

Information Gaps and Belief-Based Utility

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Food for Thought

What is the mind consuming (or preferring not to consume)?

- when people succumb to clickbait on the Internet
- when people skip a visit to the doctor despite unrelieved symptoms of illness
- when people gamble on their favorite sports teams after purchasing a low-deductible insurance policy

Unexplained Stylized Facts: Preferences about Information

- More information avoidance with unfavorable beliefs than with favorable beliefs (e.g., ostrich effect for investors, herpes testing)
- Some information acquisition without caring about beliefs (e.g., answers to trivia questions)
- Information acquisition or avoidance depends on situational determinants (e.g., priming, clues, violated expectations, distractions)

Unexplained Stylized Facts: Risk and Ambiguity Preferences

- Source preference: ambiguity seeking in domains of expertise / competence
- Context-sensitive preference: increased ambiguity aversion when ambiguous gambles can be compared against risky ones

Information Gaps¹

There are lots of things we don't know that don't bother us

But we do have feelings about specific uncertainties that we are aware of and attending to – *information gaps*

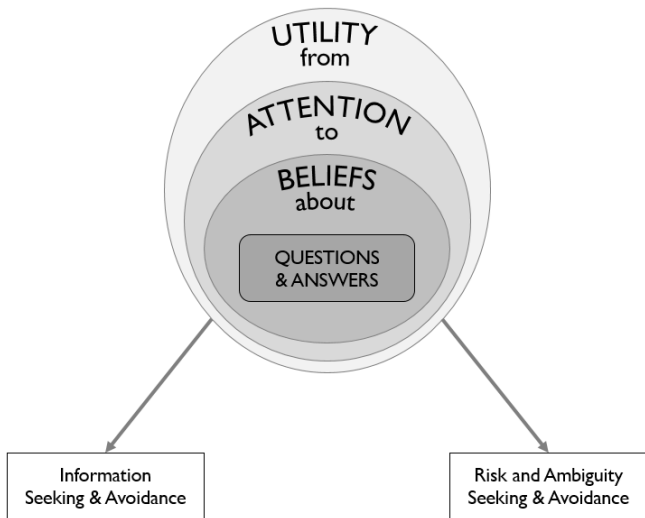
- We define a specific uncertainty as a question and a set of multiple possible answers
- We specify attention to information gaps and the value of beliefs about them

Thoughts and feelings about information gaps affect

- preferences about information acquisition and avoidance
- preferences about exposure to risk and ambiguity

¹Golman & Loewenstein, 2016, "Information Gaps: A Theory of Preferences Regarding the Presence and Absence of Information" *Decision*

Schematic of the Development of Our Model



Attention

Attention weights specify how much a person is thinking about particular beliefs and, in turn, how much those beliefs directly impact utility.

Attention weight is increasing in:

- *Importance*: how much is at stake depending on the answer
- *Saliency*: how much the context highlights the question
- *Surprise*: how much beliefs must change to accommodate new information

Valence and Clarity

- Beliefs have intrinsic valence
 - Believing I'm a good teacher has positive valence
 - Believing I'm a bad teacher has negative valence
- Ceteris paribus, people prefer to have greater clarity, i.e., less uncertainty or more definitive subjective beliefs

Our Theory of Preferences about Information ²

Obtaining information has three effects (and is driven by three motives):

- 1 Can change plans / make better subsequent choices (has instrumental value)
- 2 Reduces uncertainty (satisfies curiosity)
- 3 Focuses attention on it (directs motivated attention)

²Golman et al., in prep, “The Demand For, and Avoidance of, Information”

Instrumental Value of Information

Information can allow one to make better choices

- Examining a company's financial statements before investing

Information can make subsequent actions more (or less) attractive

- “Sh! Don't give away the ending. I haven't read it yet”

Curiosity

Curiosity – the desire to fill an information gap for its own sake

Depends on

- *Importance* of the question (and related questions)
- *Salience* of the question (and related questions)
- *Surprise* associated with the question (and related questions) after receiving partial information
- Expected *informativeness*
 - Completeness of the information (i.e., the extent to which the uncertainty will be resolved)
 - Potential for *epiphany* (i.e., the number of related questions)

Motivated Attention

People seek out information about issues they like to think about and avoid information about issues they do not like

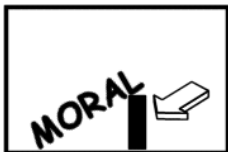
- Most people enjoy opening a gift
- Most people do not enjoy seeing a doctor for a diagnosis

The *ostrich effect* – more people look up the value of their investment portfolios when markets are up than when they are down



Study Protocol

- 1 Give subjects (229 MTurkers) 5 puzzles (2 for practice; 3 for a \$2 bonus if all correct) and tell them how many they got correct



- 2 Elicit curiosity for the correct answer to this last puzzle (excluding 84 subjects who got it correct)
 - First ask, “You missed this puzzle. Do you want to see the solution?”
 - If yes, “Please click again if you want to see the solution.” (Up to 5 clicks)

Manipulating Importance

Two conditions:

① High Importance

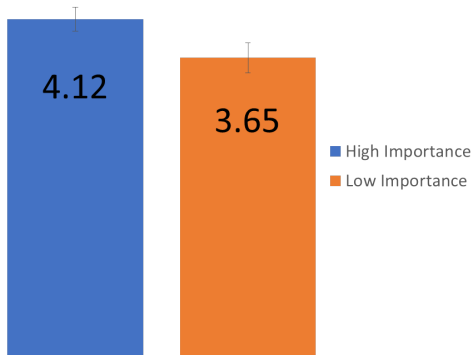
- Practice puzzles are hard
- First two incentivized puzzles are easy
- The last puzzle was critical for earning the bonus

② Low Importance

- Swap the practice puzzles with the first two incentivized puzzles
- Most subjects had already lost the bonus by the time they got to the last puzzle

Results

Mean number of clicks



* $t(143) = 2.03, p = 0.04$

Our Theory of Preferences about Risky / Ambiguous Gambles ³

Gambling serves to attract attention to one's belief(s) about some uncertain event (i.e., information gap), so people may

- enjoy gambling when the uncertain event is pleasant to think about
- avoid gambling when the uncertain event is unpleasant to think about

³Golman, Gurney, & Loewenstein, 2016 working paper, "Information Gaps for Risk and Ambiguity"

Risk

When beliefs have negative valence (either because the outcomes are bad or the uncertainty is aversive):

- Low-stakes risk aversion
- Direct risk aversion
- Compound risk aversion

Ellsberg Paradox

Bet on Urn I: unknown composition OR Urn II: 50-50 composition?

Activated questions:

Q1 What is the composition of Urn I?

Q2 What is the composition of Urn II?

- All answers have neutral valence, but because uncertainty is aversive, question Q1 induces a negative belief
- Betting on Urn I makes Q1 more important; but question Q2 is not important because the answer is known
- Increasing the importance (attention weight) of a negative belief decreases utility
- Preference is for betting on the known urn despite equivalent subjective chances of winning

Source Preference

People actually prefer to bet on uncertain events in domains of expertise rather than on chance events (Heath & Tversky, 1991)

- Such bets increase the importance of questions with positive beliefs. (We like thinking about things we are expert on.)
- Increasing attention weight on positive beliefs increases utility.

Confirmatory Experimental Evidence

We gave 100 subjects a two-part math test

Pairwise competition with a non-monetary prize for the higher score

Subjects placed bets of up to \$5 on three events (one of which was then randomly selected):

- 1 scored higher on part A than on part B
- 2 scored higher on part B than on part A
- 3 one die roll higher than another

Winning the prize significantly predicts gambling on the test (Bet 1 + Bet 2) even after controlling for gambling on the dice (Bet 3) [$p = .005$]

Self-reported feelings about performance on the quiz significantly predict gambling on the test [$p = .025$] and make winning the prize no longer significant [$p = .335$]

Summary of Theoretical Predictions

