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## EFFICIENCY ANALYSIS OF SCHEDULED URBAN CO-OPERATIVE BANKS BY DEA APPROACH

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### ABSTRACT

*Co-operative Banks are important component of Indian banking industry. Commercial banks are unable to serve the need of all people in our country specially poor people therefore Co-operative banks came into existence to fulfill their need. The role of Co-operative banks is significant because their main objective is to serve deprived people instead of making profit unlike commercial banks. Performance measurement is essential for co-operative banks because it helps to identify the financial health of banks, to identify the best practice bank in the group and also to notice whether the banks are able to discharge its services for which it is meant for. The present study is designed to measure the performance of Scheduled Urban Cooperative Banks (SUCBS) by a Data envelopment Analysis (DEA) approach. DEA is a nonparametric frontier approach used to measure relative performance of homogeneous set of units, operating in similar condition. The study evaluates the performance in terms of efficiency of 25 SUCBS for six years that is from 2008-09 to 2012-13.*

### KEYWORDS

scheduled urban cooperative banks (SUCBs), data envelopment analysis (DEA), efficiency, performance.

### INTRODUCTION

Economic condition of a country is judged by the efficiency and soundness of its financial sector. Indian financial sector comprises of banking and non banking financial institutions. Indian financial sector is dominated by banking sector hence performance evaluation of banking sector is the focus area of researchers. Indian banking sector consist of commercial banks and cooperative banks. The existence of Co-operative banks in our country is more than 100 years ago, these banks came into existence with the enactment of co-operative credit societies act, 1904. The Co-operative banks provide banking services to agricultural and allied activities, small scale industries and self employed workers. The cooperative structure in India is divided into Urban Cooperative Banks (UCBs) and rural cooperatives. Cooperative banks are spread in all parts of our country to serve the country at gross root level. Commercial banks are the backbone of Indian financial system while the cooperative banks serve the nation at rural level. The role of Cooperative banks is significant because their main objective is to serve deprived people instead of making profit unlike commercial banks. Performance measurement of commercial banks is the routine task by the regulators and policy makers but cooperative banks are overlooked many times. The present study is significant from many aspects; firstly it measure the individual efficiency score of SUCBs which help to identify the best and least performing bank, secondly it applied a frontier approach to measure efficiency in spite of traditional ratio approach. Finally it explores efficiency of SUCBs on the basis of scale of operation and managerial performance. Efficiency is a major yardstick to measure bank performance. Performance has been traditionally evaluated on the basis of financial ratios, but with due course of time many new technique has been emerged, Data envelopment Analysis (DEA) is one of such technique. The presents study uses DEA technique for performance evaluation of Scheduled Urban Cooperative banks. Data envelopment Analysis is a nonparametric linear programming technique in the area of Operations Research and helps to identify the best performing unit in a group of several units. It evaluates the relative efficiency of homogeneous set of units known as decision making unit (DMU) on the basis of multiple inputs and multiple outputs. The ratio of weighted inputs and outputs produce a single measure of productivity called relative efficiency. DMU for which efficiency score is 1 known as efficient unit, all such efficient DMUs forms a frontier known as efficiency frontier or envelop. Efficiency of all other units is measured in reference to the efficient DMU. Efficiency measured by DEA technique under constant return to scale (CRS) assumption known as overall technical efficiency and under the assumption of variable return to scale measures known as pure technical efficiency (PTE). Overall technical efficiency is composite of pure technical efficiency and scale efficiency.

### LITERATURE REVIEW

Mittal and Dingra (2007) used DEA to measures the impact of computerisation on productivity and performance of Indian Banks. To measure productivity the staff expense to operating expense was taken as input and business per employee, total income per branch and operating profit per branch was taken as output similarly the input parameter for profitability are staff expenses to operating expenses and corresponding outputs used are net profit to deposits, operating profit to average working funds, return on assets and profit margins. The CCR output-oriented model (output maximization) was used to evaluate the data. Das, Nag and Ray (2005) also estimates and analyses various efficiency scores of Indian banks during 1997-2003 using data envelopment analysis (DEA). They observed that Indian banks are not differentiated in terms of revenue and cost efficiency but they differ in terms of revenue and profit efficiency. They also found that Bank size, ownership, and being listed on the stock exchange are some of the factors that have a positive impact on average profit efficiency, and to some extent, revenue efficiency scores. Ahmed and Ahmad (2008) has applied input oriented Data Envelopment Analysis and developed two specifications. In first specification, profit is considered as output of the commercial bank while advances, investments and lending to financial institutions (intermediate outputs) are considered as its inputs. In second specification, again profit is considered as output while number of employees, bills payable, borrowing from financial institutions and deposits and other accounts are considered as inputs of the commercial banks. After the estimation of technical efficiency from non-parametric DEA, double log regression model between technical efficiency scores and inputs used in second specification is developed to show the marginal effect of inputs on the technical efficiency scores. Chakrabarti and Chawla (2005) has applied DEA model to evaluate the efficiency of Indian banks during 1990-2002. They used two models for measuring efficiency, first model uses interest expenses and operating expense as inputs and advances, investments and deposits as outputs. In using deposits as an output variable, this model uses the "production" view of banking. They discussed issue here is that bank management may not always explicitly consider deposits as an output as it is a source of expense rather than revenue. However, given that a bank's ability to lend and invest is restricted by its level of deposits, the approach is not wholly without merit. The second model is closer to measuring financial performance in its approach. It uses interest and non-interest expenses as inputs and studies interest income and non-interest income as outputs. Thus the first model takes more of a "quantity" approach to performance measurement while the second looks more at "value created". Ketkar, Noulas and Agrawal (2003) has examined a relative efficiency of state controlled, nationalized, private and



foreign banks from 1990-1995 using the Data Envelopment Analysis. The study measured technical efficiency and productive growth of all commercial banks during the period. The study considers the bank as financial intermediaries, hence used input oriented intermediation approach of data envelopment analysis considering investment and advances as output and deposit, labor and physical capital as input. The study also examined the effect of size (measured by total deposit) and bank branches on pure technical efficiency through a regression analysis and found that total deposit is positively related to pure technical efficiency, while no of branches are negatively related. **Sanjeev M (2009)** assessed the efficiency of 27 public sector banks through DEA approach for the time frame 2002-03 to 2006-07. The intermediation approach is used in the study considering interest income and fee, commission and brokerage as outputs. Against these, the inputs taken are the interest expense and non-interest expense. As the interest expense constitutes the largest proportion of the expenses in banks, it is being considered as one of the inputs. The other input, the operating expenses (rentals and salaries), of the banks is also quite significant. **Vardi et.al (2006)** has measured the efficiency of 93 commercial banks of India by DEA technique. The efficiency has been measured through four indicators profitability, financial management and asset quality along with productivity for the period 1999-2000 to 2002-03. The study used intermediation approach, for measuring productivity establishment expense to operating expense as input and business per branch, business per employee and operating profit per employee are taken as output. For profitability net profit to spread, establishment expense to operating expense as input and return on asset, return on equity, net interest income to %change to asset and net profit to deposits are taken as output. For Financial Management spread to total advances, NPA TO NET advances as input and average yield on asset, average yield on advances, average yield on investment, capital adequacy ratio as output. For Asset quality Gross NPA to Gross Advances, net NPA to net advances as input and Gross NPA to total asset, net NPA to total asset as output. **Trehan and Soni (2003)** has measured the operating efficiency and its relationship with profitability for the public sector banks of India. The efficiency has been measured using the DEA technique. The intermediation approach has been used for modeling input and output variable, the input variable labor, capital and borrowed fund and out variable investment and advances are considered for measurement of efficiency. The Banks whose efficiency score is 1 is considered efficient and efficiency score less than 1 are considered inefficient. Besides discriminating banks on efficiency score the study also determine the relationship between profitability and efficiency using regression analysis, considering efficiency as dependent variable and ROA, profit per employee, operating profit as percentage of working fund and net profit as percentage to working funds as independent variable. **Reddy A. Amarendra (2004)** has assessed the competitiveness of 74 Indian commercial banks in the deregulated period 1996-2002. The author has applied value added approach (production approach) of DEA considering fixed asset, interest expended and wages as input variable while total income, liquid assets, total advances, total deposit as output variable. He decompose the overall efficiency in the pure technical efficiency and scale efficiency and hence analysed the bank on the basis of each efficiency measure. The mix of input and outputs were selected by considering the broader objectives such as profitability (total income given fixed assets, interest expended and wages), low cost and service provision (maximization of advances and deposits). He concluded that financial sector liberalization and deregulation of interest rates have greater impact on banking sector as a whole, as evidenced from increased profits, reduction in interest margins of all banks in general and public sector banks in particular. In terms of prudential norms in respect of capital adequacy norms and non-performing assets also, Indian banks improved a lot, but still there are large gaps to be filled in non-performing assets. **Sathey (2003)** analyzed using DEA the efficiency of Indian banking sector in the year 1997-98 using both the financial and operational models of the intermediation approach. **Kumar and Gulati (2008)** has first time measure the efficiency and effectiveness simultaneously for 26 public sector bank using the two stage DEA model. In the first stage they measure efficiency and at second stage they measure effectiveness and disused that both efficiency and effectiveness together contributes performance of the bank. **Sahoo, Sengupta and Mandal (2007)** measured the productive performance of Indian commercial banks through efficiency and scale economics for the period 1997-98 to 2004-05. The DEA method is applied here considering three output variable investment, performing loan assets and non interest income and three inputs borrowed funds, labor and fixed asset. **Eltivia Nurafni (2013)** has applied all the three approaches of DEA to measure efficiency of Indonesian banks. The study consider deposits, labour, and capital as inputs for producing loans and investments under intermediation approach. Under the value added approach, labour, capital, and interest expenses are used as inputs producing outputs like deposits, loans, and investments and Under the operating approach, three types of inputs are considered namely, interest expenses, labour, and other operating expenses excluding employee expenses and outputs are interest income and non-interest income emanating mostly from commission, exchange, brokerage, etc. **Fernando and Nimal (2014)** give preference to DEA technique as compared to traditional measures to evaluate bank performance. The study uses total deposits Number of employees and fixed assets as input variable and Non-Interest income, total loan and Total investments as output variable. The study also measures the impact of ownership and size of banks. **Rehman and Raof (2010)** made a comparison of efficiency among the public, private and foreign banks of Pakistan from 1997-2007, through DEA approach. The study measured overall technical efficiency, allocative, efficiency and cost efficiency considering capital and deposit as input and loan and advances as output. The study concluded that public and private banks are close competitor while foreign banks were far behind. **Sufian Fadzlan (2006)** measured bank performance of Malaysian Islamic banking sector by DEA approach. The study applied two models of DEA, in model I deposit is taken as input and total loan and investment is taken as output variables, in second model one more input variable loan loss provisions is added to previous model to gauge the impact of risk on efficiency. The study also applied various parametric and non parametric test to the efficiency difference among the banks of different ownership. **Tahir, Bakar and Haron (2009)** has assessed the overall technical efficiency, pure technical efficiency and scale efficiency of Malaysian commercial banks applying DEA technique. The study applied intermediation approach of DEA considering total deposits and overhead expenses as input and total earning asset as output. The results are explicitly discussed in terms of overall technical efficiency along with pure technical efficiency and scale efficiency. **Oberholzer et al. (2010)** compared the internal performance measures and external performance measure of listed banks of South Africa. The two internal measures of bank performance used are ROA as a profitability measure and DEA models as a efficiency estimate. The operating efficiency and investment efficiency models are used to measure efficiency in DEA. Operating efficiency is based on income statement data while investment efficiency model is based on balance sheet data. Thus staff, operating costs and deposit are taken as input and non interest income and interest income are taken as output variable in operating efficiency models. In Investment efficiency model deposit and loan are taken as output and equity, fixed asset are taken as input variable. The market ratios are taken as external measures of bank performance. the study also attempted the correlation analysis to find the association between internal and external ratios.

## OBJECTIVES OF THE STUDY

1. To study the efficiency of SUCBs banks by DEA approach.
2. To analyse the banks on the basis of Overall Technical efficiency, Pure Technical efficiency and Scale efficiency.

## RESEARCH DESIGN

- Population – All co-operative banks of India
- Sample – Scheduled Urban Cooperative banks (SUCBs).
- Sample Size – 25 SUCBS
- Data Source – Secondary Data has been collected from the “Performance highlights of Urban Cooperative banks” published by Indian Banks’ Association.
- Tool used for data analysis – input oriented DEA technique.
- Period of study- 2007-08 to 2012-13

## FRAMEWORK OF THE STUDY

Present study evaluates the efficiency of 25 SUCBs by DEA approach. Deposit & Borrowing, capital and operating expenses are taken as input variable while advances & investment as output variables. The study measures the overall technical efficiency (OTE), technical efficiency (PTE) and Scale efficiency (SE).

**Overall technical efficiency = Pure technical efficiency \* Scale Efficiency**

Under the assumption of constant return to scale overall technical efficiency is measured while under the assumption of variable return to scale pure technical efficiency is measured.

**DATA ANALYSIS**

**TABLE 1: OVERALL TECHNICAL EFFICIENCY (OTE) SCORE OF SUCBs BY INPUT ORIENTED APPROACH (CRS)**

S.No	Bank	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	AVG	Rank
1	A.P. Mahesh	0.976	0.895	0.926	0.961	0.923	0.979	0.944	16
2	Abhyudaya	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1
3	Bassein Catholic	1.000	1.000	1.000	0.979	1.000	1.000	0.997	3
4	Bharat	1.000	1.000	1.000	0.996	0.975	1.000	0.995	5
5	Bombay Mercantile	1.000	1.000	1.000	1.000	0.952	1.000	0.992	6
6	Citizen Credit	0.787	0.908	1.000	1.000	1.000	1.000	0.949	15
7	Dombivli Nagarik Sahakari	1.000	0.996	1.000	0.982	1.000	1.000	0.996	4
8	Greater Bombay	1.000	0.991	0.911	0.955	1.000	0.953	0.968	9
9	Jalgaon Janata Sahakari	0.932	0.877	0.864	0.958	0.904	0.892	0.905	20
10	Janakalyan Sahakari	0.954	0.958	0.872	0.904	0.902	0.917	0.918	19
11	Janalaxmi	0.880	0.924	1.000	NA	1.000	NA	0.951	14
12	Janata Sahakari	1.000	0.997	0.959	1.000	1.000	0.981	0.990	7
13	KAIJSB	NA	0.956	0.957	0.955	1.000	0.914	0.956	12
14	Kapol	0.929	0.885	0.861	0.854	0.865	0.902	0.883	22
15	Karad Urban	0.939	0.932	0.902	0.936	0.927	0.920	0.926	18
16	Mahanagar	0.974	0.949	1.000	1.000	0.993	1.000	0.986	8
17	Nagpur Nagarik Sahakari	0.806	0.857	0.825	0.874	0.972	0.953	0.881	23
18	NKGSB	0.985	0.911	0.910	0.958	0.875	0.937	0.929	17
19	Nutan Nagarik Sahakari	1.000	0.899	0.900	0.957	1.000	1.000	0.959	10
20	Rajkot Nagarik Sahakari	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1
21	Saraswat	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1
22	Shamrao Vithal	0.991	0.982	0.972	0.940	0.907	0.946	0.957	11
23	Surat People's	1.000	1.000	1.000	0.996	1.000	0.999	0.999	2
24	Thane Janata Sahakari	0.987	0.983	0.883	0.943	0.985	0.932	0.952	13
25	Zoroastrian	0.885	0.884	0.823	0.862	0.993	0.976	0.904	21
	<b>Percentage efficient bank</b>	44%	28%	44%	28%	48%	40%		

**TABLE 2: PURE TECHNICAL EFFICIENCY SCORE OF SUCBs BY INPUT ORIENTED (VRS)**

S.No	Bank	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	AVG	Rank
1	A.P. Mahesh	1.000	0.974	0.981	1.000	0.945	0.981	0.980	5
2	Abhyudaya	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1
3	Bassein Catholic	1.000	1.000	1.000	0.983	1.000	1.000	0.997	2
4	Bharat	1.000	1.000	1.000	1.000	0.981	1.000	0.997	2
5	Bombay Mercantile	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1
6	Citizen Credit	0.832	0.936	1.000	1.000	1.000	1.000	0.961	9
7	Dombivli Nagari Sahakari	1.000	1.000	1.000	0.985	1.000	1.000	0.997	2
8	Greater Bombay	1.000	1.000	0.945	0.945	1.000	0.964	0.976	6
9	Jalgaon Janata Sahakari	1.000	1.000	1.000	1.000	0.965	0.939	0.984	4
10	Janakalyan Sahakari	0.978	0.964	0.891	0.905	0.909	0.928	0.929	14
11	Janalaxmi	1.000	1.000	1.000	NA	1.000	NA	1.000	1
12	Janata Sahakari	1.000	0.998	0.983	1.000	1.000	1.000	0.997	2
13	KAIJSB	NA	1.000	1.000	1.000	1.000	0.950	0.990	3
14	Kapol	1.000	0.960	0.977	0.895	0.883	0.916	0.938	12
15	Karad Urban	0.972	0.958	0.940	0.946	0.954	0.931	0.950	11
16	Mahanagar	1.000	0.987	1.000	1.000	0.994	1.000	0.997	2
17	Nagpur Nagarik Sahakari	0.909	0.951	0.968	0.945	1.000	1.000	0.962	8
18	NKGSB	0.987	0.911	0.918	0.963	0.877	0.942	0.933	13
19	Nutan Nagarik Sahakari	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1
20	Rajkot Nagarik Sahakari	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1
21	Saraswat	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1
22	Shamrao Vithal	1.000	1.000	0.983	0.944	0.907	0.947	0.964	7
23	Surat People's	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1
24	Thane Janata Sahakari	1.000	0.988	0.888	0.946	1.000	0.937	0.960	10
25	Zoroastrian	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1
	<b>Percentage efficient bank</b>	76%	60%	60%	60%	64%	56%		

TABLE 3: SCALE EFFICIENCY FOR SUCBS BY INPUT ORIENTED METHOD

S.No	Bank	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	AVERAGE	RANK
1	A.P. Mahesh	0.976	0.919	0.944	0.962	0.977	0.998	0.963	11
2	Abhyudaya	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1
3	Bassein Catholic	1.000	1.000	1.000	0.997	1.000	1.000	0.999	2
4	Bharat	1.000	1.000	1.000	0.997	0.994	1.000	0.998	3
5	Bombay Mercantile	1.000	1.000	1.000	1.000	0.952	1.000	0.992	6
6	Citizen Credit	0.946	0.970	1.000	1.000	1.000	1.000	0.986	9
7	Dombivli Nagari Sahakari	1.000	0.996	1.000	0.998	1.000	1.000	0.999	2
8	Greater Bombay	1.000	0.991	0.964	1.010	1.000	0.989	0.992	6
4	Jalgaon Janata Sahakari	0.932	0.877	0.864	0.959	0.937	0.950	0.920	14
12	Janakalyan Sahakari	0.975	0.994	0.980	0.999	0.992	0.989	0.988	8
13	Janalaxmi	0.880	0.924	1.000	NA	1.000	NA		
7	Janata Sahakari	1.000	0.999	0.976	1.000	1.000	0.981	0.993	5
7	KAJSB	NA	0.956	0.957	0.956	1.000	0.963		
5	Kapol	0.929	0.923	0.881	0.955	0.980	0.985	0.942	13
3	Karad Urban	0.967	0.973	0.960	0.989	0.972	0.988	0.975	10
8	Mahanagar	0.974	0.962	1.000	1.000	0.999	1.000	0.989	7
18	Nagpur Nagarik Sahakari	0.886	0.901	0.853	0.925	0.972	0.953	0.915	15
4	NKGSB	0.997	1.000	0.991	0.995	0.998	0.995	0.996	4
20	Nutan Nagarik Sahakari	1.000	0.899	0.900	0.957	1.000	1.000	0.959	12
23	Rajkot Nagarik Sahakari	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1
7	Saraswat	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1
22	Shamrao Vithal	0.991	0.982	0.988	0.997	1.000	0.999	0.993	5
12	Surat People's	1.000	1.000	1.000	0.997	1.000	0.999	0.999	2
24	Thane Janata Sahakari	0.987	0.994	0.994	0.998	0.985	0.995	0.992	6
25	Zoroastrian	0.885	0.884	0.823	0.863	0.993	0.976	0.904	16
	Percentage efficient bank	44%	32%	44%	28%	52%	40%		

## DISCUSSION AND CONCLUSION

Indian banking sector consist of commercial banks and cooperative banks. Commercial banks are pillars whereas co-operative banks are foundation of the sector, as together they fulfill the financial need of customers in urban and rural areas of our country. Performance measurement of banks is important to assess economic and financial state of a country. Banks play the role of arbitrator between the depositors and borrowers of funds but how efficiently and effectively they perform the role is matter of concern for stakeholders. Cooperative banks are important segment and serve the country as gross root level, hence present study evaluated performance of scheduled urban co-operative banks (SUCBs) of India.

The result of average efficiency score of six years reveals that, Abhyudaya, Rajkot Nagarik Sahakari and Saraswat are overall technically efficient bank in the period (table1).

Apart from Abhyudaya, Rajkot Nagarik Sahakari and Saraswat ; Janalaxmi , Nutan Nagarik Sahakari , Surat People's and Zoroastrian are also found pure technically efficient (table 2). Banks which are only pure technical efficient are scale inefficient that means they are inefficient due to inappropriate size of operation. Thus Janalaxmi, Nutan Nagarik Sahakari, Surat People's and Zoroastrian are not operating in perfect size. t Apart from Abhyudaya, Rajkot Nagarik Sahakari and Saraswat none other bank found scale efficient thus it can be interpreted that all remaining banks are scale inefficient(table 3).

It can be concluded that only 3 banks are overall efficient in the sample of 25 SUCBs and remaining banks are inefficient due inappropriate size of operation or due to managerial underperformance. Year wise overall technical efficiency score shows that the percentage efficient banks are 44% , 28% , 44% , 28% , 48% and 44% respectively , percentage efficient bank in case of pure technical efficiency score is 76% ,60% ,60% ,60% ,64% and 56% respectively and percentage efficient bank in case of scale efficiency is 44%,32%,44% 28%,52% and 40% respectively in each year from 2007-08 to 2012-13 .

Overall percentage efficient banks are very less in the sample; sampled banks are found to be more efficient on pure technical efficiency score as compared to scale efficiency score. As discussed earlier overall efficiency is blend of pure technical efficiency and scale efficiency thus to improve efficiency bank's management should properly plan their resources and should operate on optimum scale size .SUCBs need to work more on their size to improve overall efficiency .

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