

Soft Decision Analysis

From a standpoint of "computing with words," the expected utility method begins by

- converting natural perceptions of how usual or unusual the possible states are into ratio scale probability estimates , and**
- converting natural perceptions of how acceptable or unacceptable the possible outcomes of state-action pairs are into interval scale utility numbers**

A direct generalization: use fuzzy numbers to represent perceptions & extension principle to find fuzzy expected utility

Ordinal Methods

Most likely Outcome (prevalent in practice, frowned upon in theory)

Worst Case Analysis

These two ordinal methods consider either the maximal usability alone or the maximal disutility alone.

Possibilistic Decisionmaking

**fuzzy set of bad outcomes & fuzzy set of possible states of nature
action has a fuzzy set of outcomes that are threats: both possible and
bad**

risk of an action is the greatest threat of its possible outcomes.

Example:

Utilities

	Usual	Plausible	Rare
actions:	State	State	State
A1	good	fair	poor
A2	good	poor	fair
A3	fair	poor	good
A4	poor	good	fair
A5	poor	fair	good

Equivalent Disutilities:

	Usual	Plausible	Rare
actions:	State	State	State
A1	low	medium	high
A2	low	high	medium
A3	medium	high	low
A4	high	low	medium
A5	high	medium	low

	Usual State	Plausible State	Rare State	Overall Risk
A1	min(low, usual) = low	min(medium, plausible)	min(high, rare) = rare	Max(low, min(medium, plausible), rare) =min(medium, plausible)
A2	min(low, usual) = low	min(high, plausible) = plausible	min(medium, rare) = rare	max(low, plausible, rare) = plausible
A3	min(usual, medium) = medium	min(high, plausible) = plausible	min(low, rare) = rare	max(usual, plausible, rare) = max(usual, plausible)
A4	min(usual, high)	min(low, plausible) = low	min(medium, rare) = rare	max(min(usual, high), low, rare) = min(usual, high)
A5	min(usual, high)	min(medium, plausible)	min(low, rare)	max(min(usual, high), min(medium, plausible), min(low, rare)). =min(usual, high)

Ranking actions from lowest to highest disutility, we have:

Action	A1	\leq	A2	\leq	A3	\leq	A3	$=$	A5
Disutility	min(usual, plausible)	\leq	plausible	\leq	max(usual, plausible)	\leq	min(usual, usual)	$=$	min(usual, usual)

So A1 is our first choice, with A4 and A5 tied for last.

Decision Making and Rhetoric

rhet·o·ric n. 1.a. The art or study of using language effectively and persuasively.

“Language” can include both the language of mathematics and modern methods of “computing with words.”

“Effectively and persuasively” means leading someone towards making a desired decision; in this context, the ‘desired’ decision means a good decision, and the person to be persuaded is oneself or one’s organization. The highest goal of decision analysis is to provide effective and persuasive elements that will inform the process of making good human decisions, not to automate human decisions away.