



Chief Editor

Dr. A. Singaraj, M.A., M.Phil., Ph.D.

Editor

Mrs.M.Josephin Immaculate Ruba

Editorial Advisors

1. Dr.Yi-Lin Yu, Ph. D
Associate Professor,
Department of Advertising & Public Relations,
Fu Jen Catholic University,
Taipei, Taiwan.
2. Dr.G. Badri Narayanan, PhD,
Research Economist,
Center for Global Trade Analysis,
Purdue University,
West Lafayette,
Indiana, USA.
3. Dr. Gajendra Naidu.J., M.Com, LL.M., M.B.A., PhD. MHRM
Professor & Head,
Faculty of Finance, Botho University,
Gaborone Campus, Botho Education Park,
Kgale, Gaborone, Botswana.
4. Dr. Ahmed Sebihi
Associate Professor
Islamic Culture and Social Sciences (ICSS),
Department of General Education (DGE),
Gulf Medical University (GMU), UAE.
5. Dr. Pradeep Kumar Choudhury,
Assistant Professor,
Institute for Studies in Industrial Development,
An ICSSR Research Institute,
New Delhi- 110070.India.
6. Dr. Sumita Bharat Goyal
Assistant Professor,
Department of Commerce,
Central University of Rajasthan,
Bandar Sindri, Dist-Ajmer,
Rajasthan, India
7. Dr. C. Muniyandi, M.Sc., M. Phil., Ph. D,
Assistant Professor,
Department of Econometrics,
School of Economics,
Madurai Kamaraj University,
Madurai-625021, Tamil Nadu, India.
8. Dr. B. Ravi Kumar,
Assistant Professor
Department of GBEH,
Sree Vidyanikethan Engineering College,
A.Rangampet, Tirupati,
Andhra Pradesh, India
9. Dr. Gyanendra Awasthi, M.Sc., Ph.D., NET
Associate Professor & HOD
Department of Biochemistry,
Dolphin (PG) Institute of Biomedical & Natural Sciences,
Dehradun, Uttarakhand, India.
10. Dr. D.K. Awasthi, M.SC., Ph.D.
Associate Professor
Department of Chemistry, Sri J.N.P.G. College,
Charbagh, Lucknow,
Uttar Pradesh. India

ISSN (Online) : 2455 - 3662

SJIF Impact Factor :5.614

ISI I.F. Value : 1.188

EPRA International Journal of Multidisciplinary Research

Monthly Peer Reviewed & Indexed
International Online Journal

Volume: 5 Issue: 8 August 2019

Indexed By:



Published By :EPRA Publishing

CC License





EFFICIENCY ANALYSIS OF SELECTED PRIVATE SECTOR BANKS IN INDIA USING DATA ENVELOPMENT ANALYSIS

Ravikumar Undi

Research scholar,
Department of Studies and Research in
Commerce,
Gulbarga University,
Kalaburagi, Karnataka,
India

Basavaraj C.S

Professor,
Department of Studies and Research in
Commerce,
Gulbarga University,
Kalaburagi, Karnataka,
India

ABSTRACT

Purpose – This paper aims to analyse the efficiency level of selected private sector banks in India.

Design/methodology/approach – Data envelopment analysis has been used to measure the efficiency of banks, in which technical, allocative and cost/economic efficiency measures are analysed to know the efficiency of banks.

Findings - The empirical evidence suggests that ICICI and Kotak Mahindra banks are the most efficient banks in terms of all three efficiency measures with the mean score of 100 percent. It implies that remaining banks are managerially inefficient due to failure to use the available resources at optimum level.

Originality/values – The paper compares the efficiency of selected private sector banks by utilizing the available data set for the period 2013-18.

INDEX TERMS: Private sector banks, Efficiency analysis, Data envelopment analysis.

I. INTRODUCTION

The banking sector is one of the major components of the economy, which influences the path of the economy. Financial sector comprises of commercial banks, financial institutions and wide cluster of financial instruments. Indian economic policy framework is the combination of socialistic and capitalistic features with a huge preference towards public sector investment. Economic reforms (LPG- liberalization, privatization and globalization) introduced by the Indian government in the year 1991 has made remarkable changes and brought out the competition in the financial service industry. This competition has become the subject matter of many research studies due to its significance. On the other hand,

introduction of demonetization (in 2017) with the motives of controlling cash circulation and curbing black money in the economy has significant impact on the banking system (Undi Ravikumar, 2018). Of late private sector banks are becoming dominant by size, by customer base, by quality of service and by customer choice and preference (Laxmappa, 2017). Many studies have been made to evaluate the performance/ efficiency of banks to know which bank stands where.

Axis Bank Ltd., Federal Bank Ltd., H D F C Bank Ltd., I C I C I Bank Ltd., Kotak Mahindra Bank Ltd. and Yes Bank Ltd. are the prominent private sector banks in India. The researchers make an

attempt to measure the comparative efficiency level of these banks.

II. LITERATURE REVIEW

The following research works which measured the efficiency of banks using mainly DEA tool have been reviewed by the researchers.

Sl. No	Author/s	Year	Title	Tools	Brief summary
01	Satya M	2003	Efficiency of banks in a developing economy: The case of India	DEA	Public, private and foreign banks are covered in this study. Study finds that private sector banks are inefficient with comparison of both public and foreign banks working in India.
02	Bhattacharyya , lovell & Sahay	1997	The impact of liberalization on the productive efficiency of Indian commercial banks	DEA & SFA	The study is undertaken on 70 Indian commercial banks working in India during 1986-1991. It shows that mean efficiency score of public sector banks is higher than that of private and foreign banks.
03	K R Shanmugan & A Das	2004	Efficiency of Indian commercial banks during the reform period.	SFA	The study comprises of state bank group, nationalized banks, foreign banks and private sector banks in India. To find out the efficiency of banks, technical efficiency has been computed and results indicate that foreign banks and state bank group are more efficient in comparison with other banks considered in the study.
04	Das & Ghosh	2006	Financial deregulation and efficiency: An empirical analysis of Indian banks during the post reform period.	DEA	Researchers have employed the three different approaches viz., operating approach, intermediate approach and value added approach. The empirical results show that technically efficient banks have less non-performing loans. And found a close relationship between efficiency and soundness determined by banks' capital adequacy ratio.
05	Muhammad Tariq Majeed and Abida Zanib	2016	Efficiency analysis of Islamic banks in Pakistan	DEA	The study aims to analyse the efficiency of Islamic banks, conventional banks and Islamic branches of conventional banks in Pakistan. Three measures such as technical, pure technical and scale efficiency are computed to measure the efficiency of banks. Outcome of the study is, full-fledged Islamic banks are less efficient than conventional banks in terms of technical and pure technical efficiency.

III. DATA AND METHODOLOGY

This study focuses on Six private sector banks viz. Axis Bank Ltd., Federal Bank Ltd., H D F C Bank Ltd., I C I C I Bank Ltd., Kotak Mahindra Bank Ltd. and Yes Bank Ltd. The study period is 2013-18 and necessary data are collected from the annual reports of each of the banks. Parametric and non-parametric approaches are the two models widely used to measure

the efficiency of banks or firms throughout the world. Financial ratio analysis (FRA) is used in parametric approach and data envelopment analysis (DEA) is used in non-parametric approach. Profit maximization and wealth maximization are the two major assumptions assumed in financial ratio analysis whereas in DEA no such assumptions are made to analyse the efficiency of banks (Hasan 2005). Even though no such assumption

under DEA, it has been used widely to analyse the efficiency of banks by many researchers.

Data envelopment analysis (DEA)

DEA is a linear programming, originated by Charnes et al. (1978). DEA offers two assumptions: constant return to scale (CRS) and variable return to scale (VRS). CRS considers that there is no association between scale of operation and efficiency of a firm. This assumption is used to measure the overall technical efficiency (OTE) of a firm. CRS assumption is applicable only when, all decision making units (DMU) operate at an optimal level. Practically banks or firms or DMU might face increasing return to scale or decreasing return to scale. BCC (Banker, Charnes and Cooper) model proposed by Banker et al. (1984) is an extension of CCR model which assumes VRS rather

than CRS to measure the efficiency of bank or firm or DMU. VRS provides pure technical efficiency (PTE). The variance between OTE and PTE score of DMU indicates the presence of scale efficiency. Thus, CCR and BCC model can be used to estimate scale efficiency. DEA model can be constructed using either an input orientation (IO: same level of output with minimum input) or output orientation (OO: maximization of output with given input).

The researcher used CCR model which assumes CRS. Under this assumption efficiency of bank or DMU can be measured with technical efficiency (OTE), allocative efficiency and cost/economic efficiency. Variables, notation and description of variables used for the study to construct the data are given in the Table I.

Table-I: Description of variables

Variables	Notation	Description
Assets	Y_1^*	Total assets
Advances	Y_2	Total loans and advances
Interest Income	Y_3	Interest income
Deposits	X_1^\dagger	Deposits of customers
Fixed Assets	X_2	Gross fixed assets
Interest on Deposits	P_1^{**}	Interest on deposits
Depreciation	P_2	Depreciation on fixed assets

* Y- Indicates output variables.

† X- Indicates input variables.

** P- Indicates price of input variables.

IV. EFFICIENCY ANALYSIS OF PRIVATE SECTOR BANKS IN INDIA

Results in Table III suggest that the efficiency of six private sector banks in India: Axis Bank Ltd., Federal Bank Ltd., H D F C Bank Ltd., I C I C I Bank Ltd., Kotak Mahindra Bank Ltd. and Yes Bank Ltd. It

is found that each and every sample bank of the study is technically efficient as the mean technical efficiency score of each banks is 100 percent. ICICI and Kotak Mahindra banks are the two banks which are efficient in technical, allocative and cost/economic efficiency throughout the study period.

Table - II: Statistics of output, input and price variables used in DEA (Rs in million)

Variables	Output			Input		Price	
	Y ₁	Y ₂	Y ₃	X ₁	X ₂	P ₁	P ₂
Axis Bank Ltd.							
Mean	5431284	3501643	399323.6	3663456	56921.88	179791	4747.48
SD	1233293	945807.5	66439.35	702037.6	12761.89	17160.04	854.2011
Federal Bank Ltd.							
Mean	1016662	649376.4	81471.28	838709.6	11634.32	50046.64	1068.72
SD	260757.9	194990.9	11831.43	209459.8	1669.313	6024.64	189.6254
H D F C Bank Ltd.							
Mean	7737705	4964138	629884.5	5589493	97558.78	271495.8	7920.26
SD	2363627	1543534	171200.6	1647090	14704.05	57361.4	1279.17
I C I C I Bank Ltd.							
Mean	9236170	5027457	570605.4	4589857	150034.2	216385.3	8388.76
SD	1459254	835839.1	51178.98	925268.7	27096.86	21388.17	839.7012
Kotak Mahindra Bank Ltd.							
Mean	2251706	1357616	186323.4	1224996	37354.7	65206.32	3069.8
SD	893827.4	555077.5	57315.32	564852.8	11858.64	23376.47	791.2149
Yes Bank Ltd.							
Mean	1875799	1131336	143560.8	1241189	9624.14	73833.92	1332.84
SD	801036.2	580944.3	40866.92	498695.3	4290.469	14616.2	687.674

Source: Authors' calculations based on annual reports of 6 Private sector banks in India during 2013-14 to 2017-18. All variables reported in Indian Rs Millions.

Table - III: Statistics of efficiency estimates of Private sector banks

Efficiency scale	13-14	14-15	15-16	16-17	17-18	Mean	SD
Axis Bank Ltd.							
Technical efficiency	1.00	1.00	1.00	1.00	1.00	1.00	0.00
Allocative efficiency	0.75	0.76	0.88	0.90	1.00	0.86	0.10
Cost efficiency	0.75	0.76	0.88	0.90	1.00	0.86	0.10
Federal Bank Ltd.							
Technical efficiency	1.00	1.00	1.00	1.00	1.00	1.00	0.00
Allocative efficiency	0.95	1.00	1.00	1.00	1.00	0.99	0.02
Cost efficiency	0.95	1.00	1.00	1.00	1.00	0.99	0.02
H D F C Bank Ltd.							
Technical efficiency	1.00	1.00	1.00	1.00	1.00	1.00	0.00

Allocative efficiency	0.83	0.79	1.00	1.00	1.00	0.92	0.10
Cost efficiency	0.83	0.79	1.00	1.00	1.00	0.92	0.10
ICICI Bank Ltd.							
Technical efficiency	1.00	1.00	1.00	1.00	1.00	1.00	0.00
Allocative efficiency	1.00	1.00	1.00	1.00	1.00	1.00	0.00
Cost efficiency	1.00	1.00	1.00	1.00	1.00	1.00	0.00
Kotak Mahindra Bank Ltd.							
Technical efficiency	1.00	1.00	1.00	1.00	1.00	1.00	0.00
Allocative efficiency	1.00	1.00	1.00	1.00	1.00	1.00	0.00
Cost efficiency	1.00	1.00	1.00	1.00	1.00	1.00	0.00
Yes Bank Ltd.							
Technical efficiency	1.00	1.00	1.00	1.00	1.00	1.00	0.00
Allocative efficiency	0.77	0.80	0.95	0.94	0.95	0.88	0.09
Cost efficiency	0.77	0.80	0.95	0.94	0.95	0.88	0.09

Table-III infers that technical efficiency of all selected private sector bank is higher than allocative and cost/economic efficiency. Other than ICICI and Kotak Mahindra bank mean score of allocative and cost/economic efficiency are found inefficient which demonstrate that they are managerially inefficient. More fluctuations in allocative and cost efficiency is found in case of AXIS bank and HDFC bank as the standard deviation (SD) of these banks is higher in comparison with other banks under the study.

AXIS bank found efficient in terms of all three efficiency measures only in the year 2017-18 and in the remaining period it is found inefficient in terms of allocative and cost efficiency. In contrast, it is found that the Federal bank found inefficient in terms of allocative and cost efficiency only in 2013-14 and in residual period it is found efficient in terms of all three efficiency measures used in this study.

HDFC bank found inefficient in terms of allocative and cost efficiency for a period of 2013-15 as its efficiency scores are less than 100 percent in the said period, but it became technically and managerially efficient in 2015-16, 2016-17 and 2017-18 as its mean score is 100 percent with respect to all three efficiency measures. On contradictory to this Yes bank remains inefficient in terms of allocative and cost efficiency throughout the study period. And it is found managerially more inefficient in the year 2013-14 as its mean efficiency score is 77 percent on the other hand it is found less inefficient in the year 2015-16 and 2017-18 as mean efficiency score is 95 percent in both the years.

CONCLUSION

The study focused to analyse the efficiency of selected private sector banks operating in India during 2013-2018. Data envelopment analysis, a non-

parametric approach has been used. The empirical evidence suggests that ICICI and Kotak Mahindra bank are the most efficient banks in terms of all three efficiency measures with the mean score of 100 percent. It implies that remaining banks are managerially inefficient due to failure to use the available resources at optimum level. However, results indicate that Yes bank is most inefficient bank followed by AXIS bank in comparison with other banks under study.

REFERENCES

- Ahmad, N. H., & Noor, M. A. N. M. (2011). *The determinants efficiency and profitability of world Islamic banks. In 2010 International Conference on E-business, Management and Economics (Vol. 3)*.
- Ataullah*, A., Cockerill, T., & Le, H. (2004). *Financial liberalization and bank efficiency: a comparative analysis of India and Pakistan. Applied Economics, 36(17), 1915-1924*.
- Banker, R. D., Charnes, A., & Cooper, W. W. (1984). *Some models for estimating technical and scale inefficiencies in data envelopment analysis. Management science, 30(9), 1078-1092*.
- Bhattacharyya, A., Lovell, C. K., & Sahay, P. (1997). *The impact of liberalization on the productive efficiency of Indian commercial banks. European Journal of operational research, 98(2), 332-345*.
- Bodla, B. S., & Verma, R. (2006). *Determinants of profitability of banks in India: A multivariate analysis. Journal of Services Research, 6(2), 75-89*.
- Charnes, A., Cooper, W. W., & Rhodes, E. (1978). *Measuring the efficiency of decision making units. European journal of operational research, 2(6), 429-444*.
- Das, A., & Ghosh, S. (2006). *Financial deregulation and efficiency: An empirical analysis of Indian banks during*

- the post reform period. *Review of Financial Economics*, 15(3), 193-221.
8. Das, A., Nag, A., & Ray, S. C. (2005). Liberalisation, ownership and efficiency in Indian banking: a nonparametric analysis. *Economic and political weekly*, 1190-1197.
 9. Dash, M., & Charles, C. (2009). A study of technical efficiency of banks in India. Available at SSRN 1417376.
 10. Gupta, O. K., Doshit, Y., & Chinubhai, A. (2008). Dynamics of productive efficiency of Indian banks. *International Journal of operations research*, 5(2), 78-90.
 11. Hasan, Z. (2005), "Evaluation of Islamic banking performance: on the current use of econometrics models", *Munich Personal RePEc Archive*, pp. 72-82.
 12. Kalluru, S. R., & Bhat, S. K. (2009). Determinants of cost efficiency of commercial banks in India. *IUP Journal of Bank Management*, 8(2), 32.
 13. Karimzadeh, M. (2012). Efficiency analysis by using Data Envelop Analysis model: evidence from Indian banks. *International Journal of Latest Trends in Finance and Economic Sciences*, 2(3), 228-237.
 14. KAUR, B. P., & Kaur, G. (2010). Impact of mergers on the cost efficiency of Indian commercial banks. *Eurasian Journal of Business and Economics*, 3(5), 27-50.
 15. Laxmappa K. & Basavaraj C.S. (2017, April-June). Comparative performance analysis of the ICICI bank and the HDFC bank. *The Indian journal of commerce*, 70(2), 58-64.
 16. Majeed, M. T., & Zanib, A. (2016). Efficiency analysis of Islamic banks in Pakistan. *Humanomics*, 32(1), 19-32.
 17. Mohan, T. R., & Ray, S. C. (2004). Comparing performance of public and private sector banks: a revenue maximisation efficiency approach. *Economic and Political weekly*, 1271-1276.
 18. Ray, S. C., & Das, A. (2010). Distribution of cost and profit efficiency: Evidence from Indian banking. *European Journal of Operational Research*, 201(1), 297-307.
 19. Rezvanian, R., Rao, N., & Mehdian, S. M. (2008). Efficiency change, technological progress and productivity growth of private, public and foreign banks in India: evidence from the post-liberalization era. *Applied Financial Economics*, 18(9), 701-713.
 20. Saha, A., & Ravisankar, T. S. (2000). Rating of Indian commercial banks: a DEA approach. *European Journal of Operational Research*, 124(1), 187-203.
 21. Sathye, M. (2003). Efficiency of banks in a developing economy: The case of India. *European journal of operational research*, 148(3), 662-671
 22. Sensarma, R. (2005). Cost and profit efficiency of Indian banks during 1986-2003: a stochastic frontier analysis. *Economic and Political Weekly*, 1198-1209.
 23. Sensarma, R. (2006). Are foreign banks always the best? Comparison of state-owned, private and foreign banks in India. *Economic Modelling*, 23(4), 717-735.
 24. Shanmugam, K. R., & Das, A. (2004). Efficiency of Indian commercial banks during the reform period. *Applied Financial Economics*, 14(9), 681-686.
 25. Undi Ravikumar & Basavaraj C.S. (2018). Impact of Demonetization on E-Banking Services in India. 7th International Conference on Emerging Trends in Finance, Accounting & Banking, September 7 & 8, 2018 (pp. 1-17). Mysore: SDMIMD.
 26. Varadi, V. K., Mavaluri, P. K., & Boppana, N. (2006). Measurement of efficiency of banks in India.

APPENDIX

Table -1: Descriptive data table of variables used to equip data envelopment analysis for the year 2013-14

Banks	Output			Input		Price	
	Y ₁	Y ₂	Y ₃	X ₁	X ₂	P ₁	P ₂
<i>Axis Bank Ltd.</i>	3863936	2324122	307359.6	2805411	42221.4	154318.6	3754.6
<i>Federal Bank Ltd.</i>	750205.1	447942.4	69045.2	597290.4	9394.2	42092.6	980.6
<i>H D F C Bank Ltd.</i>	5036799	3170825	425550.1	3670803	78815.6	190425.6	6886.8
<i>I C I C I Bank Ltd.</i>	7500139	3933453	492800.9	3595127	117450	184190.2	7192.7
<i>Kotak Mahindra Bank Ltd.</i>	1222760	717514	119859.1	569297.6	23885.8	36420.3	2078.6
<i>Yes Bank Ltd.</i>	1090048	556771.9	99813.6	741856.3	5362.4	56181	635.4

Table -2: Descriptive data table of variables used to equip data envelopment analysis for the year 2014-15

Banks	Output			Input		Price	
	Y ₁	Y ₂	Y ₃	X ₁	X ₂	P ₁	P ₂
<i>Axis Bank Ltd.</i>	4672889	2847098	357274.6	3222442	45763.2	171078.1	4196.4
<i>Federal Bank Ltd.</i>	831976.8	524629.8	74173	708226.9	10460.4	46273	794.9
<i>H D F C Bank Ltd.</i>	6071701	3853558	506665	4502837	88599.8	235047.8	6804.5
<i>I C I C I Bank Ltd.</i>	8288370	4438145	546886.6	3859552	125590.9	207723.1	7982.2
<i>Kotak Mahindra Bank Ltd.</i>	1486878	886860.2	133188.8	728434.6	26750.1	43998.5	2368.9
<i>Yes Bank Ltd.</i>	1361430	756220.7	115720	911587.7	6320.9	65360.3	860.7

Table -3: Descriptive data table of variables used to equip data envelopment analysis for the year 2015-16

Banks	Output			Input		Price	
	Y ₁	Y ₂	Y ₃	X ₁	X ₂	P ₁	P ₂
<i>Axis Bank Ltd.</i>	5465619	3617177	414092.4	3583022	58982.8	185207.8	4613.9
<i>Federal Bank Ltd.</i>	949622.7	590505.4	77854.2	791709	12077.8	50612.6	1081.7
<i>H D F C Bank Ltd.</i>	7623068	4895322	631615.7	5458733	97104.2	291509.5	7380.3
<i>I C I C I Bank Ltd.</i>	9220400	5268269	589662.7	4510774	158773.9	219989.8	8431.1
<i>Kotak Mahindra Bank Ltd.</i>	2409813	1451847	204016.4	1359488	40469.3	76493.9	3445.1
<i>Yes Bank Ltd.</i>	1652426	982927.8	135334.4	1117042	8558.9	71771.1	1118.4

Table -4: Descriptive data table of variables used to equip data envelopment analysis for the year 2016-17

Banks	Output			Input		Price	
	Y ₁	Y ₂	Y ₃	X ₁	X ₂	P ₁	P ₂
<i>Axis Bank Ltd.</i>	6115551	3987997	451750.9	4149827	65399.2	196406.5	5266.7
<i>Federal Bank Ltd.</i>	1157177	746114.8	87364.3	976620.8	12853.7	54036	1239.1
<i>H D F C Bank Ltd.</i>	8924627	5877175	732713.6	6431343	107355.9	312955.9	8861.9
<i>I C I C I Bank Ltd.</i>	9892653	5473055	604855.6	5125873	169963.7	232626.5	9116.4
<i>Kotak Mahindra Bank Ltd.</i>	2761876	1671686	223242.1	1555400	43401.2	80626.6	3622.1
<i>Yes Bank Ltd.</i>	2150597	1323849	164250	1428575	12180.9	82032.4	1726.1

Table -1: Descriptive data table of variables used to equip data envelopment analysis for the year 2017-18

Banks	Output			Input		Price	
	Y ₁	Y ₂	Y ₃	X ₁	X ₂	P ₁	P ₂
<i>Axis Bank Ltd.</i>	7038426	4731820	466140.6	4556578	72242.8	191943.9	5905.8
<i>Federal Bank Ltd.</i>	1394329	937689.4	98919.7	1119701	13385.5	57219	1247.3
<i>H D F C Bank Ltd.</i>	11032328	7023810	852878.3	7883751	115918.4	327540.4	9667.8
<i>I C I C I Bank Ltd.</i>	11279291	6024365	618821.3	5857961	178392.4	237396.9	9221.4
<i>Kotak Mahindra Bank Ltd.</i>	3377205	2060171	251310.8	1912358	52267.1	88492.3	3834.3
<i>Yes Bank Ltd.</i>	3124497	2036910	202685.9	2006886	15697.6	93824.8	2323.6