

Abstract

Classical efficiency studies on data envelopment analysis (DEA) consider all its inputs and outputs are desirable factors and real valued-data. Additionally, the DEA models only focus either on input-oriented projection minimizing inputs for an inefficient decision making unit (DMU) while keeping outputs at their maximum level, or output-oriented projection maximizing outputs under the present level of input consumption. To simultaneously deal with input excesses and output shortfalls maximizing both projections, this paper proposes a bi-objective DEA model in the context of undesirable factors and mixed integer requirements. These factors and requirements were integrated into the objective function and constraints of the existing bi-objective models. In addition, the proposed model estimates the returns to scale of DMUs that depends on the projections of input reduction and output augmentation. The applicability and usefulness of the proposed model were tested using the dataset of 39 Spanish airports retrieved from the literature. Besides, the proposed model was compared with the three existing bi-objective DEA models in the literature to test its validity.