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Directional Returns to Scale of the Private Sector Banks

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Abstract

The economic and financial environment in which the Indian banking system operates is evolving continuously. In the present scenario, the banking system needs to be flexible. The entry of private sector banks changed the scene of banking in India. The public and private sector banks operating in the country need to be competitive. As the banks are dealing in identical products and services, they can gain by being efficient. The present study discusses the empirical evidence regarding the technical and scale efficiency of the private sector banks and uses Data Envelopment Analysis (DEA) for the same. For this purpose three inputs and two outputs have been taken into consideration. Total expenses, Total assets and Compensation of employees are the inputs used in the study. Outputs considered are Total income and Return on assets. The results found that Tamilnad Mercantile Bank is technically efficient. On the basis of scale efficiency, Lakshmi Vilas Bank is highly inefficient bank. Out of 19 banks, only 2 banks are performing under increasing returns to scale, 2 are performing under decreasing returns to scale and the remaining 15 are operating under constant returns to scale.

Keywords: *Banking, Technical efficiency, Scale Efficiency*

Introduction

Banking sector is an important component of the service sector of the country. The banking industry is highly competitive, with banks not only competing amongst each other; but also with non-banks and other financial institutions (Kaynak et al., 1991). The banking scenario changed after the entry of new private sector banks. They have given hard competition to the public sector banks. Unless a bank can extend its product quality beyond the core service with additional and potential service features and value, it is unlikely to gain a sustainable competitive advantage (Chang et al., 1997). In the financial institutions' environment, efficiency depicts the degree of utilization of different resources: human, physical and financial resources and evaluation of these resources will be very important during any disturbance in the setting (Saha and

Ravisankar, 2000). Assessing the efficiency of banks is a powerful means of evaluating performance of banks. Efficiency is all about making the best use of the scant resources among competing ends so that economic and social welfare is maximised over time.

Objectives of the study

1. To find the technical efficiency and scale efficiency of the private sector banks for 2011-17.

2. To estimate the directional returns to scale of the private sector banks for 2011-17.

Period of study and data collection

The period of this study covers the years 2011–2017 and the data used has been taken from the Prowess Database (CMIE) published by Center for Monitoring Enterprises. The scope of the present study is restricted to nineteen private sector banks.

Review of studies

The first attempt to define technical efficiency of the firm was made by Koopman (1957). According to his definition inefficient producer can either increase production of one output without change in other outputs and inputs or decrease input without change in outputs and other inputs. The first non-parametric method applied to efficiency analysis was Data Envelopment Analysis (DEA) which was introduced by Farrell (1957) and was applied by Charnes et al. (1978). Sherman and Gold (1985) studied the overall efficiency of 14 branches of a U.S. savings bank. DEA results showed that six branches were operating inefficiently compared to the others. Berg et al. (1993) found that the productivity of banks declined initially in Norway during 1980-89 after the liberalisation, though, eventually rose. Drake and Jones (1996) used non-parametric DEA technique to estimate scale and technical and allocative efficiencies of 46 United Kingdom (U.K.) building societies and employed an intermediation approach in their study. They found considerable variability in inefficiencies across building societies in the sample, with allocative inefficiency dominating the technical and scale inefficiencies.

Saha and Ravisankar (2000) analyzed the performance of Indian banks using DEA approach for a sample of 25 public sector banks over a period 1992-1995. The findings revealed that barring few exceptions, the public sector banks have in general improved their efficiency over the years. Sathye (2001) compared productive efficiency of publicly owned, privately owned and foreign owned

banks operational in India in the year 1997-1998 and reported that private sector commercial banks as a group was paradoxically lower than the efficiency of public sector and foreign banks. Sathye (2002) measured the productive efficiency of banks in India using DEA approach. The efficiency scores for three groups of banks that were, publicly owned, privately owned, and foreign owned, were measured. The study tried to explain the performance variation among different groups of the banks. Two inputs namely interest expenses and non-interest expenses and two outputs, namely net interest income and non-interest income were used. A second DEA analysis was run with deposits and staff numbers as input and output respectively, to show how efficiency scores differ when inputs and outputs were changed. Their results suggested that foreign banks were in higher efficiency quartile than public and private sector banks. There were inefficiencies in the use of inputs among public sector and private sector banks. Sathye (2003) measured the productive efficiency of 94 banks in India for the year 1996-97 by using DEA wherein, it was found that the public sector banks were on average more efficient than foreign banks, which in turn were more efficient than private banks.

Sufian (2004) analyzed the technical and scale efficiency of domestic incorporated Malaysian commercial banks during the merger year, pre-and post merger period using DEA. The study found that Malaysian banks had exhibited a commendable overall efficiency level of 95.9% during 1998-2003. The results suggested that the merger programme was successful, particularly for the small and medium size banks, which had benefited the most from the merger and expansion via economies of scale and the larger banks should shrink to benefit from scale advantages. Neal (2004) investigated X-efficiency and productivity change in Australian banking sector between 1995 and 1999, using Data Envelopment Analysis (DEA) and Malmquist productivity indexes. The study concluded that diseconomies of scale set in very early and hence were not a sufficient basis on which to allow mergers to proceed between large banks. Total factor productivity in the banking sector was found to have increased by an average annual 7.6 per cent between 1995 and 1999. The banking sector's performance was less efficient relative to the frontier in 1999, than it had been in 1995. Drake et al., (2006)

appraised the relative technical efficiency of banks in Hong Kong. Their analysis revealed that factors like accession of Hong Kong to China, financial deregulation episodes, and the Asian economic crisis of 1997-1998, did not appear to have any significant impact on the relative efficiency of banks across Hong Kong. Kumar and Charles (2012) analysed the performance of Indian banks using DEA. The performance was measured in terms of technical efficiency, returns-to-scale, and Malmquist productivity index for a sample of 33 banks, consisting of 19 public sector and 14 private sector banks during the period 1995-96 to 2009-10**.** The findings revealed that the public sector banks were doing better than the private sector banks in terms of (i) technical efficiency since 2003-04 and (ii) scale efficiency from 2000-01 onwards.

Singh and Gupta (2013) gave a comparative analysis of the technical efficiency of top Indian banks during 2007-2011. The study used DEA for evaluating the relative efficiency of top public, private and foreign banks in India. The study showed that the levels of input and output variables in efficiency measurement had changed significantly during this period and banks had improved their relative efficiency score over the period of time. Abedsharghi (2015) investigated the directional return to scale of biological institutions in the China Science Academy. The results indicated that diagnosis directional return to scale (incremental, constant, and decreasing) taken for each biological institute that this information can be the basis for decisions regarding the modification of any organization. Also, congestion and directional congestion occur in several biological institutes. In such cases, when the inputs are increased the outputs of these institutions are reduced. These institutions should analyze the occurrence of congestion of specific cause up to more resources to be used more effectively and useful. Sharma and Sharma (2016) studied the X-efficiency of Indian commercial banks for the post financial crisis period i.e. 2007-14 and also identified important determinants of service quality of efficient banks. The findings showed that Indian public sector banks had larger network but the percent of efficient private sector banks was more than the public sector banks. As regards service quality dimensions, on the basis of customers' perceptions and expectations both reliability and empathy dimensions were found to be important.

Discussion of results

Data envelopment analysis (DEA) is a non-parametric method of measuring efficiency of a decision-making unit (DMU) such as bank/firm. DEA employs mathematical programming to construct a best practice frontier from the observed data and to measure efficiency relative to the constructed frontier. The best practice frontier represents optimal utilization level of resources and efficiency of banks is measured relative to that best frontier (benchmark). If a bank lies on the frontier, it is referred to as an efficient bank otherwise; it is termed as less efficient bank. More away the bank is from the frontier, the less efficient it is.

Several mathematical programming DEA models have been proposed in the literature. In the present study, CCR (named after its developers, Charnes, Cooper and Rhodes, 1978) and BCC (named after its developers, Banker, Charnes and Cooper, 1984) models to obtain efficiency measures corresponding to the assumptions of CRS and VRS, respectively have been used.

The present study analyzes technical and scale efficiency of private banks. For this purpose the following inputs and outputs have been used.

Table 1 shows the descriptive statistic of the inputs and outputs used to analyze the efficiency scores of private sector banks during 2011-17. During this time period, private sector average expenses and average assets have been Rs. 72137.95 million and Rs 1124595.54 million respectively. The spread of total expenses was found to be 100423.45 and coefficient of variation was 139.21%, Similarly 133.59%, 132.02% and 142.40% variation found in case of total assets, compensation of employees and total income respectively which means that there is huge variation between small size private banks and large size private sector banks, whereas comparatively less variation was found in returns on assets.

Table 2 depicts the technical efficiency scores and scale efficiency scores of the 19 private sector banks for the period 2011-17 using input oriented model of DEA. As shown in the table, Tamilnad Mercantile Bank, Nainital Bank and HDFC Bank are found to be technical efficient with highest scores under the Constant Returns Scale Model (CRS). It is evident that other banks i.e. Catholic Syrian Bank (0.86), Dhanlaxmi Bank (0.81), Federal Bank (0.96), ING Vysya Bank (0.94), Indusind Bank (0.98), Karnataka Bank (0.91), KarurVysya Bank (0.97), Kotak Mahindra Bank (0.99), Lakshmi Vilas Bank (0.89), Ratnakar Bank

(0.92) and South Indian Bank (0.94) are relatively inefficient. In other words, these banks can increase the level of output by 14.0%, 19.0%, 4.0%, 6.0%, 2.0%, 9.0%, 3.0%, 1.0%, 11.0%, 8.0% and 6.0% respectively with the same level of input. Dhanlaxmi Bank is found to be the most inefficient bank.

8 out of 19 banks have been judged as technical efficient whereas 15 out of 19 banks are scale efficient as shown in Table 2. Therefore it is clear from the above table that commonly 8 banks are both technical and scale efficient. Out of 19 banks, only 2 banks are performing under increasing returns to scale, 2 are performing under decreasing returns to scale and the remaining 15 are operating under constant returns to scale. On the basis of scale efficiency, Lakshmi Vilas Bank is highly inefficient bank and relatively underperforming by 3.0 percent.

Conclusion

Banks need to be highly efficient. After liberalization, globalization and privatization banks cannot afford to be inefficient. Data Envelopment Analysis (DEA) helps to compute the level of efficiencies considering different inputs and outputs. The paper investigated about the technical and scale efficiency of nineteen private sector banks. The empirical observations obtained through Charnes, Cooper and Rhodes (CCR) and Banker, Charnes, Cooper (BCC) model have been presented in this paper. The results show that Tamilnad Mercantile Bank is technically efficient. As regards scale efficiency Lakshmi Vilas Bank is found to be highly inefficient.

References

1. Abedsharghi, Sara (2015). A Study on Directional Returns to Scale. European Online Journal of Natural and Social Sciences 2015, www.european-science.com Volume 4 (1), pp. 1275-1287.
2. Berg, Sig born A., Finn R. Forsund, Lennart Hjalmarsson and Matti Suominen (1993). Banking Efficiency in the Nordic countries. Journal of Banking and Finance, (17), pp. 371-88.
3. Chang, Zeph Yun, Chan, Joanne and Leck, Siew Leng (1997). Management of market quality for correspondent banking products. International Journal of Bank Marketing, pp. 32-35.

4. Charnes, A., W. W. Cooper and E. Rhodes (1978). Measuring the inefficiency of Decision Making Units. European Journal of Operational Research, Volume 2 (6), pp. 429-444.
5. Charnes, A., W.W.Cooper, and E, Rhodes (1978). Banking efficiency in China: Application of DEA to pre and fast deregulation eras: 1993-2000. China Economic Review, Volume 16 (3), pp. 229-245.
6. Drake, L. and Weyman-Jones, T.G. (1996). Productive and allocative inefficiencies in U.K. building societies: A comparison of non-parametric and stochastic frontier techniques. The Manchester School of Economic and Social Studies, Volume 64 (1), pp. 22-37.
7. Drake, L. Hall, M. J. B. and Simper, R. (2006). The impact of macroeconomic and regulatory factors on bank efficiency: A non- parametric analysis of Hong Kong's banking system. Journal of Banking and Finance, Volume 30 (5), pp. 1443-1466.
8. Farrell, M.J. (1957). The Measurement of Efficiency of Production. Journal of the Royal Statistical Society (Series A), Volume 120 (3), pp. 253-281.
9. Galagedera, Don UA and Edirisuriya, Piyadasa (2005). Performance of Indian Commercial banks. South Asian Journal of Management.
10. Kaynak, E. Kucukemisroglu, O.and Odobasi, Y.(1991). Commercial bank selection in Turkey. International Journal of Bank Marketing, Volume 9 (7), pp. 30-39.
11. Koopmans, T. C. (1957). Three essays on the State of Economic Analysis. New York: Mc Graw-Hill.
12. Kumar Mukesh and Charles Vincent (2012). Evaluating the Performance of Indian Banking Sector Using Data Envelopment Analysis during Post-Reform and Global Financial Crisis. Working Paper.
13. Neal Penny. (2004). X-efficiency and productivity change in Australian banking. Australian Economic Papers, Volume 43 (2), pp. 174-191.
14. Saha, A. and Ravisankar, T. S. (2000). Rating of Indian Commercial Banks: A DEA Approach. European Journal of Operational Research, Volume 124 (1), pp. 187-203.
15. Sathye Milind (2002). Efficiency of banks in a developing economy: The case of India. School of Accounting, Banking and Finance, University of Canberra, Bruce.

16. Sathye, M. (2001). X-efficiency in Australian banking: An empirical investigation. Journal of Banking and Finance, Volume 25, pp. 613-630.
17. Sathye, M. (2003). Efficiency of Banks in a Developing Economy: the Case of India. European Journal of Operational Research, Volume 148 (3), pp. 662-71.
18. Sharma, Gagandeep (2013). A study of efficiency of public and private sector banks in India. Diviner, Volume 10 (1), pp. 11-22.

Sharma, Gagandeep and Sharma Divya (2016). X-Efficiency of Indian Commercial Banks and their Determinants of Service Quality: A Study of Post Global Financial Crisis. Proceedings of 13th International Conference on DEA, DEA 2015, Braunschweig, Germany, ISBN: 978 1 85449 497 9 pp. 181-186.

20. Sherman, H. D. and Gold, F. (1985). Bank branch operating efficiency-evaluation with data envelopment analysis. Journal of Banking and Finance, Volume 9, pp. 297-315.
21. Singh Piyush Kumar and Gupta V. K. (2013). Measuring Technical Efficiency of Indian Banking Sector in Post Subprime Crises Scenario: A Non-Parametric Frontier Based Approach European. Journal of Business and Management, Volume 5 (5), pp. 87-99.
22. Sufian, F. (2004). The efficiency effects of bank mergers and acquisitions in a developing economy: Evidence from Malaysia. International Journal of Applied Econometrics and Quantitative Studies, (1-4), pp. 53-74.

Inputs	Outputs
Total expenses	Total income
Total assets	Return on assets
Compensation of employees	

Table 1
Descriptive statistic of various variables of private sector banks

Descriptive Statistics						
Private Sector Banks						
	N	**Minimum**	**Maximum**	**Mean**	**Standard Deviation**	**Coefficient of Variation**
Total Expenses (Million Rs.)	19	2998.20	354207.52	72137.95	100423.45	139.21%
Total Assets (Million Rs.)	19	44510.86	5254403.94	1124595.54	1502371.37	133.59%

Compensation of Employees (Million Rs.)	19	429.28	33338.96	7558.71	9979.19	132.02%
Returns on Assets (Percentage)	19	-0.77	1.78	1.13	0.70	61.94%
Total Income (Million Rs,)	19	3531.64	421762.66	84384.83	120160.86	142.40%

Table 2
Technical efficiency and Scale efficiency of private sector banks during 2011-17

Banks	Technical Efficiency	Benchmarks	Scale Efficiency	Returns to Scale
Axis Bank	1.00	6	1.00	CRS
Catholic Syrian Bank	0.86	6 (0.02) 18 (0.14)	1.00	IRS
City Union Bank	1.00	0	1.00	CRS
Dhanlaxmi Bank	0.81	6 (0.02) 18 (0.17)	1.00	CRS
Federal Bank	0.96	1 (0.06) 6 (0.09) 15 (0.21) 18 (0.44)	1.00	CRS
HDFC Bank	1.00	8	1.00	CRS
ICICI Bank	1.00	2	1.00	CRS
ING Vysya Bank	0.94	6 (0.11) 15 (0.29) 18 (0.25)	1.00	CRS
Indusind Bank	0.98	1 (0.14) 15 (0.02) 18 (0.69) 19 (0.16)	0.98	DRS
Jammu & Kashmir Bank	1.00	7 (0.12) 15 (0.82)	1.00	CRS
Karnataka Bank	0.91	1 (0.06) 6 (0.03) 18 (0.30)	1.00	CRS
KarurVysya Bank	0.97	1 (0.05) 15 (0.34) 18 (0.24) 19 (0.22)	1.00	CRS
Kotak Mahindra Bank	0.99	6 (0.16) 15 (0.32) 18 (0.66)	0.99	DRS
Lakshmi Vilas Bank	0.89	1 (0.04) 6 (0.00) 15 (0.05) 18 (0.26)	0.97	IRS
Nainital Bank	1.00	9	1.00	CRS
Ratnakar Bank	0.92	7 (0.01) 15 (0.53)	1.00	CRS
South Indian Bank	0.94	1 (0.07) 6 (0.05) 15 (0.44) 18 (0.10)	1.00	CRS
Tamilnad Mercantile Bank	1.00	10	1.00	CRS
Yes Bank	1.00	2	1.00	CRS