

Measuring Efficiency of Private banks Using CCR Model through DEA Approach

Dr. R. P. Sreedevi

*Professor of Mathematics, St.Peter's Engineering College,
Hyderabad-5000014, India.*

Abstract

This paper describes the efficiency of 10 private banks in Hyderabad using CCR Model through DEA Approach. The most important sector in finance is banking sector and the goal is to achieve greater outputs with lower inputs, or to use the available inputs to the maximum. DEA applies a multiple input and output variables approach, which is a clear advantage to other approaches using simple performance ratios. DEA has suggested reconsideration of previous studies of the efficiency with which pre and post merger activities have been conducted in banks that were studied by DEA.

Keywords Decision Making Units, Data Envelopment Analysis, Technical Efficiency, CCR Model, Returns to Scale

1. INTRODUCTION

Banking system assets constitute a substantial proportion of total output (Bauer Paul et al, 1992). Banks provide liquidity, payments and safekeeping for depositors` and channel these funds into investment and working capital requirements. In addition, banks are supposed to play a special role in funding small businesses that often have very limited access to other sources of external finance. Banks also play a major role in ensuring a smoothly functioning payment system, which allows financial and real resources to flow freely to their highest-returns uses. As pointed out in Cooper, Seiford and Tone (2000), DEA has also been used to supply new insights into activities

(and entities) that have previously been evaluated by other methods. DEA studies of the efficiency of different legal organization forms such as “Banks” “stock” vs “mutual” insurance companies have shown that previous studies have fallen short in their attempt to evaluate the potentials of these different forms of organizations. A study of bank efficiency is important because it is generally acknowledged that financial sector development is a crucial ingredient for economic growth. Honohan and Beck (2007) emphasize that the services provided by the financial sector of mobilization of savings and facilitating transaction services and risk management services are critical for development. Therefore, the operational efficiency of banks is crucial for the smooth development of an economy. In fact, the long-term viability of banks is linked to their levels of efficiency. The study of bank efficiency is also helpful in locating sources of inefficiencies to enable stakeholders to initiate reforms and design suitable strategic measures especially in developing economies (Chen, 2009). The choice of South Africa as a unit of study is driven from the stylised fact that the country has a well-developed banking sector similar to those in the developed countries yet its efficiency has not been extensively researched. To our knowledge all studies on bank efficiency carried in South Africa have used either the stochastic frontier approach or the standard DEA approach on data, typically from 1999 to 2009 (Mlambo & Ncube, 2011; Van Heerden & Van der Westhuizen, 2008; Okeahalam, 2006; O’Donnell & van der Westhuizen, 2002).

2. DATA ENVELOPMENT ANALYSIS

DEA in its present form was first introduced in 1978; researchers in a number of fields have quickly recognized that it is an excellent and easily used methodology for modeling operational process for performance evaluation. This has been accomplished by other developments. For instance, ZHU (2002) provides performance evaluation and benchmarking. DEA’S empirical orientation and the absence of a need for the numerous a prior assumption. In their originating study, Charnes Cooper and Rhodes (1978) described DEA as a mathematical programming model applied to observational data provides a new way of obtaining empirical estimates of relations. Such as the production functions and / or efficient production possibility surfaces – that are corner stone of modern economics. For instance, consider what one wants to mean by “efficiency” or more generally, what one wants to mean by saying that one DMU is more efficient than another DMU. This is accomplished in a straight forward manner by DEA without requiring explicitly formulated assumption and variation with various types of models such as linear and non- linear regression models. Relative efficiency in DEA accords with the following definitions, which has the advantage of avoiding the need for assigning prior measures of relative importance to any output.

3. CCR MODEL

To allow for applications to a wide variety of activities, we use the term Decision Making Unit (DMU) to refer to any entity that is to be evaluated in terms of its abilities to convert inputs into outputs. The evaluation can also be directed to educational institutions and hospitals as well as police forces or army units for which comparative evaluations of their performance one to be made. We assume that there are n DMUS to be evaluated; each DMU consumes varying amounts of m different inputs to produce s different outputs. Specifically, DMU_j consumes amount X_{ij} of input i and produces amount Y_{ij} of output r. We assume that X_{ij} ≥ 0 and Y_{ij} ≥ 0 and for other assume that each DMU as at least one positive input and one positive output value. We now term to the “ratio form” of DEA. In this form, as introduced by Charnes Cooper and Rhodes, the ratio of outputs to inputs is used to measure the relative efficiency of the DMU_j = DMU₀ to be evaluated relative to the ratios of all of the j = 1,2,3.....n DMU_j.we can interpret to the CCR construction as the reduction of the multiple output/multiple input situation to that of a single “virtual output “ and “virtual input”. For a particular DMU the ratio of this single virtual output to single virtual input provides a measure of efficiency that is a function of the multipliers. In mathematical programming parlance, this ratio which is to be maximize forms the objective function per the particular DMU being evaluated, so that symbolically

$$Z (CCR) = \text{Max } Z = \sum_{r=1}^s \mu_r Y_{ro}$$

Subject to

$$\sum_{i=1}^m \mu_r Y_{rj} - \sum_{r=1}^s V_j X_{ij} \leq 0$$

$$\sum_{i=1}^m V_i X_{io} = 1 \quad \mu_r, V_i \geq 0$$

4. EMPIRICAL INVESTIGATION

10 private banks under Hyderabad have been selected for data collection to measure efficiency through DEA Approach using CCR Model. All the 10 banks are exposed to a common frontier. The overall technical efficiency measured by λ (CRTS) is calculated to each of the banks Out of 10 private banks only three has been emerged as efficient and the remaining banks experienced input losses due to over all technical efficiency. The Technical Efficiency variation for the 10 private banks has the following bounds.

$$0.862 \leq \lambda (CRTS) \leq 0.984$$

The Technical Efficiency variation for Efficient Banks is 1.000.

For DMU 1 the technical efficiency is 0.862 ≈ 0.9. According to the “returns to scale

constant “its current outputs with only 90% of inputs is produced, it means 10% of inputs are freely disposed or cost lessly disposed. The overall technical efficiency measured by constant returns to scale is calculated to each of the banks.

Table: Statistic by CCR Model

Result Analysis	CCR Score
No of efficient institutions	3
No of inefficient institutions	7
Average efficiency result	0.9421
Standard deviation	0.08563
Maximum efficiency result	1.000
Minimum efficiency result	0.862
Coefficient of Variation	6.435

5. CONCLUSION

Mathematical models that were described and applied in this paper clearly indicate their important role in operational analysis of banking sector of one country at specific period of time. DEA is applicable to a comparative analysis of banks and their grouping according to performance in various aspects of business. Based on the analysis, the bank management could direct the bank development in order to improve the business. For this kind of analysis, two aspects have been considered that directly determine business accomplishment of a bank - costs and revenues, but also the employment structure. Some of these banks have shown very different results according to these models, depending on whether it is a bank of the public or private sector, i.e. foreign bank. During this research, the number of branches has not been considered, and this is a very important indicator when it comes to operation performance of a bank, because if there are branches also in rural areas, for bank that means more profit because of its prevalence throughout the country. The success for the banks represents a constant influx of new clients, so management has a job to devote itself to the improvement of the bank operation, in order to gain more money and thus become a superefficient unit.

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