Mathematics > Optimization and Control

Stochastic Switching Games and Duopolistic Competition in Emissions Markets

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We study optimal behavior of energy producers under a CO_2 emission abatement program. We focus on a two-player discrete-time model where each producer is sequentially optimizing her emission and production schedules. The game-theoretic aspect is captured through a reduced-form price-impact model for the CO_2 allowance price. Such duopolistic competition results in a new type of a non-zero-sum stochastic switching game on finite horizon. Existence of game Nash equilibria is established through generalization to randomized switching strategies. No uniqueness is possible and we therefore consider a variety of correlated equilibrium mechanisms. We prove existence of correlated equilibrium points in switching games and give a recursive description of equilibrium game values. A simulation-based algorithm to solve for the game values is constructed and a numerical example is presented.

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