



A Critical Study of Indian Banking System

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Abstract: Several authors worked on the estimation of Economic Efficiency, Price Efficiency and Farrell Cost Efficiency by the work of Charness A. Cooper W.W., and Prodes E., (1978) and Banker, Rajiv D., Charness A. Cooper, W.W. (1984) and Farrell M.J. (1957) begins by assuming a function giving maximum possible output as a function of certain inputs. Charness A. Cooper, W.W. (1978) and Banker, Rajiv D., Charness A. Cooper, W.W. (1984) suggest the estimation of efficiencies for Indian Banking System. The studies on Indian Commercial Banks reveal that the capital adequacy ratio increased to levels much above the international norm. It was empirically shown by Nunamaker (1985) that heavily correlated variable deleted from DEA input and output list had shown significant impact on DEA efficiency scores to reduce the number of variables in the DEA. Jenkins et al (2003) developed multivariate statistical approach. Jenkins and Anderson used regression and correlation analysis to identify which DEA variable to be dropped on the basis of least loss of information.

Key Words: Farrell Cost Efficiency, Price Efficiency, Economic Efficiency, Commercial banks, DEA Ratio.

I. Introduction

Banking in India originated in the last decades of the 18th century. The first banks were the General Bank of India, which started in 1786 and Bank of Hindustan, which started in 1790, both are now defunct. The oldest bank in existence in India is the State Bank of India, which originated in the Bank of Calcutta in June 1806, which almost immediately became the Bank of Bengal. This was one of the three Presidency banks, the other two being the bank of Bombay and the Bank of Madras, all three of which were established under charters from the British East India Company. The three banks merged in 1921 to form the Imperial Bank of India which upon India's independence became the State Bank of India.

The Imperial Bank of India was nationalized in the year 1955, renamed as the State Bank of India now, the largest of all public, private and foreign sector banks. In the year 1959 the State Bank of India Act was passed and by enclosing seven states as its associated banks the domain of SBI expanded. SBI and its associates were assigned the task of serving India towards economic development by meeting the needs of economy. All other banks privately owned till 1969. To fulfill social objective like the welfare and well being of sections of people and for uniform distribution of bank credit under Nationalization Act 14 of the largest private banks were nationalized in first phase. In second phase another 6 private banks were nationalized in the year 1980. The private and public sector banks co-existed in highly regulated environment where their activities. The Reserve Bank of India imposed a rule of license that if a commercial bank opened a branch where already one or more of its branches existed.

II. Methodology

The studies on Indian commercial Banks reveal that the capital adequacy ratio increased to levels much above the international norm. Net Profits (NP) increased and NP as declined and intermediation process improved in post reforms period. By means of mergers and acquisitions banks cut cost and improved efficiency. During post regulations period the public sector banks experienced tough competition from the private sector banks. Consequently the market share of PSB's declined in terms Deposits, Investments, Advances and Total Assets.

Three cost efficiency notions are introduced viz,

- 1 Economic Efficiency
- 2 Price Efficiency
- 3 Farrell cost Efficiency

The Farrell cost Efficiency is assessed under very restrictive assumptions. The factor prices used are assumed to be constant, but in reality they vary from time to time in quick succession due to the factors governing price uncertainty. Only one set of input prices (those of DMU₀) (Decision Making Units) are considered while other DMU's prices are ignored.

A commercial bank emerges to be most successful in input market if it procures its inputs at a minimum of the prevailing prices such commercial banks for which the factor minimal cost assessed with factor prices defined as

$$P_i^{\min} = \max_{1 \leq j \leq n} P_{ij} \quad (2.1)$$

Is equal to its observed factor cost are said to be Economic Efficient.

$$Q(u, P^{\min}) = \min_x \sum_{i=1}^m P_i^{\min} x_i \quad (2.2)$$

Subject to

$$\sum_{j=1}^n \lambda_j x_{ij} \leq \lambda x_{i0} \quad , \quad i=1, 2, 3, \dots, m$$

$$\sum_{j=1}^n \lambda_j u_{rj} \geq u_{r0} \quad , \quad r=1, 2, 3, \dots, s$$

$$\lambda_j \geq 0$$

Economic efficiency:

$$\frac{Q(u, P^{\min})}{\sum_{i=1}^m P_i x_{i0}} \quad (2.3)$$

Another notion of Efficiency is input price efficiency factor minimal cost is assessed for DMU using two sets of prices, namely the observed prices and the minimal prices. Any departure of factor minimal cost assessed using observed prices from the factor minimal cost derived using the minimum prices signals price in efficiency.

Input price efficiency:

$$\frac{Q(u_0, P^{\min})}{Q(u_0, P_0)} \quad (2.4)$$

III. Selection Of Data Envelopment Analysis Inputs – A Stepwise Method

The first step after formulating the objectives in Data Envelopment Analysis (DEA) is that of selection of inputs and outputs. If these inputs and outputs are very ambitiously selected in a large number, several commercial banks will surface with 100% efficiency score leading to no way to rank them. In general it requires that the total number of inputs and outputs of DEA list shall not exceed one third of the number of commercial banks has suggested by Friedman, L., Sinuany (1998).

The analyst shall be parsimonious to some extent and objective oriented while he selected his inputs and outputs. To select DEA inputs and outputs correlation analysis was used and such variables that are not heavily correlated with one another were given prominence to choose as DEA inputs and outputs. But, it was empirically shown by Nunamaker (1985) that heavily correlated variables deleted from DEA input and output list had shown significant impact on DEA efficiency scores to reduce the number of variables in the DEA Jenkins et al (2003) developed multivariate statistical approach. Jenkins and Anderson used regression and correlation analysis to identify which DEA variables are to be dropped on the basis of least loss of information.

Data:

This study makes use of secondary data of Indian commercial Banks which comprise of public, private and foreign sector banks. The data belong to 76 commercial banks, collected from the Reserve Bank of India (2010, 2011, and 2012) bulletins.

IV. DEA Variable Selection

The stepwise output selection processes is started with two inputs and six outputs. The inputs are i) Number of employees and ii) Fixed, capital, adjusted for depreciation.

The outputs are i) Advances ii) Deposits iii) Investments iv) Business per employee v) profit per employee and vi) Number of Branches.

The Banker, Charness and Cooper (1984) envelopment problems are formulated and solved individually for 76 commercial banks. The mean efficiency scores obtained is 67% indicating that 33% of inputs are lost due to free disposability.

The previous study identifies two input variables i) Number of employees and ii) Fixed capital, adjusted for depreciation and five output variables i) Number of Branches ii) Deposits iii) Advances iv) Business per employee v) profit per employee. Thus we have 7 DEA variables and 76 commercial banks.

V. Farrell Cost Efficiency

The factor Minimal cost $\frac{Q(u_0, P_0)}{P_0 x_0}$ is computed for each commercial bank. For this purpose seventy six linear programming problems are solved. Each of these problems resulted in a factor minimal cost of the corresponding commercial bank. The factor minimal cost is divided with the observed cost. Consequently, the factor minimal cost is computed for three year (2010, 2011, and 2012) and also finds mean Farrell cost Efficiency, standard deviation, co-efficient of variation and comparison between them shown in conclusions.

VI. Economic Efficiency

The Public, Private and Foreign banks are assumed to produce similar outputs combining similar inputs. But the prices at which inputs are procured varying from one bank to another. The reasons for this are many. In this study three ownerships are identified these are Public, Private and Foreign sectors. The endogenous and exogenous environments varying from one sector to another, with in Public sector different commercial banks are governed by different employees unions.

If there is a commercial bank that procures inputs at minimum prices relative to its competing commercial banks such a bank is Economic Efficient. The factor minimal cost attained replacing a bank's actual input prices with minimum of all input prices of all other banks we obtain.

$$Q(u_0, P^{\min})$$

$$\text{Where } P^{\min} \in R_n^+$$

The j^{th} component of $P^{\min}$ is defined as follows :

$$P_i^{\min} = \max_{1 \leq j \leq n} P_{ij} \quad (6.1)$$

VII. Price Efficiency

Price Efficiency measure is a derived measure which is the ratio of Economic Efficiency to the Farrell input cost Efficiency

Input Price Efficiency:

$$IPE = \frac{Q(u_0, P^{\min})}{Q(u_0, P_0)} \quad (7.1)$$

The measure compares observed price vector to minimum price vector $0 \leq IPE \leq 1$
Closer it is to unity more the commercial bank is input price efficient

VIII. Conclusions

TABLE (1): Descriptive statistics for three years of AVERAGES for FCE, EE, PE

YEAR SECTOR	2010			2011			2012		
	FCE	EE	PE	FCE	EE	PE	FCE	EE	PE
Public sector bank	0.55603	0.14556	0.26235	0.62221	0.217189	0.341548	0.213565	0.08921	0.52502
Private sector bank	0.575068	0.194525	0.329068	0.553669	0.276955	0.508349	0.268864	0.095484	0.507135
Foreign sector bank	0.49187	0.086451	0.204597	0.483009	0.0909	0.197041	0.476258	0.117512	0.190945

It is apparent from the above table that the Farrell cost efficiency is predominantly maximum in Public Sector banking than Privates and Foreign sectors. When compound to Economic Efficiency and Price Efficiency, this remarkable highest FCE is noticed only in 2011 when compared to 2010 and 2012. So, the Public banking sector is the most Farrell Cost Efficient in 2011. It is also identified from the above table that the Economic Efficiency predominantly found lowest in Foreign Sector banking than Public and Private sectors when compared to FCE and PE. This remarkable lowest EE is noticed only in 2010 when compared to 2011 and 2012. So, the Foreign sector banking is significantly average least performed in 2010. Also that the FCE is more stable in terms of averages in the sectors of Public banking and private banking for the two consecutive year 2010 and 2011. Further, the EE is more stable in 2010 and 2012 in the sectors of Foreign banking and Public banking. The PE is more stable in 2011 and 2012 in the sector of Private banking only.

Hence, it is evident that the Public sector banking performed very well than Private and Foreign sector in 2011.

TABLE (2): Descriptive statistics for three years of STANDARD DEVITATION for FCE, EE, PE

YEAR SECTOR	2010			2011			2012		
	FCE	EE	PE	FCE	EE	PE	FCE	EE	PE
Public sector bank	0.265615	0.068798	0.077195	0.18697	0.089247	0.06572	0.073218	0.032967	0.638591
Private sector bank	0.264553	0.099202	0.085153	0.23397	0.139069	0.162842	0.277851	0.036279	0.170374
Foreign sector bank	0.335679	0.082894	0.150969	0.304222	0.085491	0.157176	0.344632	0.198029	0.159823

It is apparent from the above table that the Farrell Cost Efficiency is predominantly maximum in Foreign Sector banking than Public and Private sectors when compared to Price Efficiency and Economic Efficiency. This remarkable highest FCE is noticed only in 2012 but not in 2010 and 2011. So, the Foreign sector banking is the most Farrell Cost Efficiency in 2012. It is also identified from the above table that the Economic Efficiency is

predominantly found lowest in Public sector banking when compared to FCE and PE. This remarkable lowest EF is noticed in 2012. So, the Public sector banking is significantly least performed in terms of S.D for the year 2012, the FCE is more stable in 2010 for the sectors of Public banking and Private banking . The EE is more stable in 2012 for the sectors of Public banking and Private banking. The PE is more stable in the Foreign sector banking for the consecutive years 2011 and 2012.

Hence, it is evident that the Foreign sector banking performed very well than Public and Private sectors in 2012.

TABLE (3): Descriptive statistics for three years of C0-EFFICIENT VARIATION for FCE, EE, PE

YEAR SECTOR	2010			2011			2012		
	FCE	EE	PE	FCE	EE	PE	FCE	EE	PE
Public sector bank	40.95517	47.26307	29.4239	30.04929	41.09205	19.24169	34.28371	36.95414	121.6319
Private sector bank	94.514	50.99696	25.87695	42.25805	50.2138	32.03353	103.3426	37.99476	33.59534
Foreign sector bank	68.24535	95.88536	73.78863	62.98481	94.0497	79.76834	72.36259	168.5187	83.70129

It is apparent from the above table that the Economic Efficiency is predominantly maximum in Foreign sectors banking than Private than Public sectors when compared to Farrell Cost Efficiency and Price Efficiency. In terms of coefficient of variation, it is found that FCE is the least of maximum stalid values. Hence Private sector banking consistently performed well in 2012. It is also identified from the above table that Price Efficiency is predominantly found lowest in public sector banking when compared to FCE and EE. This remarkable PE is noticed in 2012. So, the Public sector banking is significantly less performed in terms of CV for the year 2012.The FCE is more stable in 2010 and 2011 for the sector of Private banking. The EE is more stable in 2010 and 2011 for the sector of Private banking. The PE is more stable in 2011 and 2012 for the sector of Private banking. Hence, it is evident that the Foreign sector banking performed very well than Private and Public sectors in 2012.

IX. References

- [1]. Banker, Rajiv D., Charnes A., Cooper, W.W. (1984), "Some models for estimation technical and scale inefficiencies in data envelopment analysis". *Management science*, 30, 1078 – 1092.
- [2]. Bulletin of RBI (2010, 2011, 2012).
- [3]. Charnes A., Cooper W.W., and Prodes E., (1978), "Measuring the efficiency of Decision Making Units", *European Journal of Operations Research*, 2, 429 – 444.
- [4]. Friedman L., Sinuany – Stern, Z., (1998), "Combining ranking scales and selecting variables in DEA context. The care Industrial Branches". *Computers and Operations Research*, 25, 781 - 791.
- [5]. Farrell M.J (1957) The measurement of Productive Efficiency, *J.R. Statis. SOC. Series A* 120, 253-281.
- [6]. Farrell M.J. and Field House M. (1962), Estimating Efficient Production functions, under increasing returns to scale, *J.R. Statis .SOC. Series A* 125, 252-267.
- [7]. Jenkins L., Anderson, M., (2003), "Multivariate statistical approach to reducing the number of variables in the data envelopment analysis". *European Journal of Operational Research*, 147, 51 – 61.
- [8]. Nunamaker (1985), "Using Data Envelopment Analysis to measure efficiency of non – profit organizations, A critical-evaluation" *Managerial and Decision Economics* 6, 50 – 58.