



## A Research Paper on Analyzing Mergers in Indian Banking Industry using Data Envelopment Analysis

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**KEYWORDS**

**Introduction:**

DEA is utilized to research the proficiency impacts of business bank mergers to think about the above efficiencies for consolidated and non-combined banks (Acquiring banks before merger). Next, a similar investigation of the efficiencies alluded to above, of the blended and non-combined gaining banks in the specimen (3 years normal pre-merger to 3-years normal post-merger) has been done. DEA is truly well known in measuring effectiveness in national saving money commercial ventures [Ferrier and Lovell(1990),Berg-er et al(1993)].The decision of [-3,+3] occasion window has been impacted by Rhoades (1998,p. 278) who pointed out that there has been consistent understanding among the specialists that about a large portion of any proficiency increases ought to be clear following one year and all additions ought to be acknowledged inside of three years after the merger(Sufian et al,2007).

**Methodology:**

Data envelopment analysis was developed by Charnes, Cooper and Rhodes (1978) to evaluate Non-Governmental organization. The analysis is done with an objective to improve the service quality in organization under study. DEA is made to compare services of departments over a certain period of time taken under study. It helps in identifying the inefficient process in the system in-terms of cost and resources involved in the unit considered under study and devise a best practice to follow. The Data envelopment analysis includes various techniques to determine the efficiency for a given period of time.

The common relative measure of efficiency: -

$$Efficiency = \frac{Weightedsumofoutputs}{Weightedsumofinputs} \tag{1}$$

DEA relative measure of efficiency notation: -

$$Efficiency = \frac{w_1 Y_1 + w_2 Y_2 + \dots + w_m Y_m}{v_1 X_1 + v_2 X_2 + \dots + v_n X_n} \tag{2}$$

Where  $w_i$  = the weight given to output  $i$   
 $Y_i$  = amount of output  $i$  from unit  $j$   
 $v_j$  = weight given to input  $j$   
 $X_j$  = amount of input  $j$  to unit  $j$

DEA analyses include Model 1, Model 2, Model 3 and Model 4 to evaluate the Technical efficiency, Cost efficiency and Profit efficiency. For calculation of technical efficiency two sets of variables, designated as Model 1 and Model 2 had been utilized. The input and output variables selected for calculating Cost efficiency and Profit efficiencies (herein included in **Models 3 and 4**). Cost efficiency is defined as the relative efficiency of banks minimizing costs in the production of earning assets (Mester, 1996; Resti, 1997). Profit or P-efficiency, on the other hand, is defined as the profit maximizing or value-added efficiency of banks. (5)

In order to calculate Cost efficiency and Profit efficiencies, Chu and Lim (1998) model has been followed. The three inputs that bank transforms into three outputs of the model are mentioned below:

**Inputs-**

- 1 Share holder fund
- 2 Interest expenses
- 3 Operating Expenses

**Outputs-**

- 1 Annual increase in average assets.
- 2 Total Income ( for CE)
- 3 Profit after tax (for PE)

**Evaluation of post-merger efficiencies of select commercial banks in India using Data Envelopment Analysis (DEA) approach**

The impact of mergers on the Technical (TE= crste), Pure Technical (PTE= vrste) Scale (SE-se), Cost (X-or CE) and Profit (PE) efficiencies of the acquiring Indian commercial banks is investigated below, merger-wise. The tables 1 to 4, summarize DEA TE, PTE, SE, CE and PE scores for 2 acquiring commercial banks in bank mergers constituting the sample. This could help shed some light on the sources of inefficiency of the Indian banking sector in general as well as to differentiate between the public and private sector banks in terms of their relative efficiencies. DEA analysis has been conducted using the computer program (DEAP version 2.1) written by Professor Tim Coelli (1996). This program has been used to construct DEA frontiers for the calculation of various efficiency scores.

**Table 1: Times Bank Ltd. [merged] - H D F C Bank Ltd (Technical Efficiency)**

Total Sample	Year 1996	Pre-Merger			Merger Year	Post-Merger			Mean Pre-Merger Efficiency	Mean Post-Merger Efficiency
		1997	1998	1999	2000	2001	2002			
Technical Efficiency Model1	TE	1	1	1	1	0.996	0.993	0.957	1	0.982
	PTE	1	1	1	1	1	1	1	1	1
	SE	1	1	1	1	0.996	0.993	0.957	1	0.982
Technical Efficiency Model2	TE	1	1	1	0.975	0.906	0.755	0.792	1	0.818
	PTE	1	1	1	1	1	1	1	1	1
	SE	1	1	1	0.975	0.906	0.755	0.792	1	0.818

Source: Processed Data

**Table 2: Times Bank Ltd. [merged] - H D F C Bank Ltd (Cost & Profit Efficiencies)**

Total Sample	Year	Pre-Merger			Merger Year	Post-Merger			Mean Pre-Merger Efficiency	Mean Post-Merger Efficiency
		1996	1997	1998		1999	2000	2001		
Cost(X) Efficiency	TE	0.83	0.509	0.655	0.737	1	0.968	1	0.665	0.989
Profit Efficiency	PE	0.83	0.726	0.936	0.938	1	0.965	1	0.831	0.988

Source: Processed Data

DEA model decomposes Technical Efficiency (TE) in two parts, one due to Pure technical efficiency (PTE) and the other due to Scale

efficiency (SE). Pure technical efficiency refers to the firm's (bank's) capability to avoid waste by producing as much output as input usage allows, or by using as little input as output production allows. Scale efficiency refers to the capability of the firm to operate at its optimal scale. (Coelli, 1998).

**The takeover of the Times Bank (TB) by HDFC Bank (HDFCB)** was unique in the sense that it was the first merger deal between two new generation private sector banks. In a milestone transaction in the Indian banking sector, Times Bank Ltd promoted by Bennett, Coleman & Co (Times Group) was merged with HDFC Bank. The shareholders of the Times Bank received 1 share of HDFC Bank for every 5.75 shares of Times Bank. The merger with Times Bank had catapulted HDFC Bank into a different league, providing it with higher muscle in terms of retail client base as well as mid-market corporate clientele. The bank had nearly 8.5 lakh retail accounts post-merger. While the lending focus continued to be on top-end corporate clientele, it had an added advantage (diversification benefits) of serving the mid-market clientele that came as a part of the Times Bank baggage.

Times Bank had an asset base of Rs.3,274.46 crore; deposits: Rs.3011.18 crore, Capital adequacy ratio: 9.97%; Advances: Rs.1,311.90 crore; Fee based income to total income ratio: 24.58% and Credit-deposit ratio: 44%; Investment-deposit ratio: 30.05 as on 31.3.1999.

HDFC Bank: The bank's total assets increased almost three fold post-merger to Rs.11,656.14 crore. Pre-merger investment/deposit ratio: 58.23%; Assets: Rs.4349.96 crore Deposits: Rs.2915.51 crore Advances: Rs 1400.56 crore; Paid-up capital: Rs.424.60 crore.

Synergies expected from the merger: As per the scheme of amalgamation issued by the HDFC Bank to its shareholders, the following synergies were expected to be realized from the deal:

1. Branch network to increase by over 50%
2. Increase geographical coverage and ATM numbers which allow multi-branch access to retail clients.
3. Increase in retail customer base and improvement in product portfolio
4. Increase in shareholders' wealth
5. Cost savings from centralized processing and scale and scope economies
6. Complementary business practices
7. Improved infrastructure facilities

While the mean TE under Model 1, declined slightly by 0.70% due to decline in mean PTE by 0.90%, the mean SE remained steady at 98.20% (a healthy figure) post-merger. Under Model 2, the mean TE, PTE and SE dropped by 18.2%, 100% and 18.2% respectively. Hence it would appear that the merger had not improved the PTE and SE under Model 2, which involved conversion of deposits & compensation to employees into Advances and Non-interest income. Hence the merger could not leverage the resource base available in terms of employee potential and deposits for the acquiring bank, HDFCB. Coming to the Cost and Profit efficiencies, they had remained at 32.4% and 15.7% both pre and post-merger which could be construed as the hallmark of efficiency. The capability to sustain the cost and profit efficiency post-merger could be attributed to the three-fold increase in size, increase in geographical and improved access to retail clients through increased ATM numbers.

**Table 3: Sikkim Bank Ltd. [merged] - Union Bank of India (Technical Efficiency)**

Total Sample	Year 1996	Pre-Merger			Merger Year	Post-Merger			Mean Pre-Merger Efficiency	Mean Post-Merger Efficiency
		1997	1998	1999		2000	2001	2002		
Technical Efficiency Model1	TE	1	1	1	1	0.998	0.991	0.974	1	0.988
	PTE	1	1	1	1	1	1	1	1	1
	SE	1	1	1	1	0.998	0.991	0.974	1	0.988
Technical Efficiency Model2	TE	0.862	0.903	1	0.759	0.898	0.934	1	0.922	0.944
	PTE	1	1	1	0.783	0.918	0.944	1	1	0.954
	SE	0.862	0.903	1	0.969	0.978	0.989	1	0.922	0.989

Source: Processed Data

**Table 4: Sikkim Bank Ltd. [merged] - Union Bank of India (Cost & Profit Efficiencies)**

Total Sample	Year	Pre-Merger			Merger Year	Post-Merger			Mean Pre-Merger Efficiency	Mean Post-Merger Efficiency
		1996	1997	1998		1999	2000	2001		
Cost(X) Efficiency	TE	1	0.966	0.95	0.913	0.906	0.94	1	0.972	0.949
Profit Efficiency	PE	1	0.665	1	0.714	0.417	0.468	0.81	0.888	0.565

Source: Processed Data

Under the merger scheme Union Bank of India (UBI) was required to absorb the accumulated losses of Sikkim Bank (SB) as well as their total staff. SB's entire loan outstanding of Rs.60 crore had turned bad. Its net worth was negative at Rs.-40.11 crore. The only attraction to UBI in the merger proposition was that Sikkim bank had 8 branches in the North-East and this could give UBI the needed foothold in the North Eastern region where it did not have a significant presence. On

the other hand, UBI was among the top public sector banks in India in terms of business mix and customer profile, with a net profit of Rs.250.10 crore for the financial year ended 1997-98.

It may be observed from the above table, that under Model 1, the mean TE has increased by 1.2% which is accounted for by a marginal increase of 1.2% in mean SE. The mean PTE remained high all along at around 100%, an impressive

feature in its own right. But under Model 2, (inputs: Deposits and Employee compensation and outputs: Loans and Advances & Non-interest income), the mean Technical Efficiency (TE) had received a major hit, declining as it did, by about 2.2% prompted by the decline in mean PTE by a whopping 4.6%. However, the mean SE under Model 2, had gone up by 6.70% and under the Model 1, it had increased by 100%, which may be attributed to the impact of merger. The pre- and post-merger Cost and profit efficiencies had recorded at 2.3% and 32.3% respectively. Though the figure appears to be healthy in itself, the absence of any increase in this regard might be attributed to the fact that the target bank was a small and ailing bank with just 8 branches that too in the North Eastern region of India besides having accumulated losses leading to a negative net worth.

### Conclusion:

Banks today are under pressure to perform-to meet the goals of all their partners, while fulfilling the controllers that the bank's policies, credits and ventures are fiscally solid. Throughout the years, as banks have developed in size, more of them have drawn nearer the cash and capital markets to raise reserves by issuing stock, securities and different securities. Banks' entrance into private business sector for activating funds implies that their financial statement proclamations are in effect progressively investigated by the financial specialists and the overall population. These improvements combined with other regulatory measures like Basel standards and switchover to IFRS (International Financial Reporting Standards) among others have put colossal pressure on business banks to set and meet performance targets.

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