Hydro meteorological Short-Range Ensemble Forecasts in Complex Terrain Part II: Economic Evaluation

Two economic models:

Cost-loss model

Utility maximizing decision theory model

Operating Constraints in a reservoir:

1. Maximizing hydraulic pressure head to maximize generation
2. Avoiding spill over during high inflow seasons
3. Maintaining minimum discharge under dry conditions for downstream aquatic habitat
4. Maintaining stationary reservoir levels despite fluctuating inflow for recreational use (BC law).

Future rainfall uncertainty = inflow uncertainty = difficult for operators to ensure the operating constraints.

1. Cost-Loss model = same as in Roland’s book

First,

High C/L ratio operators can get maximum value from a forecast only when the threshold probability of a given event is high enough.

1. Decision Theory Model

Optimum decisions in an uncertain environment are associated with the maximum of expected rewards. Expected rewards means maximize gain or minimize loss.

Utility function = perceived worth of an outcome

x = user’s decision

y = outcome of the decision x

U (x, y) is the perceived worth of an outcome, which in turn depends on the decision.

The decision x should be made such that the utility function is maximized. The utility function is chosen by the

Future research will include a hydro meteorological model driven by probabilistic meteorological input variables to determine inflows and, ultimately, available energy.

4. Case Study scenarios:

for the utility function they have converted the inflow rate in-terms of the rainfall rate as there was a high Pearson correlation coefficient, which indicates linearity.

Conclusions:

* Forecast skill = depends on type of the forecast, but user independent
* Forecast value = depends on the user