 (62)	4 (5)	29 (33)
1996-97	92	64 (70)	3 (3)	25 (27)
1997-98	96	61(64)	2 (2)	33 (34)
1998-99	94	59 (63)	6 (6)	29 (31)
1999-2000	96	59 (62)	7 (7)	30 (31)
2000-01	95	63 (66)	3 (3)	29 (31)
2001-02	91	52 (57)	4 (4)	35 (39)
<b>Post-Reformatory Phase</b>				
2002-03	82	58 (71)	5 (6)	19 (23)
2003-04	84	48 (57)	5 (6)	31 (37)
2004-05	83	47 (57)	9 (11)	27 (32)
2005-06	82	54 (66)	8 (10)	20 (24)
2006-07	77	34 (44)	8 (11)	35 (45)
2007-08	74	41 (55)	10 (14)	23 (31)
2008-09	68	41 (60)	3 (5)	24 (35)
2009-10	73	49 (67)	1 (1)	23 (32)
2010-11	72	46 (64)	5 (7)	21 (29)
2011-12	76	50 (66)	4 (5)	22 (29)
2012-13	76	46 (60)	6 (8)	24 (32)

As seen from the Table- 4, the number (percentage) of Indian Scheduled Commercial banks operating on various Returns to Scale varied across Reformatory Phase and Post-Reformatory Phase. Table- 4 depicts that in Reformatory Phase, the number (percentage) of banks operating at DRS increased tremendously from 30 (41%) in 1991-92 to 52 (57%) in 2001-02. In 1996-97, huge increment in number of banks operating on DRS is noticed as 64 banks (70%) are working on DRS. But the number as well as percentage of banks operating at IRS fell drastically from 17 (23%) in 1991-92 to 4 (4%) in 2001-02. Number of banks operating at CRS grossly increased from 27 (36%) in 1991-92 to 35 (39%) in 2001-02 with ups and downs during this Phase. The percentage of banks operating on CRS depicts that in 1993-94, 41% banks are operating on efficient scale but afterwards it follows declining pattern and only 35 (39%) banks remain efficient in 2001-02.

The results of Returns to Scale for SCBs for Post-Reformatory Phase demonstrate that percentage of banks operating at DRS approximately followed a declining trend as the number (percentage) of banks decreased from 58 (71%) in 2002-03 to 46 (60%) in 2012-13. In contrast, the number of banks operating at IRS fluctuate from minimum of 1 (1%) in 2009-10 to maximum of 10 (14%) in 2007-08 with an erratic pattern. In 2012-13, 6 (8%) of banks are operating on IRS. The number (percentage) of banks operating at CRS increased from 19 (23%) in 2002-03 to 24 (32%) in 2012-13 with a small divergence throughout this time period.

Thus during the total study time period, the results suggest that the number of scale efficient banks is less as compared to scale inefficient banks, since Higher number (percentage) of Indian Scheduled Commercial Banks is operating on DRS and IRS as compared to banks operating on CRS. In other words, in Reformatory as well Post-Reformatory Phase results highlight

that majority number of banks operate on DRS i.e. numerous banks experience diseconomies of scale. Indian Scheduled Commercial Banks operating on DRS can recuperate by reducing the use of unnecessary inputs or by utilizing their available inputs to the fullest extent by producing maximum outputs.

## 5. Conclusion

The current paper analyses the Revenue Efficiency performance of Indian SCBs for a long period of 22 years. The results of the paper depict that:

- Indian Scheduled Commercial Banks have never achieved full Revenue Efficiency score of 1 both in the Reformatory Phase as well as in the Post-Reformatory Phase.
- During Reformatory Phase, the dominant reason behind revenue inefficiency is Allocative Inefficiency. Causes of Technical Inefficiency (output oriented) reveal that Scale Inefficiency is constantly higher than Pure Technical Inefficiency among SCBs.
- Allocative inefficiency seems to be the major cause of Revenue Inefficiency among SCBs even in the Post-Reformatory Phase. Furthermore, Scale Inefficiency is the major reason of Technical Inefficiency (output oriented).
- Revenue Efficiency scores differ during Reformatory Phase and Post-Reformatory Phase. Scheduled Commercial Banks (SCBs) exhibit higher Revenue Efficiency Scores in Reformatory Phase as compared to Post-Reformatory Phase. The same is reconfirmed from the results of Tobit regression.
- In Reformatory as well Post-Reformatory Phase, results highlight that majority number of banks operate on DRS i.e. numerous banks experience diseconomies of Scale. Higher number (percentage) of Indian Scheduled Commercial Banks is operating on DRS and IRS as compared to banks operating on CRS.

In order to improve the performance, Indian Banks should focus on Asset Liability Management and should correlate their inputs i.e., deposits, borrowings, employees and fixed assets with their outputs i.e., loans and advances, investments and non-interest income in order to improve efficiency. Indian SCBs should seriously consider the risk assessment and risk management criteria by balancing their assets and liabilities. Asset driven strategies should be framed for correcting the mismatch focusing on shortening the duration of the asset portfolio. Similarly, liability driven strategies should also be formed concentrating on lengthening the maturity profiles of liabilities. Further, they are required to choose their input-output mix taking into consideration their prices. This would help them to take benefit of the favourable economic environment and sustain in the unfavourable economic scenario. No doubt, economic changes cannot be anticipated in

advance, but bank managers can protect themselves by moving more towards non-traditional businesses such as treasury management, brokerage services, insurance selling, merchant banking, advisory services, investment banking, and asset securitization etc this will help banks to cover the losses from traditional activities as well as earn consistent revenues thus, enhancing their efficiency.

The present paper endeavors to provide comprehensive insights into the performance of Indian Scheduled Commercial Banks by analyzing the Revenue Efficiency for a long period of 22 years. The research can further be extended by analyzing Revenue Efficiency of Public, Private and Foreign Sector Banks separately i.e. across ownership. Further, the impact of macro factors on efficiency can also be evaluated empirically. The impact of financial crisis on Revenue Efficiency of banks can also be studied. Besides, various bank specific, industry specific and economy specific factors too can be taken up for checking their effect on Revenue Efficiency of banks.

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