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RESOURCE ALLOCATION APPROACH BASED ON DIFFERENT ENVIRONMENTAL DATA ENVELOPMENT ANALYSIS (DEA) TECHNOLOGIES

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Abstract

As environmental problems are of concern in modern times, decision makers, dealing with resource allocation, should consider environmental aspects. This paper examines a resource allocation problem confronted by a central decision making unit. The central unit is assumed to be interested in maximizing the total amount of desirable outputs. The optimal scale of production is obtained by allocating available resources to decision making units (DMUs) efficiently under the current production possibility set and some specific assumptions on the undesirable outputs (such as CO_2). In the proposed model, data envelopment analysis (DEA) techniques are applied to the evaluation of environmental efficiency and multiple-objective linear programming (MOLP) is formulated to obtain the objectives. Compared with the traditional resource allocation problem under the framework of DEA, the proposed model accurately reflects environmental influences. Based on assumptions from the constant returns to scale and various returns to scale, some quantitative information is obtained for enterprise operations and production management. A provincial power industry dataset from China is used to illustrate the model. Based on the results of the efficiency analysis, the optimal plan for resource allocation that aims to maximize every desirable output is obtained by solving the proposed multi-objective programming model and the environmental constraints for each province are validated.

Key words: data envelopment analysis (DEA), multiple-objective linear programming (MOLP), production possibility set (PPS), undesirable output

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