

Introduction & Background

- Traditional economic models of risk, including **Expected Utility Theory**, assume that individuals evaluate uncertainty using objective probabilities (Bernoulli, 1738). Under this framework, a 10% chance of an event is treated as exactly 10% in the decision process, thus choices reflect consistent, rational probability evaluation.
- Behavioral economics challenges this assumption by suggesting that individuals do not always treat probabilities linearly. **Prospect Theory** proposes that individuals transform objective probabilities into subjective decision weights when making risky choices (Kahneman & Tversky, 1979).
- This transformation is known as **probability weighting**, where the relationship between objective probability and decision weight becomes nonlinear rather than proportional (Barberis, 2013).
- A central prediction of behavioral models is that **distortion is much more pronounced in small probabilities**. Rare events may receive disproportionately high decision weight relative to their objective likelihood.
- These distortions may help explain why individuals participate in lotteries with extremely low odds of winning or purchase insurance for unlikely catastrophic risks (Bajtelmsmit, Fink, & Rappaport, 2015).
- While probability weighting is well established theoretically, there remains an important empirical question regarding **how consistently and strongly such distortions appear in incentivized laboratory settings**.
- This project proposes to test whether small probabilities are systematically overweighted in controlled experimental decision tasks through a **proposed incentivized lottery-choice experiment**.

Hypothesis: Participants will exhibit certainty equivalents greater than the expected value in small-probability lotteries, consistent with overweighting of small probabilities.

Research Question: Do individuals systematically overweight small probabilities when making risky decisions?

Methodology

Participants

Undergraduate participants are recruited through the XS/FS Experimental Economics Lab at Florida State University and complete the study in a controlled laboratory environment.

Incentive Structure

All decisions are monetarily incentivized. One decision is randomly selected for payment at the end of the session.

Experimental Environment

Participants complete repeated binary choices between a lottery and a guaranteed payment under standardized laboratory conditions.

Data Collection

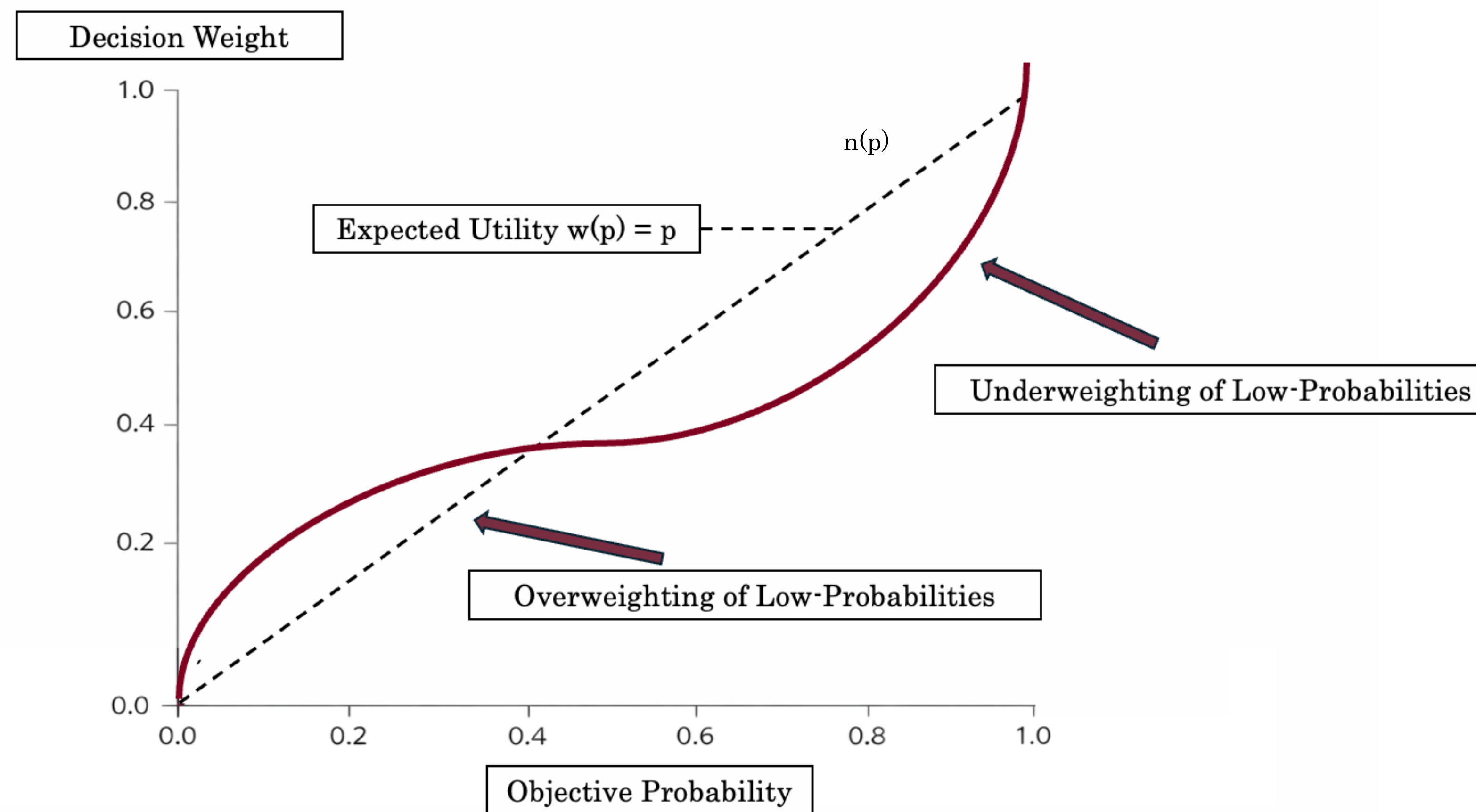
For each probability condition, participant choices are recorded to identify switching behavior and corresponding certainty equivalents.

Analytical Strategy

Certainty equivalents are compared to expected value benchmarks to evaluate deviations from objective probability evaluation.

Theoretical Framework

Probability Weighting



Expected Results

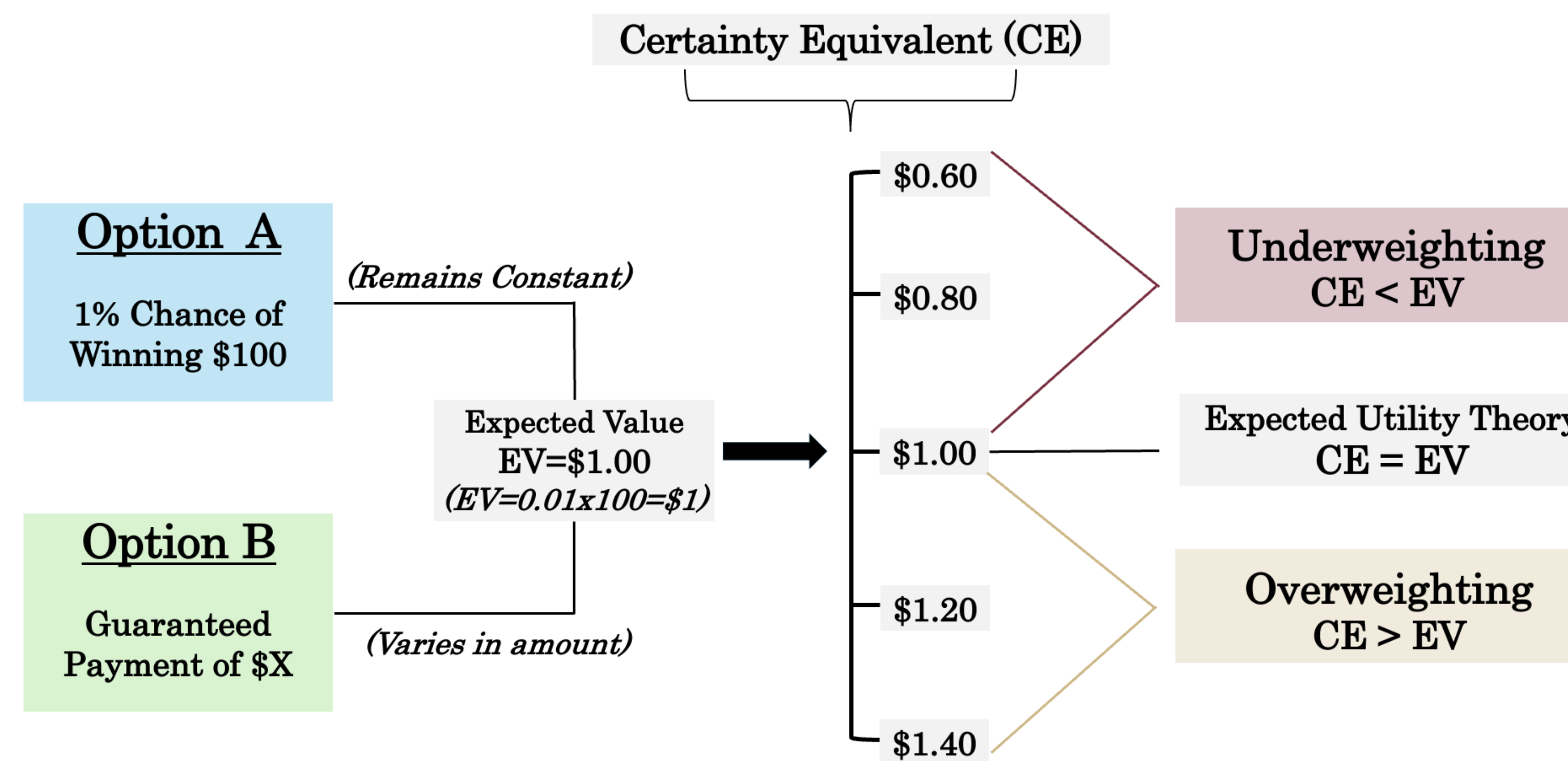
Participants are expected to require a guaranteed payment greater than the expected value before switching away from small-probability lotteries. In terms of the experimental design, this would imply: **Certainty Equivalent (CE) > Expected Value (EV) in low-probability conditions (1–5%)**.

Such outcomes would indicate overweighting of small probabilities, consistent with behavioral probability-weighting models and inconsistent with the linear probability evaluation assumed by Expected Utility Theory (Bernoulli, 1738).

Although overweighting is the primary prediction, the design also allows detection of underweighting ($CE < EV$), ensuring that any observed distortion is measured empirically rather than assumed.

Overall, results are expected to demonstrate systematic deviations from objective probability benchmarks, consistent with behavioral models of risky decision-making (Kahneman & Tversky, 1979; Tversky & Kahneman, 1992).

Experimental Design



Step 1: Set Small-Probability Lottery

Participants choose between a fixed low-probability lottery (e.g., 1–5% chance of \$100) and a guaranteed payment (e.g., 100% chance of x)

Step 2: Calculate Expected Value (EV)

The objective benchmark is computed as **Expected Value = Probability x Prize** ($EV = P \times X$).

Step 3: Vary the Sure Amount

The guaranteed payment varies above and below the expected value (e.g., \$0.60–\$1.40)

Step 4: Identify Switching Point (Certainty Equivalent)

The sure amount at which a participant switches from the lottery to the guaranteed payment is recorded as the **certainty equivalent (CE)**.

Step 5: Compare CE to EV

$CE > EV \rightarrow$ Overweighting of small probabilities

$CE \approx EV \rightarrow$ Objective evaluation (Expected Utility Theory)

$CE < EV \rightarrow$ Underweighting of small probabilities

Discussion & Significance

This study contributes to growing research that examines how individuals evaluate small-probability risks, contributing to behavioral research showing that decision-making under uncertainty often deviates from predictions of traditional economic models (Kahneman & Tversky, 1979; Tversky & Kahneman, 1992; Prelec, 1998).

- Behavioral decision-making:** Helps explain systematic deviations from Expected Utility Theory.
- Lottery participation:** Provides insight into participation despite extremely low probabilities of winning.
- Insurance behavior:** Small distortions can influence over-insurance or under-insurance against rare catastrophic losses.
- Policy making:** Research conducted through the XS/FS Lab can contribute to broader experimental work used to inform market and policy design.

References

