

Efficiency decomposition for two-process production systems with shared inputs in data envelopment analysis

ABSTRACT

Zha and Liang [10] develop an approach for measuring the efficiency of two-process production systems where the inputs of the system can be freely allocated between two processes. They represent the overall efficiency of the system as a product form, to integrate the efficiencies of the two processes. A major restriction of Zha and Liang's model is its non-linearity. This paper develops a relational DEA model, taking into account the series relationship among two processes, to measure the overall efficiency of two-process production systems with shared inputs. The linearity of DEA models is maintained in the new model. Also, by introducing dummy process, the original production system can be transformed into a two-stage system where the first stage has a parallel structure. We utilize the relational model to propose a model that the overall efficiency score of the system is decomposed into the product of the efficiencies of the stages. This helps the decision makers identify the inefficient stages and make later improvements. A numerical example of US commercial banks is used to clarify the model.

Keyword: Data envelopment analysis; Decision making unit; Efficiency; Shared input; Two-process production system