Goal Programming Three-Level Data Envelopment Analysis Model: Measuring The Efficiency of The Egyptian Electricity Production Companies

Afaf El Dash [1] Ramadan Hamed [2] Aly El-Hefnawy [3] Rasha A. El Sayed [4]

Abstract

Data Envelopment Analysis (DEA) is a mathematical programming-based methodology for evaluating the relative efficiency of each member of a set of organizational units. These units are called decision-making units (DMUs). They consume various levels of inputs and produce various levels of outputs. DMUs have been studied for one-level and two-level setups. Yet, the organizational set might involve more than two levels. In this paper, a three-level DEA model is suggested to measure the relative efficiency of three-level DMUs. It supplies the decision maker with more information and specifies sources of inefficiency which helps in future planning. The suggested model is used to measure the relative efficiency values of the Egyptian Electricity Production Companies that are responsible for producing electricity. The results show that using the three-level DEA model captures the sources and values of inefficiency in the lower-level units.

Keywords: *Data Envelopment Analysis , Relative Efficiency , Multi-Level Decision-Making Unit , Nonlinear goal programming.*