

Drought, water, and the valuation of hydropower assets

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Abstract-

The increased impact of extreme weather events and droughts has prompted the rapid growth of the water market. This paper develops a real options valuation model for a hydropower plant that incorporates uncertainty in water and electricity prices, water inflows, and drought severity. Using a stochastic optimal control framework, the model is calibrated with monthly data from a reservoir in California. Water inflow and prices are modeled as functions of the California Drought Severity Index. Results highlight strong seasonality and uncertainty in price dynamics and show that revenues from water rights trading are highly sensitive to climate conditions. The model provides a comprehensive understanding into managing and valuing hydropower reservoirs under volatile environmental and market conditions.

Index Terms- Hydropower asset; Drought; Water; Optimal control; Climate change

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