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DEA Environmental Assessment: Models and Applications

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ABSTRACT

This study introduces three approaches for environmental assessment based on the data envelopment analysis (DEA), which is a popular method to examine the production efficiency of decision-making units. We also explain the basic concepts and application examples of these approaches. Specifically, we present three types of DEA environmental assessment (DEA-EA). In previous studies, DEA-EA has been classified into radial model and non-radial model. This study presents the intermediate approach and intermediate model as a third option and discusses the characteristics of each. Although DEA-EA is originated from DEA, it differs in terms of model structure and application targets. Given that environmental issues and energy issues are closely related, energy and environmental problems and the energy industry itself can be the main subjects of DEA-EA. The energy industry provides the infrastructure that is directly linked to people's lives, but on the other hand, it emits greenhouse gases such as carbon dioxide (CO_2) through the combustion of fossil fuels. In the case of the electricity industry, for instance, electricity is produced as a desirable output, while the combustion of fossil fuels emits CO_2 as an undesirable output. In order to achieve a balance between the economy and the environment, we present that DEAEA is a promising approach to assess production efficiency that takes both of these aspects into account.

Keywords: data envelopment analysis, energy and environment, production efficiency, three approaches, intermediate model