PERFORMANCE MEASUREMENT OF PUBLIC SECTOR BANKS IN INDIA: A MULTI-COMPONENT DEA APPROACH

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Abstract: This paper seeks to measure the multi-component performance analysis of public sector banks (PuSBs) in India for the period 2008-2013. Each bank consists of two components. The first component deals with the productivity whereas the second component deals with the profitability of each bank. The empirical results of the study show that the PuSBs performed better in terms of profitability than the productivity in the selected period. The number of efficient banks in profitability stage is more than the productivity stage. Sensitivity analysis is also performed to ensure the validity of the efficiency results and the use of multi-component data envelopment analysis (DEA) instead of traditional DEA. The findings of the study are quite functional for policy makers to identify weaknesses in productivity and profitability side of PuSBs and to give directions for their improvement.

Keywords: Multi-component DEA, productivity, profitability, public sector banks.

Introduction: The economic growth of a country mainly depends on the financial soundness of its financial institutions. Thus, the performance measurement of banking sector is a key to continued existence in the international market. The banking sector in India can be categorized as: (i) Public Sector Banks (PuSBs), (ii) Private Sector Banks (PrSBs) and (iii) Foreign Banks (FBs). Due to advanced technology and professional management, PuSBs faced fierce competition from PrSBs and FBs. The literature on the bank efficiency in Indian can be seen in studies like [1]-[3]. In the literature, some studies have taken bank activity as the creation of funds using input resources, while others have taken bank activity as a process of converting interest expenses into interest income from loans and investments. The former activity results into the productivity while the latter one results into the profitability. For the sound banking system, both the bank activities are essential and should not be studied independently. In this study, both productivity and profitability are taken as two interdependent components of a bank. The components are said to be interdependent if the output(s) produced by each component is used as a part of inputs by the other component.

This paper seeks to measure aggregate and component-wise performances of each PuSB for the period 2008-2013 using multi-component DEA. A multi-component DEA is a technique for evaluating the overall performance of decision making units (DMUs) and their components. To the best of our knowledge, there is hardly any study on the performance of Indian banking industry using multi-component DEA. The aim of the present study is five-fold: (i) to evaluate average aggregate performance of PuSBs and their categories, i.e., Nationalized Banks (NBs) and SBI & its Associates (SBI group) (ii) to evaluate component-wise performance, (iii) to find out average inefficiencies present in each component, (iv) to analyse the impact of components on aggregate performance, and (v) to perform sensitivity analysis to ensure the validity of the efficiency results. The paper is organized as follows: Section 2 describes multi-component DEA. Section 3 presents the performance model for PuSBs. Section 4 presents the empirical results and discussion. The last Section 5 presents the conclusions.

DEA and Multi-component DEA approaches: DEA [4] is widely used non-parametric technique for evaluating the relative efficiencies of DMUs on the basis of multiple inputs-outputs. In real-life applications, a DMU may consist of interdependent components also known as decision making sub-units (DMSUs). A multi-component DEA is the best way to analyse the overall performance of a DMU and its components. The literature on multi-component DEA can be seen in [5]. Assume that the performance of a set of n DMUs (DMU_j ; j = 1,..., n) is to be measured and every DMU consists of d DMSUs. Each DMSU$_i$ (i =1,2,...,d) consumes I^S and I_i types of shared and external inputs respectively, and produces K_i different types of outputs. The DMSU$_i$ $(2 \le i \le d)$ also consumes I'_i types of internal inputs. The internal inputs of DMSU$_i$ are outputs produced by DMSU$_{i-1}$. Thus, $I'_i = K_{i-1}\ \forall i = 2, 3, \ldots, d$. Production process of a multi-component DMU$_k$ is shown in Fig. 1.

Let $Y_k^{(i)} = (y_{1k}^{(i)}, y_{2k}^{(i)}, \ldots, y_{K_i k}^{(i)}),\ i = 1, 2, \ldots, d$ be the vector of outputs produced by DMSU$_i$. Let $X_k^S = (x_{1k}^S, x_{2k}^S,\ \ldots, x_{I^S k}^S)$ be the vector of shared inputs. Let $\alpha_{ik}^t x_{tk}^S$ $(t = 1,\ 2,\ \cdots, I^S)$ be the portion of the t^{th} shared input consumed by DMSU$_i$. Note that

$\sum_{i=1}^{d}\alpha_{ik}^{t}=1,\ \forall t=1,2,\ \ldots,I^{S}$. Assume that $\alpha_{ik}=\left(\alpha_{ik}^{1},\alpha_{ik}^{2},\ldots,\alpha_{ik}^{I_S}\right)$ be the vector for DMSU$_i$ such that every α_{ik}^{t} corresponds to t^{th} shared input for $t=1,2,\ldots,I^{S}$. Each α_{ik}^{t} is the decision variable which must be determined. Let $X_k^{(i)}=(x_{1k}^{(i)},x_{2k}^{(i)},\ldots,x_{I_ik}^{(i)}),\ i=1,2,\ldots,d$ and $\bar{X}_k^{(i)}=Y_k^{(i-1)},\ i=2,3,\ldots,d$ be the vectors of external and internal inputs consumed by *DMSU$_i$*. $E_k^{(a)}$ of DMU$_k$ is given by

$$E_k^{(a)}=\frac{\sum_{i=1}^{d}U_k^{(i)}Y_k^{(i)T}}{\sum_{i=1}^{d}V_k^{(i)}X_k^{(i)T}+\sum_{i=1}^{d}V_k^{S(i)}\left(\alpha_{ki}X_k^{S}\right)^{T}+\sum_{i=1}^{d-1}\bar{U}_k^{(i)}Y_k^{(i)T}}$$

where $U_k^{(i)}$, $V_k^{(i)}$, $V_k^{S(i)}$ and $\bar{U}_k^{(i)}$ are vectors. Further, $E_k^{(i)}$'s are given by

$$E_k^{(1)}=\frac{U_k^{(1)}Y_k^{(1)T}}{V_k^{(1)}X_k^{(1)T}+V_k^{S(1)}\left(\alpha_{k1}X_k^{S}\right)^{T}}$$ and

$$E_k^{(i)}=\frac{U_k^{(i)}Y_k^{(i)T}}{V_k^{(i)}X_k^{(i)T}+V_k^{S(i)}\left(\alpha_{ki}X_k^{S}\right)^{T}+\bar{U}_k^{(i-1)}Y_k^{(i-1)T}}\ \forall i=2,3,\ldots,d.$$

Theorem 1. $E_k^{(a)}$ is a convex combination of $E_k^{(i)}s$.

To derive $E_k^{(a)},E_k^{(1)},E_k^{(2)},\ldots,E_k^{(d)}$, we solve the following mathematical model:

Model - 1 Max $E_k^{(a)}$

subject to $E_j^{(a)}\le 1,\ \forall j=1,2,\ldots,n,$

$E_j^{(i)}\le 1,\ \forall i=1,2,\ldots,d\,;\ \forall j=1,2,\ldots,n,$

$\sum_{i=1}^{d}\alpha_{ki}^{t}=1,\ \forall t=1,2,\ldots,I^{S},$

$U_k^{(i)}\in\Omega_1,\ \left(V_k^{(i)},\ V_k^{S(i)}\right)\in\Omega_2,\ \forall i=1,2,\ldots,d;$

$\bar{U}_k^{(i)}\in\Omega_3,\ \forall i=1,2,\ldots,d-1;\ \alpha_{ik}\in\Omega_4,\ \forall i=1,2,\ldots,d.$

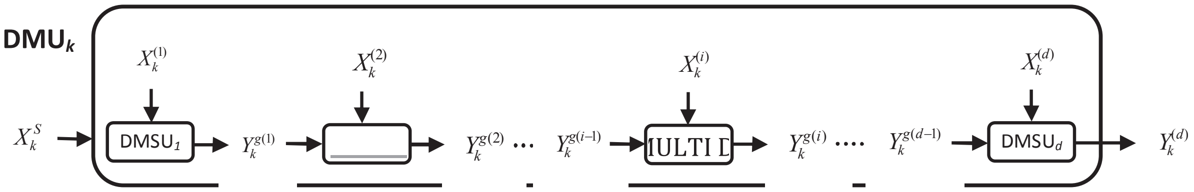

Fig. 1 Multi-component DMU in DEA.

where $U_k^{(i)}=\left(u_{1k}^{(i)},u_{2k}^{(i)},\ldots,u_{K_ik}^{(i)}\right),V_k^{(i)}=\left(v_{1k}^{(i)},v_{2k}^{(i)},\ldots,v_{I_ik}^{(i)}\right),\ V_k^{S(i)}=\left(v_{1k}^{S(i)},v_{2k}^{S(i)},\ldots,v_{I^Sk}^{S(i)}\right),\quad i=1,2,\ \ldots,d$ and $\bar{U}_k^{(i)}=\left(\bar{u}_{1k}^{(i)},\bar{u}_{2k}^{(i)},\ldots,\bar{u}_{K_ik}^{(i)}\right),\quad i=1,\ 2,\ldots,d-1.$

The sets Ω_1, Ω_2, Ω_3 and Ω_4 are assurance regions [6]. Model–1 is a fractional model and can be reduced to the linear form (Model-2) by using Charnes-Cooper transformation [4] and variable substitution: $\alpha_{ik}^{t}v_{tk}^{S(i)}=\bar{v}_{tk}^{S(i)},\quad \forall t=1,2,\ldots,I^{S};\quad \forall i=1,2,\ldots,d.$ The form of $\bar{\Omega}_1$, $\bar{\Omega}_2$, $\bar{\Omega}_3$ and $\bar{\Omega}_4$ will depend upon the structure of Ω_1, Ω_2, Ω_3 and Ω_4. The optimal objective function value of Model – 2 will give $E_k^{(a)}$ for DMU$_k$. Then the optimal solution (weights) obtained from Model – 2 are used to find $E_k^{(1)},E_k^{(2)},\ldots,E_k^{(d)}$ of DMU$_k$.

Model - 2 Max $E_k^{(a)}=\sum_{i=1}^{d}\sum_{r=1}^{K_i}u_{rk}^{(i)}y_{rk}^{(i)}$

subject to $\sum_{i=1}^{d}\sum_{l=1}^{I_i}v_{lk}^{(i)}x_{lk}^{(i)}+\sum_{i=1}^{d}\sum_{t=1}^{I^S}\bar{v}_{tk}^{S(i)}x_{tk}^{S}+\sum_{i=1}^{d-1}\sum_{r=1}^{K_i}\bar{u}_{rk}^{(i)}y_{rk}^{(i)}=1,$

$\sum_{i=1}^{d}\sum_{r=1}^{K_i}u_{rk}^{(i)}y_{rj}^{(i)}-\sum_{i=1}^{d}\sum_{l=1}^{I_i}v_{lk}^{(i)}x_{lj}^{(i)}-\sum_{i=1}^{d}\sum_{t=1}^{I^S}\bar{v}_{tk}^{S(i)}x_{tj}^{S}-\sum_{i=1}^{d-1}\sum_{r=1}^{K_i}\bar{u}_{rk}^{(i)}y_{rj}^{(i)}\le 0,\ \forall j=1,2,\ldots,n,$

$\sum_{r=1}^{K_1}u_{rk}^{(1)}y_{rj}^{(1)}-\sum_{l=1}^{I_1}v_{lk}^{(1)}x_{lj}^{(1)}-\sum_{t=1}^{I^S}\bar{v}_{tk}^{S(1)}x_{tj}^{S}\le 0,\ \forall j=1,2,\ldots,n,$

$\sum_{r=1}^{K_i}u_{rk}^{(i)}y_{rj}^{(i)}-\sum_{l=1}^{I_i}v_{lk}^{(i)}x_{lj}^{(i)}-\sum_{t=1}^{I^S}\bar{v}_{tk}^{S(i)}x_{tj}^{S}-\sum_{r=1}^{K_{i-1}}\bar{u}_{rk}^{(i)}y_{rj}^{(i-1)}\le 0,$
$\forall i=2,3,\ldots,d\,;\ \forall j=1,2,\ldots,n,$

$\sum_{i=1}^{d}\alpha_{ik}^{t}=1,\forall t=1,2,\ldots,I^{S};$

$\left(\left(u_{1k}^{(i)},u_{2k}^{(i)},\ldots,u_{K_ik}^{(i)}\right),\left(v_{1k}^{(i)},v_{2k}^{(i)},\ldots,v_{I_ik}^{(i)}\right)\right)\in\bar{\Omega}_1,\left(\bar{v}_{1k}^{S(i)},\bar{v}_{2k}^{S(i)},\ldots,\bar{v}_{I^Sk}^{S(i)}\right)\in\bar{\Omega}_2,$

$\left(\alpha_{ik}^{1},\alpha_{ik}^{2},\ldots,\alpha_{ik}^{I^S}\right)\in\bar{\Omega}_4,\forall i=1,2,\ldots,d;$

$\left(\bar{u}_{1k}^{(i)},\bar{u}_{2k}^{(i)},\ldots,\bar{u}_{K_ik}^{(i)}\right)\in\bar{\Omega}_3,\forall i=1,2,\ldots,d-1;\forall i=1,2,\ldots,d.$

Theorem 2. A DM U$_k$ is said to be overall efficient if and only if each DMSU of DMU$_k$ is efficient. Equivalently $E_k^{(a)}=1$ if and only if $E_k^{(i)}=1\ \forall i=1,2,\ldots,d.$

Performance evaluation model for PuSBs: This paper seeks to measure the aggregate and component-wise performances of PuSBs for 2008-2013 by using multi-component DEA approach. In this study, DMUs are PuSBs listed in Table 1. In banking system, the production process of a multi-component DMU$_k$ is depicted in Fig. 2. The DMSU$_1$

deals with productivity and utilizes labour as shared input; operating and interest expenses as two external inputs to produce deposits as output. The $DMSU_2$ deals with the profitability and utilizes deposits (output produced by $DMSU_1$) as an internal input and labour as shared input to produce interest and other income as two outputs. In this study, labour is the number of employees working in a bank; operating expenses include expenses on rent, printing, stationery, postage, and auditing etc.; interest expenses include the interest paid on deposits; deposits are the sum total of demand, saving banks and term deposits; interest income is the income earned from loans and investments; and other income includes the income from off-balance sheet items like commission, exchange etc. The data are taken from RBI [7] and are taken in Rupees crore.

4. Empirical results and discussion: The aggregate performance measures for PuSBs are evaluated by executing a MATLAB program of Model-2, and then productivity and profitability are evaluated using the weights obtained by solving Model-2. The results are listed in Table 2. It indicates that PuSBs have better average efficiency in terms of profitability than productivity in each year from 2008-2013.

4.1. Productivity and profitability comparison of banks using box-plots: In this study, productivity and profitability of banks are compared using box-plots given in Fig. 3. A box in the box-plot is bounded at 1st quartile Q_1 and 3rd quartile Q_3 of the efficiency scores with a median line at 2nd quartile Q_2. The box represents interquartile range ($IQR = Q_3 - Q_1$) which indicates about variability in the data. A short box signifies a tighter concentration of the data whereas a tall box signifies more variability in the data. The horizontal line inside the box signifies median. The ends of whiskers are the extreme values within $Q_3 + 1.5*IQR$ and $Q_1 - 1.5*IQR$. If the line inside the box is in middle and whiskers are equidistant from the box, then data are said to be normal. The efficiency scores show positive and negative skew if median line is pulled to lower and upper end of a box respectively. Data values exceeding whiskers are called outliers and are shown by small circles. The boxes in Figs. (3a), (3a'), (3b), (3b'), (3c) and (3c') reveal that variability in efficiency scores signifying productivity is more than the profitability for each year in 2008-2013.

4.2. Bank-wise productivity, profitability and aggregate performance : The bank-wise productivity, profitability and aggregate performance are shown in Figs. 4, 5 and 6 respectively. Fig. 4 depicts that 3rd and 8th banks remain efficient in terms of productivity in 2008-2013. Only 6th and 16th banks have shown increasing trend of productivity over time. The 7th, 10th and 12th banks in Fig. 4 are efficient in 2008 but their efficiency decreases in 2013. Fig. 5 depicts that there is mixture of increasing and decreasing trend of profitability over time. The 8th bank is efficient in terms of productivity, profitability and aggregate performance. Thus, 8th bank is overall efficient.

Table 1: PuSBs during the period 2008-2013.

NBs						SBI group		
No.	BC	Bank names	No.	BC	Bank names	No.	BC	Bank names
1	AlB	Allahabad Bank	11	IOB	Indian Overseas Bank	20	SBI	State Bank of India
2	AnB	Andhra Bank	12	OBoC	Oriental Bank of Commerce	21	SBoBJ	State Bank of Bikaner & Jaipur
3	BoB	Bank of Baroda	13	PSB	Punjab & Sind Bank	22	SBoH	State Bank of Hyderabad
4	BoI	Bank of India	14	PNB	Punjab National Bank	23	SBoM	State Bank of Mysore
5	BoM	Bank of Maharashtra	15	SB	Syndicate Bank	24	SBoP	State Bank of Patiala
6	CaB	Canara Bank	16	UCOB	UCO Bank	25	SBoT	State Bank of Travancore
7	CnBoI	Central Bank of India	17	UBoI	Union Bank of India	26	SBoI	State Bank of Indore
8	CoB	Corporation Bank	18	UnBoI	United Bank of India	27	SBoS	State Bank of Saurashtra
9	DB	Dena Bank	19	VB	Vijaya Bank			
10	IB	Indian Bank						

Note : BC stands for Bank Code; PuSBs were from 1 to 27 in 2008-09, 1 to 26 in 2009-10 and 1 to 25 in 2011-13.

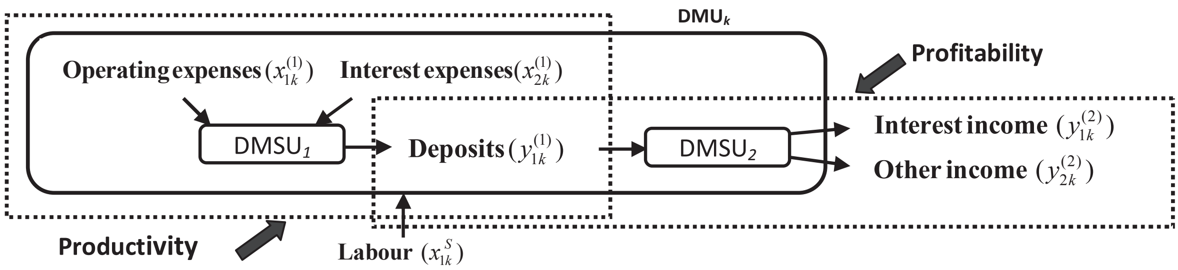

Fig. 2 Multi-component DMU$_k$ in banking system

Table 2: Average efficiencies of components and aggregate performance for the period 2008-2013

Year	Banks	$AE_k^{(1)}$	$AE_k^{(2)}$	$AE_k^{(a)}$
2008	PuSBs	0.9092815 (9.07185)	0.94483 (5.517)	0.97613 (2.387)
	NBs	0.9457368 (5.42632)	0.925042 (7.4958)	0.970311 (2.9689)
	SBI group	0.8227 (17.73)	0.991825 (0.8175)	0.98995 (1.005)
2009	PuSBs	0.8922654 (10.77346)	0.9310346 (6.89654)	0.9697885 (3.02115)
	NBs	0.9128789 (8.71211)	0.9085474 (9.14526)	0.9625158 (3.74842)
	SBI group	0.8363143 (16.36857)	0.9920714 (0.79286)	0.9895286 (1.04714)
2010	PuSBs	0.8844385 (11.55615)	0.924608 (7.5392)	0.956835 (4.3165)
	NBs	0.9085316 (9.14684)	0.906516 (9.3484)	0.952205 (4.7795)
	SBI group	0.8190429 (18.09571)	0.973714 (2.6286)	0.9694 (3.06)
2011	PuSBs	0.85486 (14.514)	0.928832 (7.1168)	0.946068 (5.3932)
	NBs	0.8847105 (11.52895)	0.913042 (8.6958)	0.937684 (6.2316)
	SBI group	0.7603333 (23.96667)	0.978833 (2.1167)	0.972617 (2.7383)
2012	PuSBs	0.82006 (17.994)	0.925572 (7.4428)	0.93488 (6.512)
	NBs	0.843842 (15.6158)	0.916021 (8.3979)	0.932526 (6.7474)
	SBI group	0.74475 (25.525)	0.955817 (4.4183)	0.942333 (5.7667)
2013	PuSBs	0.788744 (21.1256)	0.93834 (6.166)	0.94646 (5.354)
	NBs	0.816363 (18.3637)	0.926411 (7.3589)	0.940068 (5.9932)
	SBI group	0.701283 (29.8717)	0.976117 (2.3883)	0.9667 (3.3)

Note: $AE_k^{(1)}$ and $AE_k^{(2)}$ stands for average efficiency (AE) of the 1st and 2nd component, i.e., productivity and profitability respectively. $AE_k^{(a)}$ stands for average aggregate performance. The values in brackets represent average inefficiency (in %) = (1 – AE)*100.

4.3. Number of efficient and inefficient banks: The number of efficient and inefficient banks in terms of productivity, profitability and aggregate performance are listed in Table 3. It reveals that the percentage of efficient PuSBs in terms of productivity decreases from 18.5% in 2008 to 8% in 2013; profitability decreases from 29.6% in 2008 to 20% in 2013; and aggregate performance decreases from 11.1% in 2008 to 4% in 2013.

4.4. Sensitivity analysis: To ensure the validity of efficiency results, sensitivity analysis has been performed. The most reasonable sensitivity analysis is to compare the performance of PuSBs with components, without components and by taking one component at a time. If there is increase in the performance of PuSBs and number of efficient banks by removing components, we can conclude that the results of the study are quite robust and this validates the use of multi-component DEA over traditional DEA. For sensitivity analysis, the performance models listed in Table 4 are executed. The efficiency results and number of efficient banks are listed in Tables 5 and 6 respectively. Table 5 presents the average efficiency scores of PuSBs in 2008-2013. Tables 5 and 6 reveal that the average efficiencies and number of efficient banks obtained from M1, M2 and M3 exceed the results of productivity, profitability and aggregate performance obtained from Model-2 respectively. Therefore, sensitivity analysis ensures the impact of productivity and profitability on aggregate performance, and the robust results through multi-component DEA as compared to traditional DEA.

Conclusion : The results of the present study conclude that PuSBs have better average efficiency in terms of profitability than productivity in 2008-2013. The findings are quite useful for policy makers to take appropriate decisions in order to enhance the overall performance of PuSBs and to overcome the inefficiencies present in either productivity stage or profitability stage or both. Finally, we can give some suggestions which policy makers can use to improve the performance of PuSBs and their categories.

- Efforts should be made to improve productivity of PuSBs, i.e., to increase the production of funds as compared to their transformation into income.
- NBs should improve the transfer of funds into services and SBI group should improve the creation of funds.
- The sensitivity analysis concludes that multi-component DEA has shown more robust results as compared to DEA.

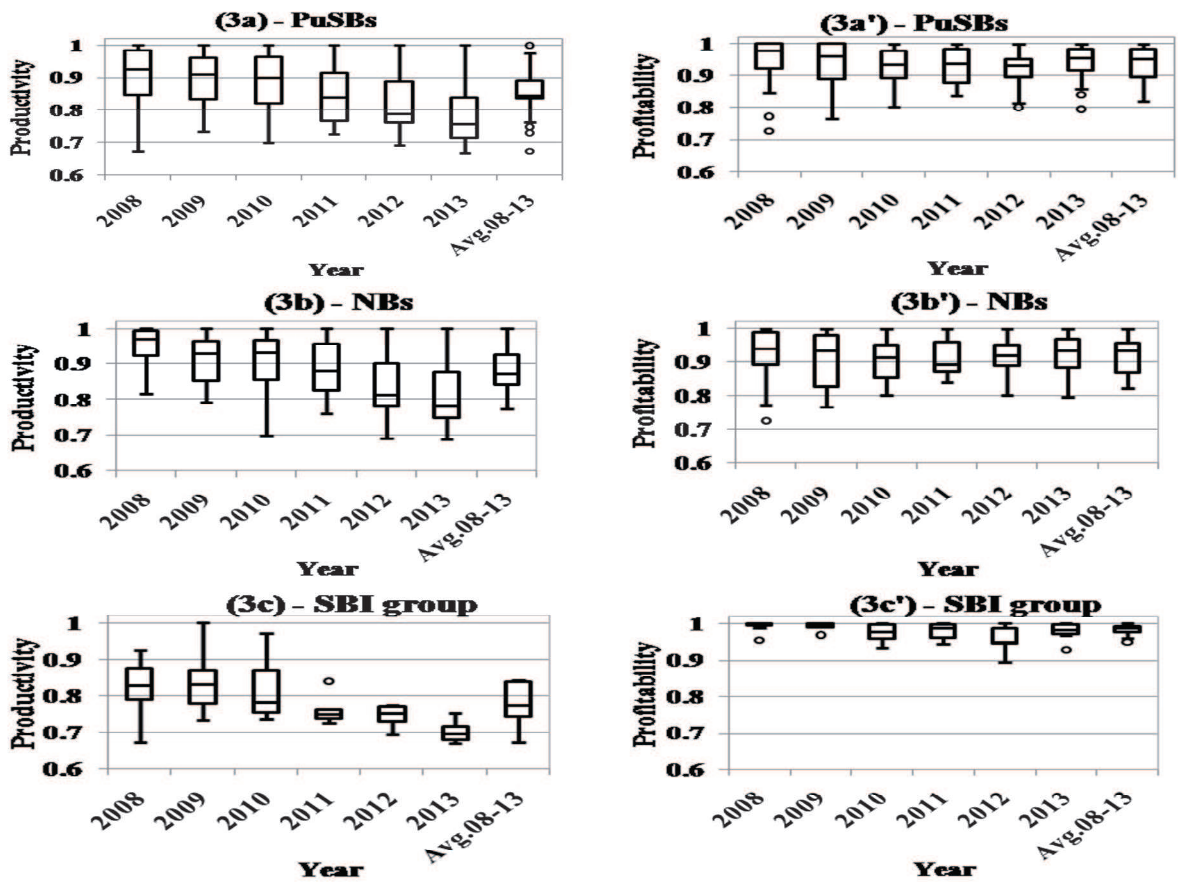

Fig. 3 Productivity and Profitability comparison using box-plots

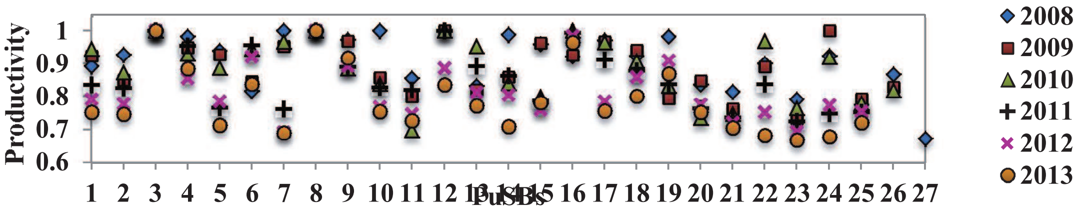

Fig. 4 Bank-wise productivity of PuSBs in 2008-2013

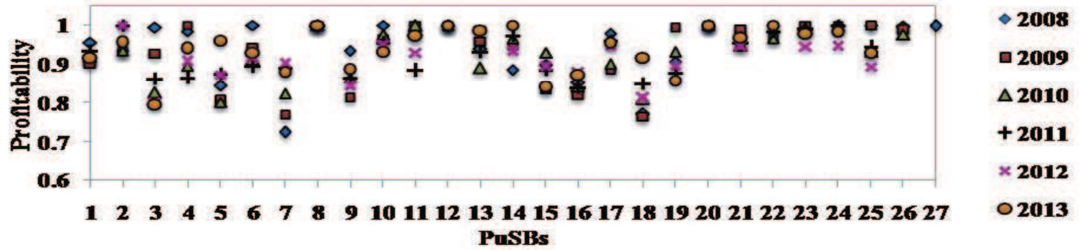

Fig. 5 Bank-wise profitability of PuSBs in 2008-2013

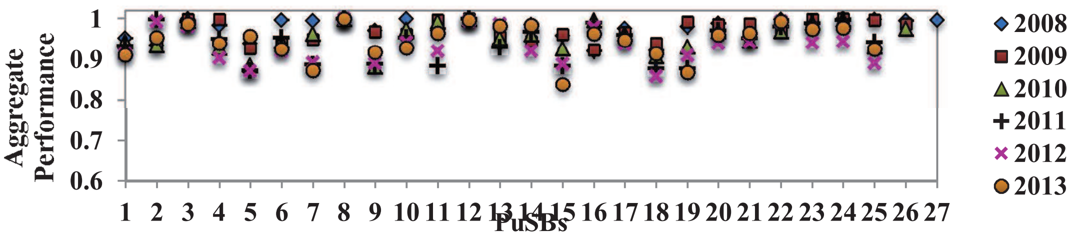

Fig. 6 Bank-wise aggregate performance of PuSBs in 2008-2013

Table 3: Number of efficient and inefficient banks in terms of productivity and profitability

	Banks	2008			2009			2010			2011			2012			2013		
		N	E	IE	N	E	IE	N	E	IE	N	E	IE	N	E	IE	N	E	IE
Productivity	PuSBs	27	5	22	26	4	22	26	4	22	25	3	22	25	2	23	25	2	23
	NBs	19	5	22	19	3	16	19	4	15	19	3	16	19	2	17	19	2	17
	SBI group	8	0	8	7	1	6	7	0	7	6	0	6	6	0	6	6	0	6
Profitability	PuSBs	27	8	19	26	7	19	26	4	22	25	5	20	25	5	20	25	5	20
	NBs	19	4	15	19	4	15	19	2	17	19	3	16	19	3	16	19	3	16
	SBI group	8	4	4	7	3	4	7	2	5	6	2	4	6	2	4	6	2	4
Aggregate Performance	PuSBs	27	3	24	26	3	23	26	2	24	25	2	23	25	1	24	25	1	24
	NBs	19	3	16	19	2	17	19	2	17	19	2	17	19	1	18	19	1	18
	SBI group	8	0	8	7	1	6	7	0	7	6	0	6	6	0	6	6	0	6

Note: 'N' stands for 'number', 'E' stands for 'efficient banks' and 'IE' stands for 'inefficient banks'.

Table 4: Models for sensitivity analysis

Models	Input variables	Output variables
M1	Labour, interest expenses, operating expenses	Deposits
M2	Labour, deposits	Interest income, other income
M3	Labour, interest expenses, operating expenses	Interest income, other income

Table 5: Efficiency results of sensitivity analysis

PuSBs	Productivity Avg.08-13	Profitability Avg.08-13	Aggregate Performance Avg.08-13	Model 1 Avg.08-13	Model 2 Avg.08-13	Model 3 Avg.08-13
AlB	0.856867	0.923883	0.930183	0.878296	0.924019	0.97939
AnB	0.833417	0.960417	0.958283	0.845712	0.960418	0.981495
BoB	1	0.867667	0.992917	1	0.871819	1
BoI	0.926267	0.932767	0.95115	0.942471	0.942588	0.981294
BoM	0.83625	0.86055	0.9093	0.928111	0.905897	0.978553
CaB	0.887683	0.932867	0.947583	0.904932	0.932886	0.965133
CnBoI	0.843417	0.832667	0.927333	0.912802	0.933126	0.974167
CoB	1	1	1	1	1	1
DB	0.921117	0.8687	0.9206	0.933899	0.871387	0.96061
IB	0.840833	0.962767	0.960617	0.950783	0.962767	1
IOB	0.774567	0.959717	0.95555	0.806665	0.964108	0.958171
OBoC	0.95395	1	0.998767	0.967367	1	1
PSB	0.847083	0.948767	0.958083	0.886066	0.962908	0.986179
PNB	0.8437	0.950467	0.960983	0.939317	0.952437	0.998918
SB	0.841817	0.880683	0.910483	0.932922	0.948201	0.984715
UCOB	0.9651	0.850867	0.963017	0.978845	0.921718	0.980823
UBoI	0.893117	0.938133	0.95915	0.947384	0.938203	0.995671
UnBoI	0.8856	0.820767	0.903833	0.987276	0.870513	0.981993
VB	0.87075	0.910983	0.927317	0.884747	0.926019	0.952474
SBI	0.78495	1	0.969683	0.979027	1	0.994762
SBoBJ	0.747717	0.960017	0.958167	0.901902	0.981609	0.963795
SBoH	0.838983	0.986317	0.984467	0.854415	0.986326	0.997079
SBoM	0.72925	0.982183	0.980367	0.898111	0.996225	0.986537
SBoP	0.840717	0.988467	0.986667	0.890687	0.994567	0.987023
SBoT	0.761983	0.949883	0.948267	0.832873	0.96062	0.952078
SBoI	0.8378	0.9867	0.986233	0.858598	0.986724	0.98968
SBoS	0.6723	0.9984	0.9976	0.707612	1	0.9985

Table 6: Number of efficient and inefficient banks using M1, M2 and M3 for the period 2008-2013

	Banks	2008			2009			2010			2011			2012			2013		
		N	E	IE	N	E	IE	N	E	IE	N	E	IE	N	E	IE	N	E	IE
M1	PuSBs	27	6	19	26	7	19	26	9	17	25	9	16	25	6	19	25	6	19
	NBs	19	5	14	19	5	14	19	6	13	19	8	11	19	4	15	19	4	15
	SBI group	8	1	7	7	2	5	7	3	4	6	1	5	6	2	4	6	2	4
M2	PuSBs	27	10	17	26	9	17	26	7	19	25	7	18	25	8	17	25	10	15
	NBs	19	5	14	19	6	13	19	3	16	19	4	15	19	5	14	19	6	13
	SBI group	8	5	3	7	3	4	7	4	3	6	3	3	6	3	3	6	4	2
M3	PuSBs	27	13	14	26	15	11	26	15	11	25	15	10	25	14	11	25	15	10
	NBs	19	11	8	19	13	6	19	10	9	19	13	6	19	12	7	19	11	8
	SBI group	8	2	6	7	2	5	7	5	2	6	2	4	6	2	4	6	4	2

Note: 'N' stands for 'number', 'E' stands for 'efficient banks' and 'IE' stands for 'inefficient banks'.

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