



Futures Markets for Water in California: Effective Management of Supply-Side Risk

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We seek to determine the theoretical value of transferring water uncertainty from one party to another at several locations in California, given current water prices and the spatial and temporal distribution of water year types in the state. Our simulation-optimization model currently makes the calculation for the northernmost region of California; next, we plan to extend the model to the rest of the State.

In California, the tremendous spatial and temporal variation in precipitation suggests that flexible contractual arrangements, such as option contracts, would increase allocative efficiency of water over time and space. Under such arrangements, a water agency pays an option premium for the right to purchase water at some point in the future, if water conditions turn out to be dry. The premium represents the value of the flexibility gained by the buyer from postponing its decision whether to purchase water. In California, the seller of existing option arrangements is often an agricultural producer who can fallow land, in the event that a water option is exercised.

In this analysis we seek to determine the theoretical value of transferring water uncertainty from one party to another at several locations in California, given current water prices and the spatial and temporal distribution of water year types in the state. (Preliminary analysis covers northern California; future analysis will incorporate southern California.) We use tools from finance theory and output from CALVIN, an economic-engineering optimization model of the California water system. CALVIN runs the current configuration of the California water system over historical hydrological conditions, to generate water's imputed price at different locations during different seasons. We analyze within a mathematical

programming framework whether increased trading among water agencies across time as well as space would result in significant gains from trade. Finally, we explore reasons why previous theoretical calculations of option value in the western United States have far exceeded option premia on existing bilateral contracts.

Professional Presentations

Hansen, Kristiana, Richard Howitt and Jeffrey Williams, Water Options in California: Effective Management of Supply-Side Risk, American Agricultural Economics Association, Long Beach, CA, July 2006; and Universities Consortium on Water Research, July 2006.

Collaborative Efforts

Economists at the Bureau of Reclamation, Lower Colorado Division in Boulder City, Nevada, have expressed significant interest in the final outcome of this project and continue to provide guidance and suggestions on the modeling of institutions within the project.

This simulation-optimization modeling project and the difficulties associated with acquiring data on water transfers due to the infrequency of trades and the reluctance of water traders to provide such information have led us to explore another avenue of

research. We have begun an experimental economics project to examine the behavior of subjects under different market institutions in a laboratory setting. This research is undertaken with colleagues in the Department of Economics at Sacramento State University, Jonathan Kaplan and Stephan Kroll.

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