

Second Order Cone Optimization Approach to Two-stage Network DEA

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Abstract : Data envelopment analysis is an approach to measure the efficiency of decision making units with multiple inputs and outputs. The structure of many decision making units also has decision-making subunits that are not considered in most data envelopment analysis models. Also, the inputs and outputs of the decision-making units usually are considered desirable, while in some real-world problems, the nature of some inputs or outputs are undesirable. In this thesis, we study the evaluation of the efficiency of two stage decision-making units, where some outputs are undesirable using two non-radial models, the SBM and the ASBM models. We formulate the nonlinear ASBM model as a second order cone optimization problem. Finally, we compare two models for both external and internal evaluation approaches for two real world example in the presence of undesirable outputs. The results show that, in both external and internal evaluations, the overall efficiency of ASBM model is greater than or equal to the overall efficiency value of the SBM model, and in internal evaluation, the ASBM model is more flexible than the SBM model.

Keywords : network DEA, conic optimization, undesirable output, SBM

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