Why the grass is greener on the other side
Behavioral evidence for an ambiguity bonus in human exploratory decision-making

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Introduction

How does ambiguity affect exploratory decision making?
The grass is greener, but the unknown is scary

Task

• Subjects choose between two one armed bandits
• At start of game four “example” rewards are shown
• Subject makes choice and gets immediate reward feedback
• Next trial begins

Results

Three horizon conditions

Horizon = 1
Horizon = 6
Horizon = 11

Two ambiguity conditions

Equal
Different

Choice curves (n = 33)

horizon 1
horizon 6
horizon 11

Model fits

ambiguity bonus
noise variance
bias

Model

Values

\[ \Delta V = \Delta \mu + a \Delta k + b + n \]

\( \Delta \mu \) difference in means
\( \Delta k \) difference in information (-1, 0 or 1)
\( a \) ambiguity bonus
\( b \) bias
\( n \) random noise, variance \( \sigma_n \)

Choice probabilities

\[ p = \frac{1}{1 + \exp(\beta(\Delta \mu + a \Delta k + b))} \]

\( \beta \propto \frac{1}{\sigma_n} \)

Side notes

Learning curves

Conclusions and future work

• Exploration in humans is driven by
  • an ambiguity bonus that is consistent with directed exploration of optimal models
  • adaptive noise consistent with undirected exploration of practical models
• In the brain we expect to see
  • Ambiguity bonus in value system (VS, OFC, etc…)
  • Adaptive noise in LC

Why only focus on first choice?