Chapter 22

Bank Branch Efficiency with DEA

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ABSTRACT

In this chapter, the extent of inefficiency of bank branches in different dimensions is evaluated with slack-based model of data envelopment analysis. Each efficiency dimension reveals the strengths, weaknesses, and improvement capabilities of branches. Multi-dimensional comparison enables the determination of the overall characteristics and the choice of the improvement strategies accordingly. An extensive literature analysis of bank branches and future research directions is also presented.

INTRODUCTION

Sherman and Zhu (2006b) list at least 14 techniques for service productivity management: Standard cost systems, comparative efficiency analysis, ratio analysis, profit and return on investment measures, zero-base budgeting, program budgeting, best practice analysis, peer review, management reviews, activity analysis, process analysis, staffing models, balanced scorecards and data envelopment analysis. Paradi and Zhu (2013) mention common performance measurement approaches applied to bank branches as ratio analysis, regression analysis, frontier efficiency analysis, and other artificial intelligence techniques (i.e. neural networks, analytic hierarchy processes and balanced scorecards). Here, we will focus on non-parametric frontier efficiency tool, data envelopment analysis (DEA), to measure efficiency of bank branches.

DEA is proved to be one of most important performance and decision analysis tools in management of bank branches. Not only it benchmarks the branches, provides potential improvement capabilities, indicates sources of inefficiency, it also helps to determine the overall situation in different dimensions.

One purpose of this study is to investigate the production and profitability dimensions of bank branches in order to reveal their performing characteristics. Multidimensional analysis enables us to develop a performance model for measuring the relative efficiency and improvement capabilities of bank branches.

DOI: 10.4018/978-1-4666-4474-8.ch022
by identifying their strengths and weaknesses in different aspects. Another purpose is to analyze bank branch efficiency studies and present an overall look and perspective. The study distinguishes from the others with an extensive list of researches.

The chapter proceeds as follows. In the next section data envelopment analysis, sources of inefficiency and approaches in determining inputs and outputs are explained. Then, efficiency studies with data envelopment analysis are described. In the following section, an empirical multidimensional bank branch efficiency analysis is conducted. Finally future research directions and conclusions are presented.

**EFFICIENCY MEASUREMENT**

**Data Envelopment Analysis**

Farrell (1957) may be assumed as the founder of non-parametric frontier efficiency technique. He introduced a model that can handle production process with multiple inputs and multiple outputs, and also can be applied to a single unit, a sector or a whole economy. In addition to measuring overall inefficiency, the method made it possible to diagnose the source of inefficiency as lack of input to output conversion process (pure technical efficiency) or performing with inappropriate size (scale inefficiency). He also constituted the frontier not from a theoretical or parametric production function but from the observed best practice observations. His model measures efficiency of a production unit by maximizing the ratio of weighted outputs to weighted inputs provided that score “1” is assigned to the best performing unit. All the ratios of the other units are calculated in accordance with best performing units and they are assigned relative values between “0” and “1”.

In spite of Farrell’s diagnosis, only Charnes, Cooper and Rhodes (1978) (CCR) could have implemented the treatment for the first time. They used the model to calculate the performance of a non-profit organization (schools) and named the model as Data Envelopment Analysis (DEA) and units as Decision Making Unit (DMU). Their model (CCR) assumes production frontier to have constant returns to scale (CRS) characteristics, i.e. a proportional increase in inputs causes the same proportionate increase in outputs.

Banker, Charnes and Cooper (1984) (BCC) relaxed CRS assumption and introduced variable returns to scale (VRS) frontier, i.e. a proportional increase in inputs causes the different proportionate increase in outputs. If the rate of increase of inputs causes less than rate of increase in outputs, then Decreasing Returns to Scale (DRS) holds. If rate of increase in inputs results outputs to increase with a greater proportionate, then efficient frontier is said to have Increasing Returns to Scale (IRS) characteristics. The purpose of decision maker is to direct the production unit towards most productive scale size (MPSs) region.

CCR measures technical efficiency which is the success of converting inputs to outputs. Technical inefficiency means, because of technical deficiencies and/or wrong production scale, producing more outputs with same input or producing same output with less input is possible. BCC model measures pure technical efficiency of a DMU to see whether it operates at most productive scale size. Since pure technical efficiency and scale efficiency both composes technical efficiency, by using CCR and BCC model together scale efficiency can be calculated to see whether a DMU is operating at optimum size. Using both CCR and BCC at the same time provide us to analyzes the reasons of inefficiency in more detail.
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