

Iterated Random Selection as Intermediate Between Risk and Uncertainty

Horacio Arló-Costa

CMU

hcosta@andrew.cmu.edu

&

Jeff Helzner

Columbia University

jh2239@columbia.edu

Decisions from Description and Experience

When people have access to information providing convenient descriptions of risky prospects, they can make decisions from description. When people make decisions without having summary description of the possible outcomes or their likelihoods they make decisions from experience.

There is now an expanding body of literature on decisions from experience. The University of Basel, Switzerland, has a website devoted to this with an updated bibliography:

<http://dfexperience.unibas.ch/>

Research on risky choice typically provides respondents with information of this type:

A: Get \$4 with probability .8, \$0 otherwise.
or

B: Get \$3 for sure.

In the case of decision from experience, decision makers were repeatedly asked to choose between two buttons projected on the computer screen. Each button selection initiated a random draw from the initially unknown payoff distribution associated with that button.

Given the payoff distributions in the aforementioned example, selecting option A could lead to outcomes of \$4 or \$0. Selecting option B, in contrast, would always result in an outcome of \$3.

Decisions from experience (DfE) and decisions from description (DfD) can lead to dramatically different choice behavior.

For example, in the case of decisions from description, people make choices as if they overweight the probability of rare events, as described by *prospect theory*.

In contrast in the case of decisions from experience people make choices as if they underweight the probability of rare events.

DfE and DfD in the case of uncertainty

- Is there an interesting contrast between DfE and DfD in the case of uncertainty?
- In the particular case of the two-color Ellsberg task is it possible to find a DfD that has a reasonable operational counterpart in DfE?

Urn A contains exactly 100 balls. 50 of these balls are solid black and the remaining 50 are solid white.

Urn B contains exactly 100 balls. Each of these balls is either solid black or solid white, although the ratio of black balls to white balls is unknown.

How much would you be willing to pay for a ticket that pays \$55 (\$0) if the next random selection from Urn A results in black (white) ball? Repeat then the same question for Urn B.

B^* : First, select an integer between 0 and 100 at random, and let n be the result of this selection. Second, make a random selection from an urn consisting of exactly 100 balls, where n of these balls are solid black and $100 - n$ are solid white.

Tutorial on Chance Setups

A *chance setup* is a system that includes a finite set $\{o_1, \dots, o_n\}$ of possible outcomes and that outputs one of these outcomes each time that it is run. Such a chance setup is *fair* just in case the following conditions are satisfied: (1) If the system were run repeatedly, then in the long run the number of trials that would result in outcome o_i would be equal to the number of trials that would result in outcome o_j and (2) One cannot predict which outcome will result from the next run of the system simply by knowing the outcome of each of the previous runs of the system.

The questionnaire then continued by instructing the subjects that “random selection” in the context of the questionnaire is to be understood as selection via a fair chance setup.

Psychological Results

- Confirming previous results presented in ISIPTA there is a significant difference between options A and B even when the subjects do not compare vague and clear options.
- Option B^* appears as an intermediate option between options A and B.
- Option B and option B^* are *operationally equivalent* if we consider the non-comparative values for the three options.

Consequences and Future Work

- There are various ways of interpreting the data, depending on your normative views about B^* and its relationships with options A and B.
- Unlike option B, option B^* has interesting counterparts in DfE (modulo the tutorial on chance set ups).
- In the paper we propose a design for DfE based on an appropriate variation of B^* .

Experimental Design

The agent faces two buttons. A ‘clear’ button C that samples the 50-50 urn and a ‘vague’ button V.

If V is selected, then the subject is instructed to press SELECT GAME. Unbeknownst to the subject, pressing SELECT GAME selects an implementation based on one of the 101 possible urns considered above (i.e., an urn consisting of n black balls and $100 - n$ white balls for some $n \leq 100$).

The following algorithm is used to select a game: consider the space of all possible ordered sequences of 101 urns. Then a sequence in this space is selected at random and fixed. When the game starts and the agent presses `SELECT GAME` for the first time the first urn in the sequence is selected. Say that the subject has pressed `SELECT GAME` n times. Then when he presses `SELECT GAME` once more the selection mechanism picks the urn in the $n + 1$ position in the sequence and samples it every time that `PLAY` is selected.

Under a normative point of view there is indeterminacy at the moment contemporary to the selection of the game, and after a few trials there will be imprecision in the corresponding probabilities.

Example 1 A possible session involving V:

The subject first presses V.

On screen: *Select a game by pressing SELECT GAME. OR EXIT*

The subject presses SELECT GAME.

On screen: *You have been awarded a game. You can play this game by pressing PLAY.*

The subject presses PLAY and a payoff appears, for example:

On screen: *You won \$55.*

The subject then agent faces the choice of pressing PLAY again or pressing SELECT GAME or EXIT (in which case he faces the election of V and C again).

Conjectures

- This design of decisions from experience will also avoid an identification of the V and C conditions.
- The gap between the V and C conditions (buttons in decisions from experience) will not be as severe between the gap between the corresponding “vague” condition and the “clear” conditions in the case of decisions from description.
- In general we conjecture that there are specific differences between DfE and DfD in the case of uncertainty.

The role of the tutorial on change set ups

- We noticed that the use of the tutorial on chance set ups makes an important difference regarding the use of the term 'random selection' in experiments.
- Concretely the values we get for Clear seem significantly less than the mean maximum buying prices for Clear reported in our experiment.
- This raises an important question as to the role of the expression 'random selection' in some of the most salient experiments in behavioral decision making.

THANKS