# Experimental Design and Preregistration

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## 1 Experimental Design

Subjects are presented with a number of choice tasks. In each choice task, there are two options. Subjects are asked to choose the probability with which the computer implements either option for them. Subjects make this decision by moving a slider to indicate the desired probabilities.

The two options in each choice task are structured as follows. Both lotteries yield a high payoff $h$ and low payoff $l$, with 50% probability each. In addition, one lottery yields an additional premium $\pi > 0$. Thus, this lottery is FOSD. We implement three sets of $(l, h)$, i.e., $(l, h) \in \{(0, 180); (40, 140); (70, 110)\}$ and cross these with two different levels of the premium, i.e., $\pi \in \{4, 30\}$. This results in 6 parameter combinations.

Subjects encounter each of the 6 tasks in three correlation structures, as displayed in table 1. Under the positive correlation structure, the dominant lottery is state-wise dominant. Under the negative correlation structure both lotteries yield a higher payoff in two out of the four states. In the intermediate correlation structure, lotteries are independent, and the dominant lottery yields a higher payoff in three states. We display choice tasks as having four states for all correlation structures in order to keep the display of choices constant.

Table 1: The three correlation structures.

(a) Positive correlation

| | $s = 1(1/4)$ | $s = 2(1/4)$ | $s = 3(1/4)$ | $s = 4(1/4)$ |
|---|---|---|---|---|
| A | $h + \pi$ | $h + \pi$ | $\ell + \pi$ | $\ell + \pi$ |
| B | $h$ | $h$ | $\ell$ | $\ell$ |

(b) Negative correlation

| | $s = 1(1/4)$ | $s = 2(1/4)$ | $s = 3(1/4)$ | $s = 4(1/4)$ |
|---|---|---|---|---|
| A | $h + \pi$ | $h + \pi$ | $\ell + \pi$ | $\ell + \pi$ |
| B | $\ell$ | $\ell$ | $h$ | $h$ |

(c) Independent

| | $s = 1(1/4)$ | $s = 2(1/4)$ | $s = 3(1/4)$ | $s = 4(1/4)$ |
|---|---|---|---|---|
| A | $h + \pi$ | $h + \pi$ | $\ell + \pi$ | $\ell + \pi$ |
| B | $h$ | $\ell$ | $h$ | $\ell$ |

Subjects encounter the different correlation structures in three distinct blocks of choices. Each block starts with four practice choices for which subjects receive immediate outcome feedback. Subjects complete the practice choices for an additional choice task that is not payoff relevant. Each possible state occurs once, that is, the outcome distribution is representative. Choice tasks are displayed in tables and lotteries are referred to Option A and Option B. Within each block, the position of the dominant lottery and whether it is called Option A or Option B, as well as the order in which states are displayed is fixed for each subject. Between blocks and between subjects, the state order and which option is called A and B is randomized.

**Attention and sanity checks:** In addition to the choice tasks discussed above, each block contains a "sanity check". For this sanity check, $l = 0$, $h = 1$, and $\pi = 100$. Subjects always encounter this sanity check as the last choice in a block. Subjects also face one attention check in each block, always between the second and third choice after the practice rounds. Attention checks display tables similar to those used to present choice tasks but they displayed letters instead of numbers. Subjects are asked to choose Option A with 56%.

**Survey questions:** After making their choices, subjects are asked to respond to a survey. First, we elicit a subjective happiness measure for different outcome scenarios. Subjects are presented with four hypothetical scenarios in which they have chosen a given lottery and received outcome feedback. Subjects are asked to rate how they feel in these scenarios, on a scale developed by Bradley and Lang (1994). The scenarios all comprise the independent correlation structure and subjects always have chosen the dominant lottery with 100% probability. The four scenarios cover all four possible states. Additionally, subjects are asked to answer the four cognitive reflection items developed by Toplak et al. (2014).

## 1.1 Procedures

We run the experiment on Prolific and restrict access to the experiment to participants residing in the US or the UK. We include three captchas at the beginning and require subjects to complete the experiment on a computer (rather than a phone or tablet). Subjects who fail to answer the three comprehension questions correctly are screened out of the experiment.

Subjects receive a fixed fee of £2.20. In addition, one of their choices is randomly selected and paid out. Payoffs are displayed in pence and are equivalent to those given above. Basing ourselves on a pilot, we are aiming for 140 respondents who pass the sanity checks, defined as choosing the dominant lottery with at least 90% for all three sanity checks.

# 2 Pre-Analysis Plan

## 2.1 Theoretical Framework

We derive our hypotheses from a theoretical model in which subjects can randomize to hedge their regret. While we refrain from a formal discussion here to keep this document concise, we sketch out the main idea. After a decision maker has made a choice and has observed the outcome, they evaluate their choice. They experience regret (rejoice) if they feel they made a bad (good) choice. We assume that this ex-post evaluation is biased in the sense that the decision maker (partially) projects the outcome information on their ex-ante self. We illustrate the model for the case of full projection. When such a decision maker has chosen one option with 100% probability, the decision maker compares the outcomes of the realized options, and evaluates their choice as good if the obtained outcome is higher than the forgone outcome. In this case the decision maker feels rejoice. If the obtained payoff is lower than the forgone payoff, the decision maker feels that they made a bad choice and experiences regret. The decision maker anticipates the ex-post experience of regret and chooses the option that optimizes expected regret and rejoice.

Randomization enters the picture as follows. If the decision maker chooses option $A$ with probability $\delta$ and option $B$ with probability $1 - \delta$, this is the decision they evaluate ex-post. This allows the decision maker to hedge their regret. If a decision maker is averse to risk in regret, they might choose to randomize. Crucially, the rate at which the decision maker wishes to randomize depends on the correlation structure. When one lottery is state-wise dominant, the dominant lottery yields a higher payoff in every state. The decision maker thus never experiences regret when they choose the dominant lottery with 100%. For the negative correlation structure, on the other hand, the dominated lottery yields a higher payoff with 50%, which implies that the decision maker might want to randomize. Finally, rates of randomization for the independent correlation structure should fall in between the rates for state-wise dominance and the negative correlation structure.

## 2.2 Main Hypotheses

Our main hypotheses are thus:

**Hypothesis 1** ***Preferences for randomization are impacted by the correlation structure***

*H1a* *The probability of choosing the dominant lottery under state-wise dominance is higher than under the negative correlation structure.*

*H1b* *The probability of choosing the dominant lottery under state-wise dominance is higher than under the independent correlation structure.*

*H1c* *The probability of choosing the dominant lottery under the independent correlation structure is higher than under the negative correlation structure.*

We test each of these predictions as follows. For each subject and correlation structure, we average the probability with which they chose the dominant lottery across the 6 difference parameter sets. We test the hypotheses using one-sided Wilcoxon signed rank tests.

## 2.3 Subjective Ex-Post Experience

We further test whether reported ex-post happiness in the hypothetical scenarios aligns with the predictions derived from our theoretical model. In the four scenarios, subjects report their happiness in four different combinations of obtained and forgone payoffs, $happy(obtained, forgone)$. We obtain the following measures: $happy(110, 0), happy(110, 100), happy(10, 0), happy(10, 100)$. We test whether subjects report a higher happiness when they receive a higher payoff, holding the forgone payoff fixed. That is, we test whether $happy(110, 0) > happy(10, 0)$ and $happy(110, 100) > happy(10, 100)$. We also test whether reported happiness decreases in the forgone payoff. That is, we test whether $happy(110, 0) > happy(110, 100)$, and $happy(10, 0) > happy(10, 100)$. We again test these hypotheses using one-sided Wilcoxon signed rank tests.

## 2.4 Typology

We also plan to perform a clustering analysis using the $k$means algorithm. We specify three classes, as we are aware of three classes of models that can be distinguished in our setting. These are 1) Models that predict no randomization: EUT, PT, CPT, regret theory (Loomes and Sugden, 1982, 1987) and models of deliberate stochastic choice (Cerreia-Vioglio et al., 2019). 2) Models that predict that randomization might occur but that the rate of randomization is independent of the correlation structure: Revealed perturbed utility models (Machina, 1985; Fudenberg et al., 2015), and 3) our model of regret hedging, which makes the predictions discussed above.

We also plan to analyze whether subjects falling into different classes differ in reported ex-post happiness CRT-scores.

# References


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