An Empirical Analysis of Shandong Power Grid Operational Efficiency Based on DEA-Malmquist

Liqing Zhu, Tianjin University, China
Xueli Zhan, Beijing Wuzi University, China

ABSTRACT

This article intends to use China State Grid Corp’s business performance evaluation system to study the Shandong Electric Power Group Corp’s power grid operation efficiency. And through analyzing the operational efficiency of each decision unit by DEA, we analyze the adjustment direction of the input and output on the angle of horizontal, vertical and internal analysis, find the investment shortage, and put forward some improvement measures. From the changes of the input and output efficiency in the last 15 years, the changing trends of the total factor productivities is found, and the successful experience of the high efficiency is obtained with the specific background.

KEYWORDS
DEA, Empirical Analysis, Making Unit, Malmquist, Operational Efficiency

INTRODUCTION

State Grid Shandong Electric Power Group Corporation is a wholly owned subsidiary of the State Grid Corporation, responsible for planning the Shandong power grid construction and providing safe, reliable and high-quality supply of electricity. By the end of 2011, Shandong Company has been established 21 departments, managed 17 city power supply enterprises and 98 county power supply enterprises, served 3.5 million customers and supplied 95,790,000 population and 15.7 km² area for power. In 2011, the sales of Shandong company have exceeded 30 billion kwh for the first time, with an increase of 22.3%.

With the expanding of the power grid, is the power grid enterprise operation efficiency improved significantly at same time? It's of guiding significance to improve the efficiency of Shandong transmission and distribution network. This paper studies Shandong Electric Power Group Corp’s power grid operation efficiency from the angle of horizontal, vertical and internal analysis. We choose 17 city power companies under the control of Shandong Electric Power Group Corp as a decision-making unit. Through the DEA analysis, we help the Liaocheng power supply company to look for the operation difference with the same level power supply company, and put forward the improvement measure.

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A REVIEW OF LITERATURE

Research Status and Literature Review

For Inner Mongolia power grid operation efficiency and stability problems, Yang (2009) adopted the Inner Mongolia power grid operation data to make analysis on the power market structure, power grid structure and operation of the way, power production demand forecasting, power system stability analysis and security constraints, etc.

Tang Hong et al. (2012) constructed a super efficiency evaluation model to solve the problem that multiple effective decision-making units could not be sorted. Yan (2014) proposed a method of grid performance analysis based on DEA. The R clustering technique was used to classify different power grids. The DEA performance analysis. Liang et al. (2007) for the regional power supply companies, the power supply price incentive model is studied. The empirical analysis is carried out with the electric power statistics data.

Long (2014) made grid as an input-output link, using Data Envelopment Analysis (DEA) method to evaluate the input and output efficiency for power system of State Grid Corporation and analyze input and output efficiency of State Grid Corporation over the past 15 years. The efficiency level of each year is significantly correlated with the electric power system and the economic situation. Thanassoulis (2011) applied Data Envelopment Analysis (DEA) to higher education institutions in England to assess their cost structure, efficiency and productivity.

Zhang (2012) used Data Envelopment Analysis method and Malmquist index. The number of employees and line length are taken as the input variables. The sell electricity and the number of users are taken as output variables. Thus, the power grid of China’s technical efficiency and total factor productivity, and empirically tested the impact of grid investment growth, electricity and other factors on the transmission and distribution grid technology efficiency can be measured. Dong (2015) used Data envelopment analysis (DEA) and Malmquist productivity index (MPI) to analysis operational efficiency across the Chinese aerospace industry. Kim (2014) used the DEA and the MPI to analysis the effect of the public highway corporations reform on the overall efficiency of the public highway corporations.

Song (2014) studied the existing power grid equipment of our country assets utilization from the view of the asset management. Economically speaking, we establish a set of grid assets economic evaluation index system, taking correlation analysis method to establish economic evaluation index of optimization and screening.

Huang (2014) adopted the Malmquist based on DEA productivity index method to study power grid enterprise technology and production efficiency of the dynamic changes in the situation. The results show that the average growth rate of the total factor productivity of the sample grid enterprises in 2005-2010 is 3.2%, which is the key to improving the productivity of the power grid enterprises in China. Lee (2015) adopted the DEA to account for the effect of sales on operational performance measurements in a production system. Based on the operating survey of catering service in international tourist hotels in Taiwan in 2008-2010, Mao (2011) improved the operational efficiency of catering service in international tourist hotels by the DEA method. Vaz (2012) analyzed the performance of retailing stores by using a Malmquist-type index and statistical tests.

Niu (2013) took human input as a science and technology index for Power Grid Corp investment. The sale of electricity, electricity to quality, reliability and power loss rate are taken as output indicators. DEA-Malmquist index approach is adopted to calculate the efficiency of scientific and technological innovation, and is decomposed into technical efficiency and technical progress.

This work has been carried out for the national network, and these suggestions can be helpful to study the efficiency of power grid operation in Shandong province. The research objects are mainly concentrated on the national power grid and its affiliated provincial network companies are lack of performance evaluation for the provincial Power Grid Corp and its subsidiaries.
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