Financial hedging strategies for mitigating the financial risks of water scarcity for water utilities: A national perspective

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We have observed that one of the most common—but certainly not the only—reasons for a utility to miss its financial targets in a fiscal year is because of weather.

Chapman, 2012 (S&P CreditWeek Report)

*miss its financial targets weather*
How does weather cause financial risk?

- Increases in water sales
- Decreases in water sales

Mild drought
Severe drought

Decreases in water sales
How does weather cause financial risk?

Majority of variability in net revenue is from variable sales revenue.

Why does weather-related financial risk matter?
What are we doing now to mitigate these weather-related financial risks?

- Increased supply capacity
- Supply transfers
- Conservation rates
- Self insurance

- Financial hedging
Index-based financial hedging

- More transparent
- More efficient
- Lower administrative costs
- Greater scalability
Financial hedging: risk pooling

risk pooling: many utilities, more predictable losses ➔ lower premiums

risk shifting: one utility, less predictable losses ➔ higher premiums
Risk pooling using index-based insurance

- **Risk pooling**: many utilities, more predictable losses $\rightarrow$ lower premiums
- **Risk shifting**: one utility, less predictable losses $\rightarrow$ higher premiums

Risks must be uncorrelated.
Weather risks are spatially correlated.
But if we pooled over large enough regions, the correlations could become negligible.
Risk pooling across the US to mitigate the financial risks of water scarcity.

Potential indices for index-based insurance:

- Precipitation
Risk pooling across the US to mitigate the financial risks of water scarcity

- Precipitation

- Drought indices
Risk pooling across the US to mitigate the financial risks of water scarcity

- Precipitation
- Drought indices
2005 Streamflow and Revenue
2010 Streamflow and Revenue
2011 Streamflow and Revenue
2012
Streamflow
and Revenue
Using a streamflow index

- 60% of water utilities
- 9,000 utilities nationally
- Limitations of risk pooling dataset
- 8-10 years of revenue data
- Tradeoffs in more utilities: less detailed data
Can we pool these non-independent risks?

YES...

with 500 miles of distance
Next steps to assessing the potential benefits of risk pooling

- Test the performance of different contracts through risk pooling
- Retrospectively evaluate the tradeoffs in risk pooling versus risk shifting for a few specific utilities