Banking Efficiency: Literature Exposition for DEA Approach

Hitendra Trivedi[1*], Dharmendra Mehta[1] and Naveen K. Mehta[2]
[1]FMS, Pt. JNIBM, Vikram University, Ujjain, MP, India
[2]SUBIS, Barla, Raisen, MP, India
hitendra_trivedi@rediffmail.com

Abstract

DEA is a popular perspective in dealing with of efficiency measurement specifically in context of financial sector irrespective of system the country. Everyone knows that money is the blood of economy and the flow of money is regulated by financial institutions. Their efficiency is to be measured consistently to ensure their working at the optimum level. This paper sets a systematic juncture for precise understanding of the literature available concerned with DEA in context of research works undertaken globally. This paper is composed with an aim to comprehend the DEA approach of efficiency measurement for financial institutions and to consolidate the works already bone by various researchers in the field.

Introduction

The importance of banking institutions is widely recognized by every educated person of the economy for its contribution in growth of the nation. The banking institutions are mainly responsible for mobility of money in the economy. To control flow of the money and credit is the important role played by the banking institutions in the economy growth and development. The efficient working of the banking institution is an essential requirement for the growth of the country. DEA is applied for evaluating the measures of efficiencies for banking institutions by various researchers since a long time. Primarily DEA can be considered as a version of linear programming method which can be utilized for scaling various incommensurable variables (as input and output) of any unit by transforming them into a measurable variable for the purpose of comparison and measurement.

In case of financial instrument this comparison is done in context of operational efficiency of the units relative to the group of units. In the method of DEA the unit is refereed as decision making unit and is considered as an independent entity operating in the group of units. This method defines one most efficient or peer unit from the set and then it is compared with the others for the measurement of their respective independent efficiency functioning in the same system. In obligatory cases required for optimization of frontiers, DEA often defines one artificial unit as the most efficient unit which constitutes the standard and envelops the other units and, thus, forms the efficient frontier.

Objectives of the study: i. To study and understand the Data Envelopment Analysis. ii. To consolidate contribution of various researchers in the field of efficiency measurement. iii.

To provide some suggestions for effective implementation of the DEA for upcoming researchers.

Methodology

Data collection was done with secondary sources such as various National and International Journal, Publications, Occasional Papers, etc. The other information has been taken from books and websites focusing on data envelopment analysis.

Literature Review

Primarily available literature is from the developed countries focusing on assessment of performance of financial performance but the developing economies have also adopted the trend from last decade. This enables the researchers to elucidate the divergent aspects of performance appraisal and efficiency assessment of the key sectors of the economy, mainly pertaining to the financial institutions. In order to describe the essence of the available literature some of the following works are explicated below:

Houqe and Rayhan[1] used linear programming method to build an artificial decision making unit to represent optimum efficiency level of 100 percent to construct efficiency frontier. This artificial decision making unit was compared with other decision making units to obtain the relative efficiency score. This study used two constraints in the liner program with the following objectives. Primary constraint forced the artificial decision making unit to yield at least as many outputs considered for the study in decision making unit. Other constraint was inserted to found out required input for the artificial decision making unit. This study also suggested that

the inefficient banks need to optimize their resources by minimizing inputs and/or maximizing outputs according to each bank efficiency score. Constant returns to scale and variable returns to scale comparison can provide a significant guideline for efficiency improvement.

In the year 2009, Tahir et al. conducted a study to investigate the performance of Malaysian banks considering data of 9 native banks and 13 non native banks operating there[2]. This study was attributed the efficiency to scale and technical efficiency. After the assessment and comparison it was found that the efficiency of the native banks was comparatively higher as compared to non native banks. Outcome of the study also revealed the reasons behind the inefficiency of both categories of banks. The inefficiency of native banks' was credited to pure technical inefficiency. On the parameter of scale efficiency the non native banks' were found inefficient who were performing comparatively better on the scale of pure technical inefficiency. This methodology of efficiency assessment is very common among researchers.

Shanmugam and Das[3] in 2004 conducted the study with a different approach by dividing the banks into four strata characterized by ownership. The study was oriented to study technical efficiency with Cobb-Douglas production function specifically. The outcome of the analysis specified that the incompetency of banks lies in the technical inefficiency as they were underperformer as compared to the potential. Foreign banks were observed efficient as compared to the other groups as a part of outcome of the study.

A research was conducted by Lang and Welzel[4] in the year 1999 with unbalanced panel data of 1220 cooperative banks with 283 mergers procured from all Bavarian cooperative banks during 1989-1997 to study the rationale and cost effect behind mergers through Stochastic Cost Frontier with a Translog Cost specification. The study explored that average cooperative banks in Bavaria could diminish total costs without any change in input prices, output volumes or the branching network.

An investigation pertaining to efficiency of Indian banking institutions was conducted by Milind Sathye[5] in the year 2003. He has worked in the field of DEA and used the method to assess the efficiency of commercial banks operating in India with the efficiency of foreign banks operating in India. In his study the annual data of 27 Public, 33 private and 34 foreign banks was obtained through Indian Banks' Association for the year 1997-1998 for analysis. The outcome of the study mentioned that most of the Indian banks had lower mean efficiency as compared to the foreign banks including both public and private sector. Among the efficient banks SBI and IndusInd bank were observed as efficient relatively for the period of the study. The author proposed to reduce the NPA and retrench the establishment expenditure cost. This research also suggested utilizing the potential of the rural branches to optimize the efficiency.

As per the work done by Noulas and Ketkar[6] in the year 1996 measured the efficiency of public sector banks of India with DEA with data of 18 public sector banks obtained from the RBI publications. The data used for the study was year 1993. This study explored the scope for comparison for the scale and technical efficiencies of the banks. The study identified that pure technical efficiency was found 1.5 percent and scale inefficiency was found 2.25 percent. Further it was observed that none of the banks were operating under decreasing returns to scale.

Further in the year 1997, Berger and Humphrey[7] surveyed 130 studies of efficiency in 20 countries covering various types of financial institutions. In the study they analyzed five different econometric techniques of measuring efficiency with an aim to summarize and critically reviving empirical estimates of efficiency of financial institutions. The important observation came from this study was that the various methods used for efficiency calculation under parametric and non-parametric frontiers do not always yield consistent results.

Shahroudi, et al. in 2011[8] conducted a study to measure efficiency of private insurance companies of Iran through two-stage DEA technique. This study considered data of 14 private insurance companies operating in Iran for the years 2007 to 2009. Values of input and output variables were taken from the financial statements of the organizations. Results of traditional DEA model indicated that Iran Moein company was efficient (Ek=1) in year 2009, but at the same time the company was inefficient in marketing and investment process. Result of the two-stage DEA model in right side of indicated that the Iran Moein company has the highest overall efficiency with score efficiency of 0.54 in year 2009. This study was a fair attempt to compare the outcomes of different approaches of DEA and analyze the result to explore the segment wise efficiency of the financial institutions.

A study was conducted in the year 2010 on the input of financial data of Syrian Financial Institution's by Khaddaj. This research was objected to analyze the data of 10 banks through four different models to evaluate relative efficiency of banks based on their operating and intermediation levels. This study employed the CCR model for evaluating the relative efficiency of the Syrian Private Banks for the period 2006 until 2009. Each year was evaluated separately by analyzing the year-end figures published by the Syrian Commission on Financial Markets.

Financial institutions, specifically insurance companies have a significant contribution in the cluster of financial services. Ahmed, Nawi and Aleng[10] have done analysis of Life and General Insurance Industry in Malaysia. This study was conducted in the year 2013. Stochastic frontier analysis approach (SFA) was used to access the efficiency of insurance companies. This study observed a consistent increase in relative efficiency for life insurance companies. Mayban Life company with the score 0.97 in 2007 and 0.99 in 2008 and 2009 was top

performer as per the efficiency score chart. The results of the study showed that efficiency performance of the life insurance industry increased by an increase from 10 to 17 percent on yearly basis.

Tone and Sahoo[11] evaluated cost efficiency and returns to scale in the Life Insurance Corporation of India using data envelopment analysis. Data source was the annual statements of LIC for the period from 1982–1983 to 2000–2001. The annual statement of LIC is the only database, which compiles the aggregate figures of necessary operational and financial data of all its branches. Nonparametric approach was adapted to measure scale elasticity for LIC.

Mehta et al. conducted a study recently in the year 2016 to analyze the efficiency public and private banks operating in India[12]. The study observed that overall the banks of private sector are performing with relatively better efficiency score for the sample period of 2012-15. In case of public sector bank the lowest efficiency level was observed 70.84 % and 70.52 in case of private banks calculated from the data taken from secondary scores. Further the majority of the banks maintained the efficiency more than 85% in both the cases of public and private banks ensuring a comfortable status of overall efficiency of banking industry.

In the year 2006, H.P. Mahesh[13] conducted analysis between liberalization and efficiency of Indian Commercial Banks through Stochastic Frontier Analysis for the period 1985-2004. It was done to examine the impact of banking reforms on efficiency level of Indian banks. Secondary data published by RBI and Annual financial statements was used for the study as input variables. The technique of stochastic frontier analysis was used to estimate bank specific cost, profit and advance efficiencies. This study suggested merging smaller banks would improvise efficiency.

Dwivedi and Charyulu have contributed studies in the field of banking efficiency. In the year 2011 they made an attempt to access the influence of diverse market and regulatory initiatives in improvising efficiency of Indian banking industry in the post-reform era. This study attempted to maximize output, therefore output oriented Data Envelopment Analysis was used[14]. The study found that the overall efficiency scores were escalated among all the scheduled commercial type banks when compared with outcomes of earlier conducted research studies. As a part of research limitation the study was confined only to the CRS assumption VRS for estimating the efficiency was ignored.

The literature exposition of various available studies was done by Eling and Luhnen in the year 2008. They reviewed 83 studies to derive a consolidated literature for efficiency measurement specifically in field if insurance companies[15]. The research also analyzed the dataset of 3710 insurer from 37 countries to access the efficiency scores from different dimensions. The study

contributed empirical evidence in evaluation of efficiency frontier for the insurance industry.

Rajput et al. conducted a study to analyze efficiency of Indian and foreign banks. The study was conducted in the year 2014 and input data used for analysis for duration of eight years from 2008-2009 to 2012-2013. Their study revealed that foreign banks were found to be consistently efficient during the duration of study. The foreign banks were ahead of the scheduled commercial banks in terms of efficiency. The outcomes suggested focusing on efforts of minimizing NPA to enhance the efficiency[16].

Avantages of DEA Approach

i. DEA approach does not need to specify a mathematical form for production function. ii. It enables researcher to explore relationships from different input output combinations resulting the elaborated relationship study of variables. iii. With the help of DEA Approach we candela with various immensurable variables. iv. The sources of inefficiency can be analyzed and quantified for every evaluated unit. v. The frontier of technical, allocative, cost efficiency provide a better understanding for the relative efficiency level among the units.

Disadvantages of DEA Approach

i. Results can be easily deviated by changing of inputs and outputs variables. ii. The DEA approach does not provide any ground of selection of variables. iii. This technique cannot test for the best specification. iv. The complexity raises with involvement of more number of input output variables. v. The number of efficient firms on the frontier tends to is proportional with the number of inputs and output variables.

Conclusion

We can summarize as DEA approach is a technique which uses liner programming method to determine the peer unit working at the optimum efficiency among the group and provide a relative efficiency score for the other organizations or institutions working at different efficiency levels. These organizations or institutions can be a whole unit like a bank, hospital, company, institution or any other which uses various variables of inputs to generate or produce various variables in outputs. The efficiency as a whole of any unit is often attributed to two categories, Technical efficiency and Allocative efficiency. Sometimes DEA approach accesses these efficiencies stepwise independently. This method sets a benchmark by identifying the most efficient unit or by creating an artificial unit working at optimum level which is considered as 100 percent efficient.

A unit or institution operating at best practice is said to be 100% technically efficient. If the unit is operating below best practice levels, then the organization's technical efficiency is expressed as a relative percentage of optimum. Factors like managerial

practices and the scale or size of operations affect technical efficiency, which is based on engineering relationships but not on prices and costs[17]. Allocative efficiency (an economic concept) refers to how different resource inputs are combined to produce a mix of different outputs[18]. In other words it reflects the ability of a firm to use the inputs in optimal proportions.

Cost efficiency is referred as the combination of technical and allocative efficiency. The calculation of cost efficiency is derived as the product of the technical and allocative efficiency scores. Therefore any unit or institution can only be cost efficient if it is working at optimum level of technical and allocative efficiency. Finally for better analysis the DEA approach plots a frontier for technical, allocative and cost efficiency to represent the relative status of the units.

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