Sampling in Decisions from Experience

https://github.com/linushof/sampling-in-dfe

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Project Description

Starting Ideas

1. Description-experience gap cf. Wulff et al. 2018
2. Empirical samples that carry over to cognitive processes

Core Question

- May samples be generated in such a way that they produce systematic choice patterns?

Difference between DfD and DfE

- Decisions from Description (DfD): Function of symbolical descriptions of prospects (gambles):

$$D := f((\Omega_1, P_1), ..., (\Omega_k, P_k))$$

- Decisions from Experience (DfE): Function of sample sequences originating from prospects:

$$D := f(X_{i1}, ..., X_{ik})$$

- f informed by psychological theory and empirical protocols

Sampling and Decision Strategies

- Hills and Hertwig (2010): Assumption of a systematic link between sampling and decision strategies
- Sampling strategy: Succession of single samples in a sequence generated from multiple prospects
  - Piecewise: Single samples from **different** prospects
  - Comprehensive: Single samples from **same** prospect

Modeling the Assumptions of Hills & Hertwig (2010)

- f maps a comparison of $\overline{X}$ and $\overline{Y}$ on the set $\{0, 1\}$, with 0 (1) indicating a lost (won) comparison:

$$D := f(\overline{X} - \overline{Y}) = \begin{cases} 1 & \text{for} \quad \overline{X} - \overline{Y} > 0 \\ 0 & \text{else.} \end{cases}$$

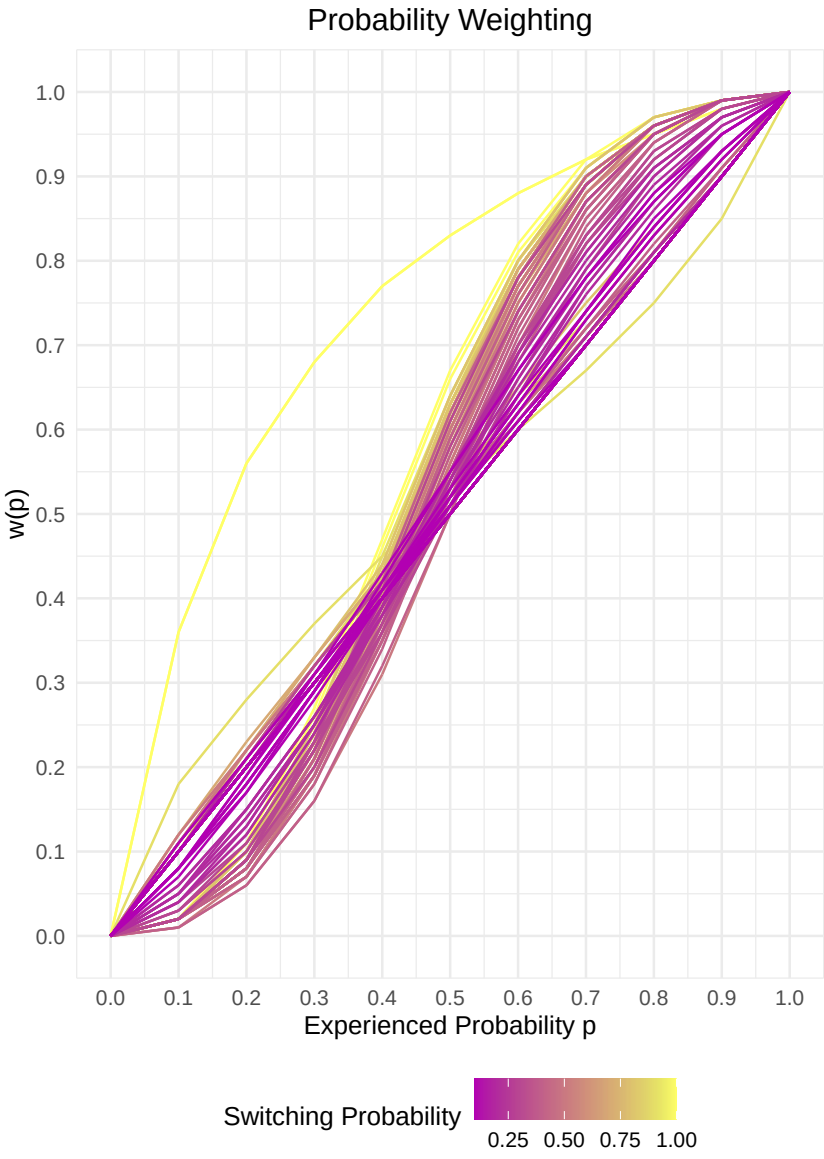
- A series of ordinal comparisons $D_i = D_1, ..., D_n$ is a Bernoulli process where the number of won comparisons follows the binomial distribution

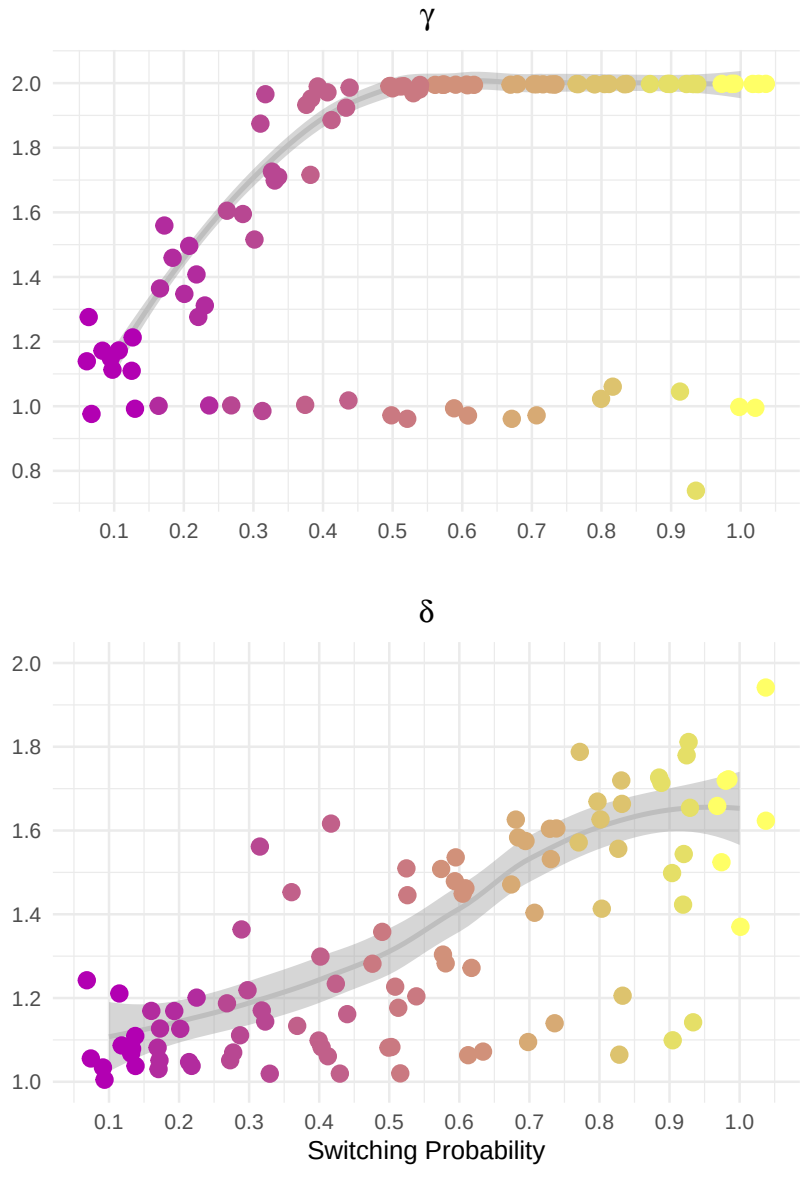
$$D \sim \mathcal{B}\left(p\left(\overline{X} - \overline{Y} > 0\right), n\right)$$

Method

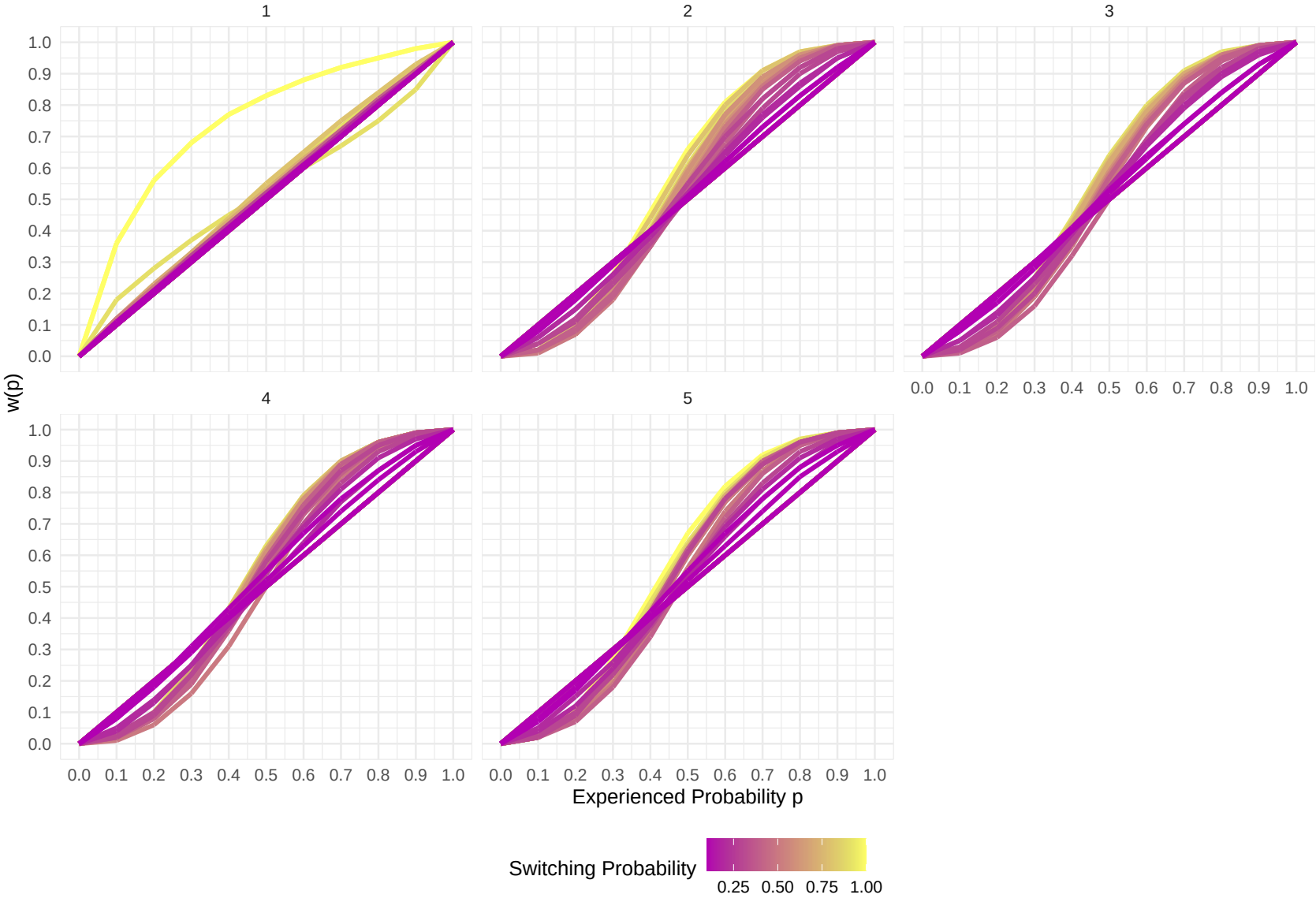
- 60 choices between a 2-outcome prospect and a safe prospect
- 100 synthetic agents
- Parameterization of the sampling and decision process
  - Probability of switching between prospects
  - Number of comparisons
- Description of simulated DfE in Cumulative Prospect Theory

Probability Weighting

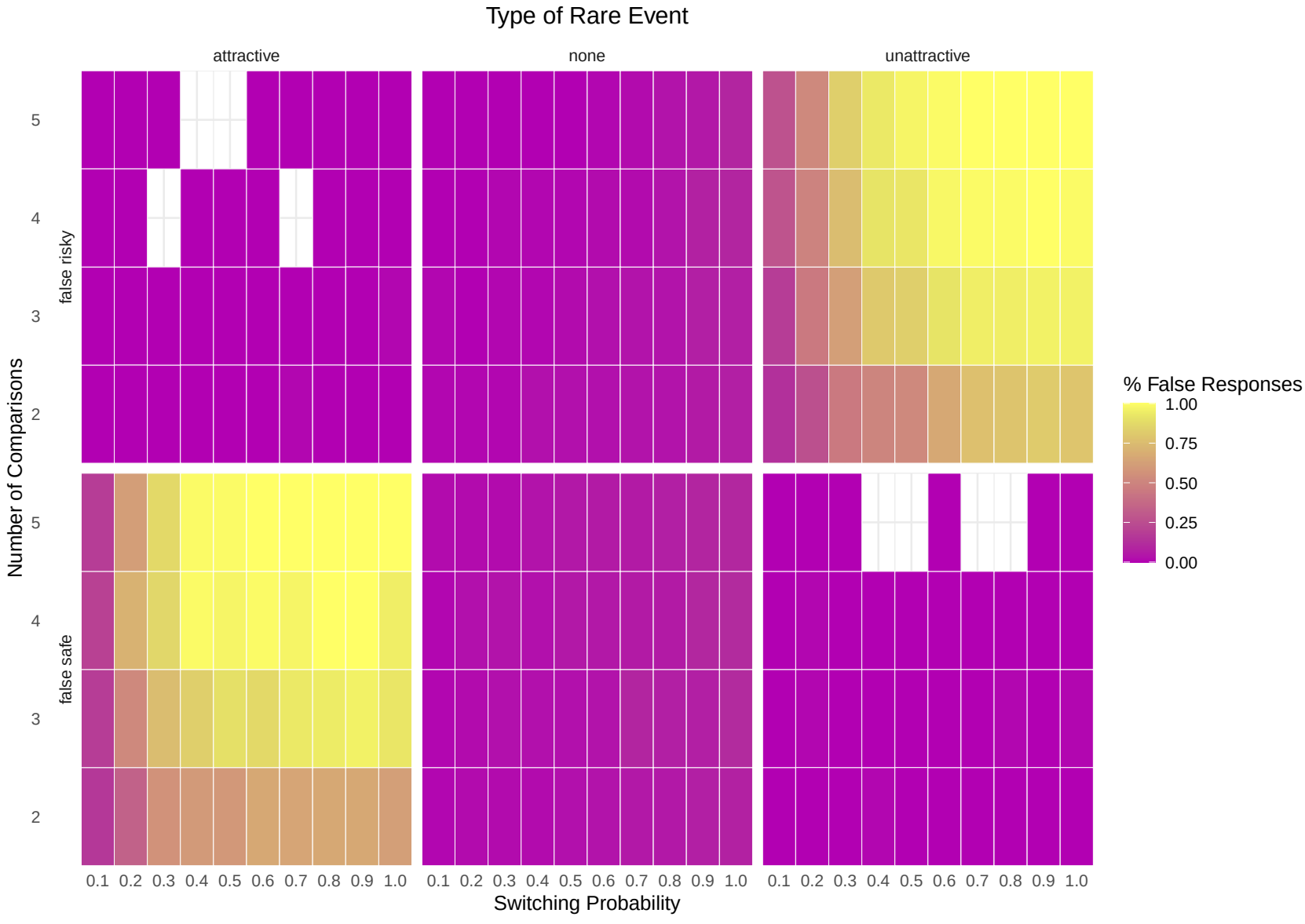




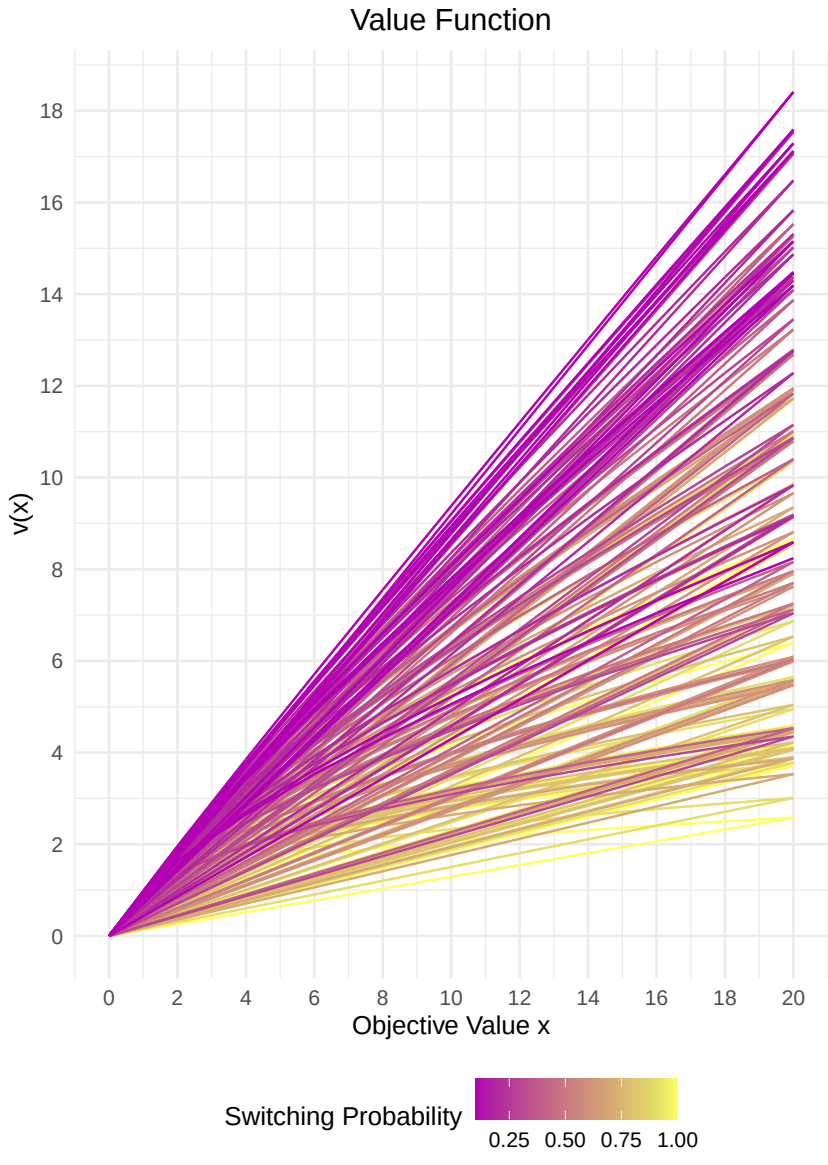
Probability Weighting: Multiple Comparisons

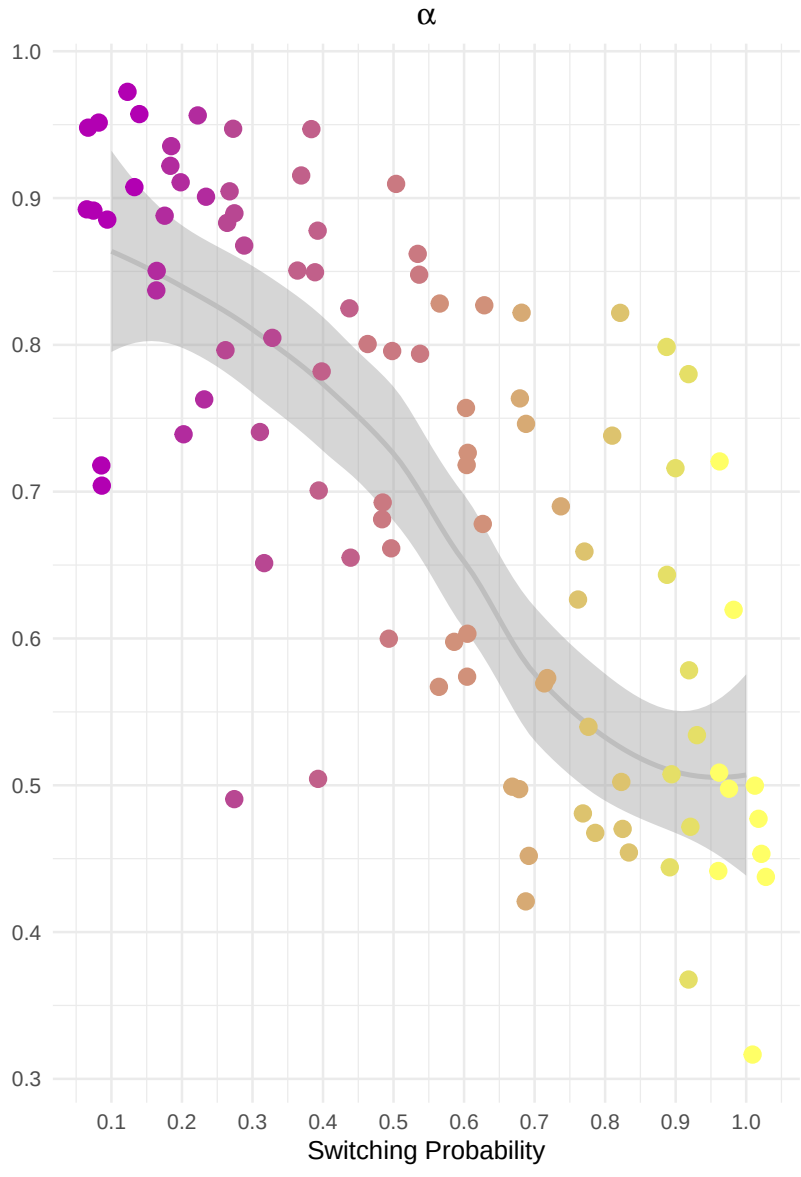


False Response Rates

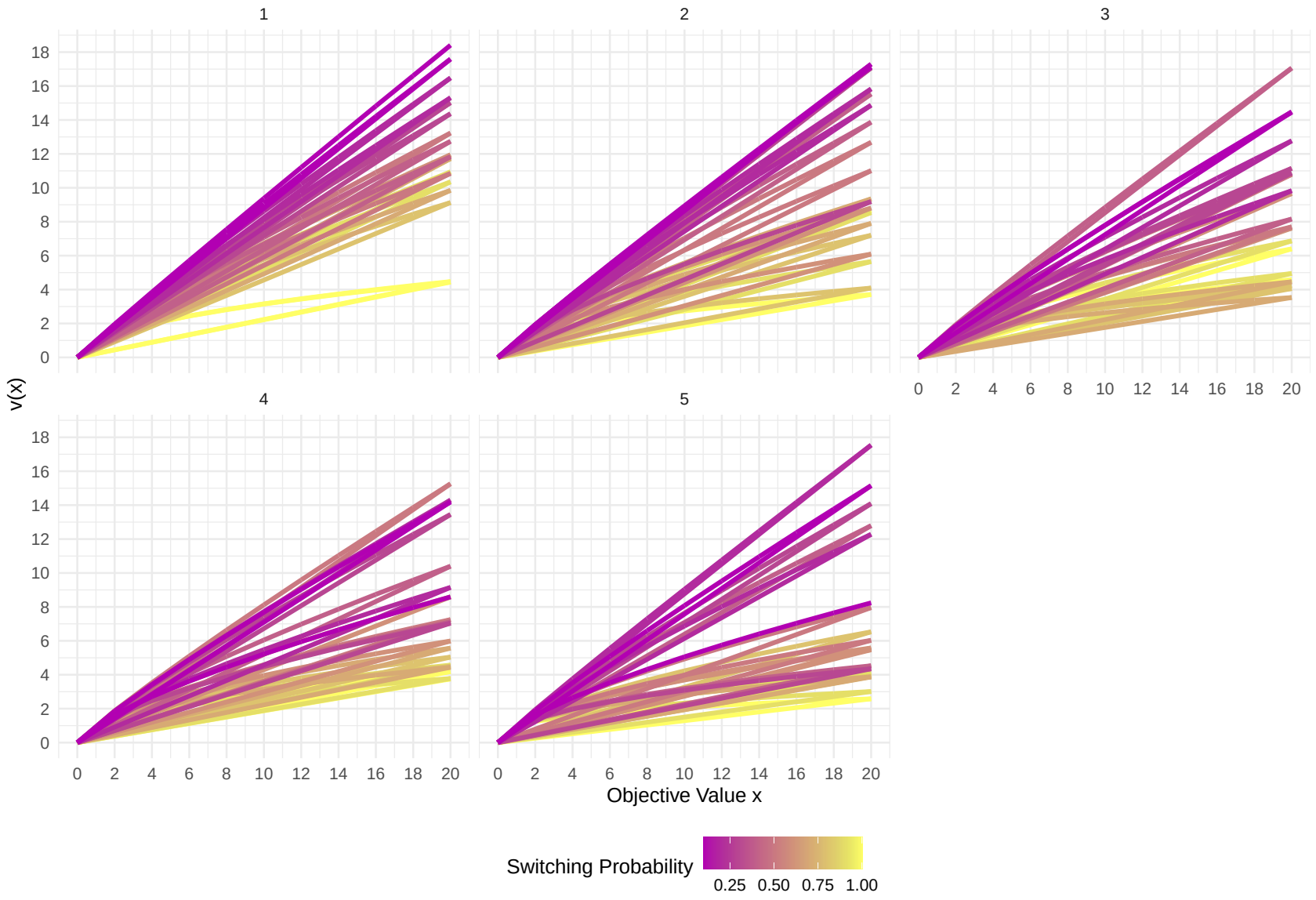


Value Function





Value Function: Multiple Comparisons



Summary and Q&A

Random processes underlying DfE . . .

- . . . can be modeled according to probability theory
- . . . can be integrated into current decision theories
- . . . could be shaped by sampling and decision strategies
- . . . could explain empirically observed choice patterns

I happily take your questions, comments and critique.