Sequential Decision-making in Interdependent Sectors with Multiobjective Inoperability Decision Trees: Application to Biofuel Subsidy Analysis

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Abstract

Decision-making involving large-scale systems often involves considerations for temporal changes, interdependencies in organizational structures, multiple competing objectives, and risk and uncertainty, among others. In this paper we develop a risk-based methodology, the Multiobjective Inoperability Decision Tree (MOIDT). It integrates several dimensions of decision-making processes associated with interconnected systems in terms of: (i) evaluation of sequential policies, (ii) analysis of interdependencies, (iii) treatment of multiple objectives and their tradeoffs, and (iv) characterization of uncertainties. To demonstrate the integration of these four components, we present a case study to analyze the impact of government policies towards mass-scale biofuel production. Using a multi-period decision framework, the analysis utilizes economic input-output data to model the probabilistic demand adjustments for sectors that will likely be affected by biofuel policies.

Keywords: Interdependency analysis, multiobjective decision-making, sequential decision-making, extreme event analysis, biofuel subsidy.