

Risk Aversion and Dynamic Games between Hydroelectric Operators under Uncertainty

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Abstract : This article analyses management of hydropower dams within two different industrial structures: monopolistic and oligopolistic; when hydroelectricity producers are risk averse and face demand uncertainty. In each type of market structure we determine the water release path in closed-loop equilibrium. We show how a monopoly can manage its hydropower dams by additional pumping or storage depending on the relative abundance of water between different regions to smooth the effect of uncertainty on electricity prices. In the oligopolistic case with symmetric rates of risk aversion, we determine the conditions under which the relative scarcity (abundance) of water in the dam of a hydroelectric operator can favor additional strategic pumping (storage) in its competitor's dams. When there is asymmetry of the risk aversion coefficient, the firm's hydroelectricity production increases as its competitor's risk aversion increases, if and only if the average recharge speed of the competitor's dam exceeds a certain threshold, which is an increasing function of its average water inflows.

Keywords : asymmetric risk aversion, closed-loop Cournot competition, electricity wholesale market, hydropower dams

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