Economic Reforms and Cost Efficiency in the Banking Sector in India

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Abstract

This research paper sought to examine the level and extent of cost efficiency and its correlates pertaining to 51 sample banks operating in India during the post - reform period (1995 - 2016). Results pointed toward the existence of significant variations across banks in respect of their cost efficiency scores that ranged between 66.94% and 99.49% during 1995 - 2016, with a mean efficiency score at 0.7960. It signified that on an average, each sample bank, if it were producing on the frontier rather than at its current location, could have done so by using only 79.6% of the resources actually employed by it. Conversely speaking, it also means that it was found involved in expending 20.40% additional resources and thus, incurred higher cost to produce the same level of output as the average efficient bank. Moreover, it was also observed that as a source of cost inefficiency within all inefficient banks, allocative inefficiency weighed slightly more than its technical inefficiency counterpart and important factors like ownership, NPAs, and expansion affected cost efficiency and their correlates of commercials banks in India.

Keywords : **cost efficiency, allocative efficiency, technical efficiency, DEA (data envelopment analysis), Tobit regression**

JEL Classification Codes : E5, G20, G28

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In a rapidly growing economy such as ours, a cost - efficient banking sector is expected to play a strategic role in its diverse set of manifestations as it lubricates the farm and the non - farm sectors of its economy through the provision of a broad range of banking services. The cost efficiency of the banking sector is perceived to provide a sort of competitive edge not only to the banking sector, but also to the overall economy and its sectors as it enables the latter to realize faster, sustained, and steady growth in terms of time.

In hindsight, it is not impertinent to note in passing that in the aftermath of nationalization of 14 commercial banks in 1969 followed by 6 others in 1980 in India, the introduction of asymmetrical and unbridled regulation in the banking sector in the form of high liquidity culminated into a serious financial squeeze with all its deleterious consequences that appeared to threaten the very foundation of the country's banking sector before the dawn of economic reforms in 1991.

Becoming cognizant of the conspicuous presence of the signs of financial strangulation and its fallout as also to save the banking sector of the country from an impending serious crisis, comprehensive banking reforms plan was set by the Government of India, which, inter alia, envisaged putting in place a more diversified, profitable, well-organized, and an enduring banking system in the country. Two committees were set under the chairmanship

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of M. Narasimham to delineate the contours of the country's financial system and also to suggest appropriate policy correctives, which submitted their reports in 1991 and 1998, respectively. In more specific terms, the economic liberalization reform agenda concerning the banking sector in India principally revolved around : (a) restructuring of public sector banks by giving them more prominent independence in decision-making and by pumping in new capital through recapitalization and fractional privatization ; (b) making contestable markets by abolishing barriers to entry for new private and foreign banks ; (c) enhancing the administrative and supervisory framework in a way so as to attune it to the needs of a progressively market-driven economy of the future ; and (d) reinforcing the banking system through consolidation. In consonance with this agenda, a number of initiatives such as interest-rate deregulation, standardized minimum capital requirements, prudential norms relating to income recognition, assets classification and provisioning for non - performing assets (NPAs) or bad loans, and changes in regulatory and supervisory environment by the bank planners and policymakers were recommended.

Viewed from this perspective, the banking sector reforms in India constituted a paradigm shift during the post-economic liberalization period wherein almost all commercial banks in the country were strained to use modern methods and simultaneous expanding of their businesses by achieving cost efficiency in the intense competition. To this end, as rational economic entities, they constantly look for measures that help them economize on the use of resources so as to realize maximum returns at minimum cost. But have they become really cost efficient? If so, on what count and to what extent ? Needless to overstress, the plausible answers to these questions have important policy stance. At the same time, a wide feeling circulating in some academic quarters has been that cost efficiency exhibits important variations across various ownership categories of banks operating in India. If this be the prevailing reality, then an important question that merits serious attention is: Is the phenomenon of variations in cost efficiency of banks in India attributable exclusively to their ownership or to something other than this ?

In addition to what has been observed above, it is not out of context to observe that a plethora of frontier studies, as have been conducted over the years in respect of efficiency of the banking sector in India, seem to focus overwhelmingly on technical efficiency, even though it is by improving overall economic efficiency that the banking sector can realize substantial gains not only for itself, but also for the country's economy as well. What needs to be underlined in respect of these existing studies is that most of them seem to deal mainly with aggregate data ; whereas, only a few of them specifically deal with the bank level data. It is possibly for such reasons that our understanding about the connection between bank ownership and cost efficiency continues to be marred both by ambiguities and inadequacies. In such a situation, a fresh probe into the issues under consideration is bound to be both academically more rewarding as well as highly informative from the viewpoint of policymaking.

Against this backdrop, this paper seeks to examine how public sector banks, private banks, and foreign banks in India use the resources at their command for increasing their cost efficiency and how it relates to its various correlates. We firmly believe that an assessment of the banking sector's cost efficiency in India cast in its current mould assumes tremendous significance on some important counts. First, it helps us in ascertaining if the efficient allocation of resources at minimum costs leads to optimum outcomes or not. Second, since cost efficiency includes technical and allocative components, an exhaustive analysis of both enables us in discovering if the banking sector in India is technically efficient or allocatively efficient or efficient in both these respects. Third, in view of the fact that India's banking sector performance continues to be characterized by significant variations across various ownership categories with ownership, inter alia, perceived to play a crucial role in the use of resources, a study of cost efficiency of the said sector factoring in bank ownership assumes considerable significance. And finally, since most of the previous studies have been based on aggregate data, the role of bank ownership affecting cost efficiency continues to remain relatively an under explored area of research. There, thus, exist important research gaps in respect of the banking sector in India on the aforementioned counts. The present study seeks to fill one such gap by using DEA (data envelopment analysis), a widely used non-parametric

technique, which was initially introduced by Charnes, Cooper, and Rhodes (1978), though its origin is traceable to the seminal work of Farrell (1957).

Literature Review

Many learned researchers have, in more recent times, attempted to appraise the performance of the banking sector in India and elsewhere by exclusively focusing on cost efficiency (see, for example, Banerjee, 2018 ; Das, Nag & Ray, 2005 ; Das & Ghosh, 2009 ; Das & Kumbhakar, 2012 ; Hassan & Hassan, 2018 ; Jain, Metri, & Rao, 2019 ; Kaur & Kaur, 2010 ; Kumar, 2012 ; Narayanaswamy & Muthulakshmi, 2016 ; Raina & Sharma, 2013 ; Sahoo, Sengupta, & Mandal, 2007 ; Wanniarachchige & Suzuki, 2011). The reasoning that underscores this focus has possibly been due to it being viewed as better-suited in assessing the comparative performance of a bank vis-a-vis the best practice bank which is credited to manage its operating costs at the lowest level for producing the same output under identical technological conditions (see, for example, Kamarudin, Nordin, Muhammad, & Hamid, 2014). The cost efficiency, from this viewpoint, came to be viewed as a measure of the capability of the bank in controlling its costs and involved the application of input-oriented approach. It is not impertinent to mention that notwithstanding the explicit recognition of the centrality of cost efficiency in determining the real performance of the banking sector by almost all its advocates, its incapacity to do so at its own has also been highlighted by its adversaries. Accordingly, in addition to cost efficiency, quite a number of researchers have become motivated to use revenue and profit efficiencies to determine the real economic performance of the commercial banking sector in India and elsewhere. Studies by Bader, Mohmad, and Ariff (2008) in respect of the foreign banking sector, and by Chatterjee (2006), Das et al. (2005), Ray and Das (2010), Sensarma (2005), Bhatia and Mahendru (2015), Mahendru and Bhatia (2017), and Jayarani and Prakash (2018) in the Indian case bear ample testimony to such an assertion. In the latter case, the overall conclusion has been that the underway process of economic liberalization has tended to impact all these efficiencies of the banking sector in India favourably, though important variations to this effect did exist across various banks operating in the country. What, nonetheless, needs to be emphasized, in particular, in this regard is that the literature on the subject has tended to grow not only in terms of volume or variety, but also in terms of sophistication over the period of time. Given these characteristic features of the burgeoning literature on the theme, while there is little point in repeating the details of each and every study comprehensively as it has already been done excellently by several other researchers, a brief overall recapitulation of broad features of some of the important studies conducted in this regard is, nonetheless, not altogether uncalled for, particularly when the theme encompassing these studies has wide implications not only for the present, but also for the future.

First, thanks to a lack of consensus about the appropriateness and preference for a particular estimation methodology, the studies applying parametric or non-parametric approach to the same data set are not strictly comparable.

Second, in view of the fact that the banking sector in India has been desperately crying for and also experiencing cost efficiency related changes on a continuing basis till date, most existing studies on the subject fail to capture the real impact of cost efficiency on the performance of the said sector.

Third, as observed earlier, most existing studies on the theme under consideration are a disjointed bit of the prevailing reality in that they overwhelmingly focus on technical efficiency or its correlates ; whereas, it is the cost efficiency (i.e., the product of technical and allocative efficiencies), which is widely acknowledged to matter the most in determining the performance of the said sector.

And finally, while most of the existing studies on the subject treat the issues involved in the theme simple and straightforward; in actual practice, nonetheless, these issues are too complex to be solved in the absence of expert decision making. It is of little wonder, therefore, that our understanding of issues involved in the theme continues

to remain blurred and inadequate. In light of the above, a study focusing on cost efficiency and its correlates in respect of the ownership of the commercial banks in India, therefore, assumes considerable significance. This is what the present study seeks to do by considering the period between 1995 - 96 and 2015 -16.

Database, Inputs -Outputs Specification ,and Methodological Frame

(1) Sample and Data : A panel dataset generated from reports available on the Reserve Bank of India (RBI) website of 51 sample banks spread across 26 public sector banks (PSBs), 20 private domestic banks, and 05 foreign banks for the period between 1995 and 2016 have been used as data for the present study. The banks included in the sample are the ones which had existed both at the initial and terminal years of the study and also had comparable quantitative information for use in the present study.

(2) Inputs - Outputs Specification : The selection and specification of inputs and outputs for modelling banks' behaviour in respect of estimation of the efficiency scores is possibly the most challenging task faced by a data analyst. Two main approaches for selecting the inputs and outputs for a bank have been discernible, namely the production approach and the intermediation approach. Taking note of the respective appropriateness of these two on the basis of their strengths and weaknesses as also the analytical needs of the present study, we prefer to go in for intermediation approach rather than the production approach for selecting input and output variables for purposes of computation of different types of efficiencies like cost efficiency, technical efficiency, and allocative efficiency for each bank included in our sample.

The Table 1 gives us the information regarding the inputs and output variables considered for analysis .

Table 1. Input and Output Variables

Input Variables	Output Variables	Input Prices
Fixed Assets	Advances	Price of Physical Capital = (Total Operating Expenses - Personnel Expenses)/Fixed Assets
No. of Employees	Investment	Price of Labour = (Personnel Expenses)/No. of Employees
Loanable Funds = Deposits + Borrowings	Non - Interest Income (Other Income)	Price of Loanable Funds = (Interest Paid on Deposits and Borrowings)/Loanable Funds

(3) Methodological Frame : Though the methodology regarding the cost efficiency measurement of an enterprise, including a bank, has witnessed great sophistication over the period of time, the origin of an analytical framework to this effect is usually attributed to Farrell's seminal work (1957). In his framework, cost efficiency (CE) is further decomposed into two separate parts, namely technical efficiency and allocative efficiency.

Data envelopment analysis ,a non -parametric input -oriented approach will be used for computing empirical estimates of the cost efficiency and its component scores for all banks at the individual level in three steps. Consider K banks, each of which produces M outputs using N inputs.

For each bank, x_{ni} and y_{mi} denote the input quantities used and output quantities produced by each bank ,where $i = 1... K$, $n = 1... N$, and $m = 1,....., M$ with $x_{ni} > 0$ and $y_{mi} > 0$, that is, at least one bank has input and output strictly positive or non zero.

Step 1 : To calculate technical efficiency as introduced by Charnes, Cooper, and Rhodes (1978)

Let X denote an input $N \times K$ matrix and Y is an output $M \times K$ matrix with bank i's output in column i.

A measure $TE_i^{CRS} = \theta_i$ of technical efficiency can be calculated as a solution to :

$Min\ TE_i^{CRS} = \theta_i$

Subject to

$Y\lambda_i \geq y_i$

$X\lambda_i \leq \theta_i x_i$ .....(i)

θ_i free

$\lambda_i \geq 0,$

On solving the above LPP, a linear combination of λ_i s of all banks in the sample given by the $K \times 1$ vector which produces at least the output quantities y_i of bank i is obtained. Those banks having non - zero λ_i values are nominated as reference banks for the bank i, and if the value of λ_i will be 1 for the element i, then a bank is said to be technically efficient. Our objective for fixing θ_i at minimum implies that we want to maximize the proportionate decrease in inputs.

Step 2 : To calculate cost efficiency as introduced by Färe and Grosskopf (1985) and Ferrier, Grosskopf, Hayes, and Yaisawarng (1993)

Min $pi'xi$

Subject to

$Y\lambda_i \geq y_i$

$X\lambda_i \leq x_i$ .....(ii)

x_i free

$\lambda_i \geq 0,$

where, p_i denotes the bank i input price vector. On solving the above LPP, we will have a cost-minimizing input vector x_i and a linear combination of weights λ_i of the entire 51sample banks which generates at least bank i's outputs yi by using its ideal input vector x_i^{CRS} under a CRS technology. The solution to model (ii) yields minimum costs as $p_i' x_i^{CRS}$. On comparing minimum costs with observed costs $w_i' x_i$ of bank I gives cost efficiency as :

$$\boldsymbol{CE_i^{CRS} = p_i' x_i^{CRS} / p_i' x_i}$$

Step 3 : Allocative efficiency can be computed by taking the ratio of the cost efficiency to the technical efficiency under input - oriented approach.

Mathematically ,

$$AE_i^{CRS} = CE_i^{CRS} / TE_i^{CRS}$$

Pertinently, this relationship facilitates the decomposition of cost efficiency as $CE_i^{CRS} = TE_i^{CRS} \times AE_i^{CRS}$

In this situation, it should be emphasized in specific that the estimated cost, technical and allocative efficiency score ranges from 0 to 1.

Empirical Analysis and Results

Equipped with the above - described research-kit, we now discuss the empirical results of our study in this section. The cost efficiency can be taken as the product of technical and allocative efficiency. A bank is said to be overall cost efficient if the technical efficiency and allocative efficiency of a bank is 1. Again, a bank which is technically

Table 2. Pattern of Cost Efficiency, Technical Efficiency, and Allocative Efficiency Scores in the Indian Banking Sector, 1995 - 96 to 2015 - 16

DMU	OWNERSHIP CODE : Public Bank = 1, Private Bank = 2, Foreign Bank = 3	AVERAGE CE	CIE %	AVERAGE TE	TIE %	AVERAGE AE	AIE %
Allahabad Bank	1	0.7458	25.42	0.8471	15.29	0.8758	12.42
Andhra Bank	1	0.8862	11.38	0.9730	2.70	0.9111	8.89
Axis Bank	2	0.8314	16.86	0.9199	8.01	0.9053	9.47
Bank of Baroda	1	0.7462	25.38	0.8390	16.10	0.8865	11.35
Bank of India	1	0.7475	25.25	0.8556	14.44	0.8703	12.97
Bank of Maharashtra	1	0.7856	21.44	0.8815	11.85	0.8869	11.31
Canara Bank	1	0.7585	24.15	0.8446	15.54	0.8961	10.39
Catholic Syrian Bank	2	0.6800	32.00	0.7936	20.64	0.8499	15.01
Central Bank of India	1	0.7104	28.96	0.8231	17.69	0.8591	14.09
Citibank	3	0.9038	9.62	0.9770	2.30	0.9227	7.73
City Union Bank	2	0.7885	21.15	0.8660	13.40	0.9059	9.41
Corporation Bank	1	0.8705	12.95	0.9622	3.78	0.9045	9.55
DBS Bank	3	0.9917	0.83	1.0000	0.00	0.9917	0.83
Dena Bank	1	0.7603	23.97	0.8568	14.32	0.8822	11.78
Deutsche Bank	3	0.9949	0.51	1.0000	0.00	0.9949	0.51
Development Credit Bank	2	0.6984	30.16	0.8521	14.79	0.8173	18.27
Dhanlaxmi Bank	2	0.7035	29.65	0.7991	20.09	0.8752	12.48
Federal Bank	2	0.7952	20.48	0.8789	12.11	0.8989	10.11
HDFC Bank	2	0.8343	16.57	0.9337	6.63	0.8900	11.00
HSBC Bank	3	0.8372	16.28	0.9515	4.85	0.8785	12.15
ICICI Bank	2	0.8262	17.38	0.9283	7.17	0.8901	10.99
IDBI Bank	1	0.8323	16.77	0.9659	3.41	0.8625	13.75
Indian Bank	1	0.7349	26.51	0.8463	15.37	0.8640	13.60
Indian Overseas Bank	1	0.7452	25.48	0.8457	15.43	0.8764	12.36
IndusInd Bank	2	0.7954	20.46	0.9107	8.93	0.8690	13.10
ING Vysya Bank	2	0.7126	28.74	0.8189	18.11	0.8701	12.99
Jammu & Kashmir Bank	2	0.7893	21.07	0.8866	11.34	0.8873	11.27
Karnataka Bank	2	0.8006	19.94	0.8806	11.94	0.9074	9.26
Karur Vysya Bank	2	0.7740	22.60	0.8634	13.66	0.8917	10.83
Kotak Mahindra Bank	2	0.7641	23.59	0.9112	8.88	0.8404	15.96
Lakshmi Vilas Bank	2	0.7778	22.22	0.8756	12.44	0.8808	11.92
Nainital Bank	2	0.6694	33.06	0.7900	21.00	0.8487	15.13
Oriental Bank of Commerce	1	0.8523	14.77	0.9399	6.01	0.9027	9.73
Punjab & Sind Bank	1	0.7431	25.69	0.8357	16.43	0.8776	12.24
Punjab National Bank	1	0.7503	24.97	0.8539	14.61	0.8763	12.37
Ratnakar Bank	2	0.6944	30.56	0.8224	17.76	0.8395	16.05

South Indian Bank	2	0.7798	22.02	0.8741	12.59	0.8852	11.48
Standard Chartered	3	0.8391	16.09	0.9593	4.07	0.8731	12.69
State Bank of Bikaner	1	0.8434	15.66	0.9715	2.85	0.8684	13.16
State Bank of Hyderabad	1	0.8732	12.68	0.9606	3.94	0.9082	9.18
State Bank of India	1	0.8172	18.28	0.9159	8.41	0.8917	10.83
State Bank of Mysore	1	0.8346	16.54	0.9477	5.23	0.8812	11.88
State Bank of Patiala	1	0.8393	16.07	0.9628	3.72	0.8723	12.77
State Bank of Travancore	1	0.8726	12.74	0.9725	2.75	0.8970	10.30
Syndicate Bank	1	0.7621	23.79	0.8780	12.20	0.8641	13.59
Tamilnad Mercantile Bank	2	0.8874	11.26	0.9465	5.35	0.9383	6.17
Uco Bank	1	0.7448	25.52	0.8617	13.83	0.8614	13.86
Union Bank of India	1	0.7502	24.98	0.8638	13.62	0.8681	13.19
United Bank of India	1	0.7518	24.82	0.8641	13.59	0.8689	13.11
Vijaya Bank	1	0.7571	24.29	0.8564	14.36	0.8835	11.65
Yes Bank	2	0.9116	8.84	0.9756	2.44	0.9320	6.80
Average		0.7960	20.40	0.8949	10.51	0.8859	11.41
Public Sector Banks -Average		**0.7891**		**0.8933**		**0.8806**	
Private Sector Banks -Average		**0.7757**		**0.8764**		**0.8812**	
Foreign Sector Banks -Average		**0.9133**		**0.9776**		**0.9322**	
MIN (MINIMUM)		0.6694		0.7900		0.8173	
MAX (MAXIMUM)		0.9949		1.0000		0.9949	

Note. TE = Technical Efficiency, TIE% = Technical inefficiency = (1 - *OTE*) × 100, EE = Economic efficiency, EE% = Economic inefficiency = (1 - *EE*) × 100, AE = Allocative efficiency, AIE(%) = Allocative inefficiency =(1 - *AE*) × 100. All figures are the mean values over the period of 1995 - 2016.

efficient ($TE = 1$), but does not demonstrate perfect allocative efficiency score as 1 cannot be termed as overall cost efficient ($CE < 1$).

It can be inferred from the Table 2 :

(1) Our results demonstrate that there exist significant variations across banks in terms of their cost efficiency scores ranging from 66.94% and 99.49% during 1995-2016. The average cost efficiency score for 51 sample banks measured in the referenced period is 0.7960.

(2) The 79.6% efficiency figure means that the average bank in the sample could have produced the same level of outputs using only 79.6% of the resources actually employed, if it were producing on the frontier rather than at its current location. Conversely speaking, it also means that the 20.40% inefficiency figure implies that in each year of the study period, the average bank needed 20.40% more resources and, thus, incurred more cost to produce the same output as the average efficient bank.

(3) Our findings further show that there are big gaps across banks in terms of their TE (technical efficiency) score ranging from 79.0% to 100% during 1995 - 2016 with an average technical efficiency score of 0.8949. This indicates that Indian banks required only 89.49% of inputs on an average to generate their present level of output.

In other words, there existed an overall potential of 10.51% for economizing on the use of input resources such as physical capital, labour, and loanable funds by the banking sector in India during 1995-96 and 2015-16.

(4) Two foreign banks, namely, DBS Bank and Deutsche Bank in our sample are observed to be technically efficient as their TE score measures at 1 (see Table 2). In terms of DEA terminology, these banks can be designated as the best practice banks (peer banks) or globally efficient banks as the resource utilization process in their case could be termed as optimal. As such, these two banks form the reference set for inefficient banks to emulate. Viewed from this perspective, these banks can be labelled as the role models for the inefficient banks.

(5) The two foreign banks mentioned above in our sample, which are observed to be technically efficient as their computed TE score is equal to 1, can also be termed as cost efficient banks as their allocative efficiency score is assessed at 0.9917 and 0.9949, respectively which is very close to 1 or close to 1, which fall in the category of economically most efficient banks.

(6) The information given in Table 2 clearly suggests that the foreign banks are *most cost efficient* (91.33%) followed by the public sector (78.91%) and private (77.57%) banks in that order. These differences in the cost efficiency of the three banks' classifications can be seen in terms of the general failure on the part of the private sector domestic banks to adopt the best practiced banking techniques and maximize outputs from the minimum input costs as a result thereof.

(7) A likewise pattern can also be noticed in respect of technical and allocative efficiencies for the banking sector in India. It is not unreasonable to argue, therefore, that there exists considerable scope for effecting significant cost saving measures for enabling the banking sector in India to use and allocate more effectively and efficiently their productive resources.

(8) Cost efficiency can be decomposed into two components - technical and allocative efficiencies. Cost inefficiency can, therefore, be attributable either to technical inefficiency or to allocative inefficiency. Our results shows that the average technical efficiency measures at 89.49% during the reference period, indicating that on an average, each sample bank in India seemed to waste about 10.51% of its inputs or resources. As against this, the average allocative efficiency is noted to be at 88.59%, suggesting thereby that each sample bank in India seemed to incur about 11.41% more production cost by choosing the incorrect input combination, when factor prices are assumed to be given and constant. It can be seen that allocative inefficiency, on an average, is slightly more than technical inefficiency in case of all the sample years. By implication, what it means is that choosing the incorrect input combination (given the factor prices) has slightly greater significance than technical inefficiency as a source of cost inefficiency in respect of each inefficient bank included in the sample. On the basis of our results, it is possible to argue that the observed cost inefficiency with regard to the banking sector in India is mainly attributable to the regulatory framework conditioning the functioning of the banking sector in India rather than to the managerial problems faced in the use of the financial resources.

Determinants of Inter - Bank Differentials

The preceding discussion points towards the existence of important differences in cost efficiency performance of the various classifications of banks in India during the period under reference. But why do such differences exist ? Can such differences in cost efficiency of the banking sector in India be attributed to the environment (or the policy-related variables) or to some other determinants ? This section seeks plausible answers to this

Table 3. Factors Affecting the Cost Effeciency of the Banks, 1995 - 2016

	Cost Efficiency (CE) Score		Overall Technical Efficiency Score (OTE)		Allocative Efficiency (AE) Score	
Variable	**Marginal Effect**	***p* - value**	**Marginal Effect**	***p* - value**	**Marginal Effect**	***p* - value**
Ownership	**0.0571834**	**0.006**	0.0293989	0.119	**0.0331077**	**0.003**
Gross NPA	0.0001772	0.085	0.000365**	0.128	0.0001179	0.097
CAR	-0.0014023	0.339	-0.0014888	0.165	0.0006658	0.582
Number of Branches	-2.78E-06	0.574	-8.70E-06**	0.023	1.40E-06	0.656
Expected Value of Mean	0.79410028		0.91116059		0.88456767	

Note. *,** , and *** represents significance at 10%, 5%, and 1 % levels of significance, respectively.

particular question. We feel that this question can be addressed by taking into account four such possible factors, namely, ownership, gross NPA, CAR, and number of branches. We believe that some factors may influence a bank's cost efficiency. The Table 3 provides the required information of the description and anticipated impact of these factors on the efficiency of the sample banks during the period under reference.

The following comments deserve to be underlined in particular from the Table 3 :

(1) Ownership via significant impact on allocative efficiency is affecting the cost efficiency positively and significantly as ownership is moving from public sector to private sector and private foreign banks. It may inferred that a higher degree of privatization is improving the Indian commercial banks' cost efficiency.

(2) The feeble impact of NPAs on allocative efficiency points towards their weak impact on cost efficiency as well. In all probability, the mounting NPAs are forcing banks to reduce inputs costs, and as such, contributing meagerly in improving the cost efficiency of Indian commercial banking. However, the NPAs do not seem to have a bearing on overall technical efficiency (OTE).

(3) The horizontal expansion of banks in terms of number of branches seems to be reducing the technical efficiency of India's commercial banks. This indicates that the commercial banking in India is probably operating with diminishing returns to scale at which diseconomies of scale are greater than the economies of scale. This, in turn, signals towards the fact that bank size expansion adversely affects both overall technical efficiency (OTE) and cost efficiency.

Conclusion

Using the DEA technique to the RBI dataset concerning 51 sample banks spread over three ownership categories of banks for the period between 1995 - 96 and 2015 - 16, this paper aims to assess the cost efficiency of the banking sector and its correlates in India. Our empirical results suggest that the cost inefficiency score must witness a decline to strengthen the banking industry's efficiency per se. Furthermore, since technical efficiency for the entire period (89.49%) is seen to be higher than allocative efficiency (88.59%), the decline in cost inefficiency ought to be slightly more marked in the case of the latter's inefficiency counterpart than in its former counterpart. It is found that the situation in terms of cost inefficiency is even bleaker in the case of private domestic banks than in case of public sector banks (PSBs) and foreign banks in that order.

Implications

Our study's empirical results have some significant policy implications because of their consequences for the economy and its various sectors. These, inter alia, include the devising of an appropriate policy - mix aimed at a thorough revamp of the existing banking order in the country in a way so as to attune it progressively to the current and emerging needs of our economy, achievement of increased cost efficiency through diversification of the banking sector portfolios, unshackling the banking sector, and promotion of healthy competition amongst banks, increasing recapitalization of weak efficiency banks, introduction of measures that lead to reduction in their administrative and other related costs, and the like. Alongside, a close and effective monitoring of the entire banking sector to rein-in the uncalled for political interventions by incorporating measures such as transparency, accountability, etc., in the day-to-day working of the banking sector in India would also, we believe, imperatively go a long way to boost the banking sector's cost efficiency of the country.

Limitations of the Study and Scope for Further Research

The findings of the study, we believe, need to be taken with a note of caution due to some inherent limitations. First, the study is primarily based on secondary data. As such, it suffers from limitations which usually characterize these data. Second, our study is restricted to information pertaining to just 51 sample banks. As against, 26 public sector and 20 private domestic banks, only 5 foreign banks are included in our sample. While we have exercised every note of caution in the selection of the sample banks, but the enlargement of the sample or its contraction by way of including/ excluding strong/weak, we believe, has the potential of distorting the findings of the study. Third, while the cost efficiency score is an important determinant of economic performance of a bank, but it, at its own, gives no guarantee of superior performance of a bank in the absence of revenue and profit efficiency scores, particularly when contrary evidence also exists to this effect (Bader et al., 2008 ; Kamarudin et al., 2014). Fourth, the year 2015-16, being the terminal year of the reference period of the study, does not factor-in the impact of the phenomenon of demonetization on the efficiency scores of the banking sector in India. Finally, the efficiency scores of Indian commercial banks are subject to macroeconomic shocks like inflationary pressures, changes in interest rates, and other such changes taking place in the economy. Moreover, while the underway process of banking reforms is a continuing one, the present study does not include in its scope the impact of changes in the pace and pattern of divestment, changes in capital structure and acquisitions, which have the potential to impact the efficiency scores of the banking sector in India. Viewed from this perspective, the findings of our study are not subject to universal application. We hope that future researchers working on the theme under consideration will take care of these limitations and incorporate the required correctives to improve our understanding of this area of research.

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