

## Series Network-Structured Inverse Models of Data Envelopment Analysis: Pitfalls and Solutions

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**Abstract :** Nowadays, data envelopment analysis (DEA) models featuring network structures have gained widespread usage for evaluating the performance of production systems and activities (Decision-Making Units (DMUs)) across diverse fields. By examining the relationships between the internal stages of the network, these models offer valuable insights to managers and decision-makers regarding the performance of each stage and its impact on the overall network. To further empower system decision-makers, the inverse data envelopment analysis (IDEA) model has been introduced. This model allows the estimation of crucial information for estimating parameters while keeping the efficiency score unchanged or improved, enabling analysis of the sensitivity of system inputs or outputs according to managers' preferences. This empowers managers to apply their preferences and policies on resources, such as inputs and outputs, and analyze various aspects like production, resource allocation processes, and resource efficiency enhancement within the system. The results obtained can be instrumental in making informed decisions in the future. The top result of this study is an analysis of infeasibility and incorrect estimation that may arise in the theory and application of the inverse model of data envelopment analysis with network structures. By addressing these pitfalls, novel protocols are proposed to circumvent these shortcomings effectively. Subsequently, several theoretical and applied problems are examined and resolved through insightful case studies.

**Keywords :** inverse models of data envelopment analysis, series network, estimation of inputs and outputs, efficiency, resource allocation, sensitivity analysis, infeasibility

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