Psychological Reason

Zark Zijian Wang

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0.1 The Decision Process

Suppose time is discrete. Let X_T denote the sequence of rewards $[x_0, x_1, ..., x_T]$, which yields reward x_t in time period t.[1] The time length of this sequence, denoted by T, is finite. For any $t \in \{0, 1, ..., T\}$, the reward level x_t is a random variable defined on $\mathbb{R}_{\geq 0}$. I assume that making an intertemporal choice involves three steps:

> Step 1. (Sampling) The decision maker subjectively draws a few potential realizations of X_T, and from each drawn realization, she draws a few time periods and observes their rewards; then, she combines all observed rewards into a sample.
>
> Step 2. (Valuation) The decision maker uses the mean utility of sampled rewards as an approximate value representation of X_T.
>
> Step 3. (Choice-making) She chooses the sequence with the highest value from all the available reward sequences.

In the decision process described above, Step 3 is standard. By Step 1-2, I take the notion that, to evaluate a stimuli, the decision maker needs to assess all the relevant information, while her information processing capacity is limited. Consequently, she selectively attends to only *a subset* of the available information (which is termed *a sample*), then aggregates the attributes observed in the sample to calculate the stimuli value. This sampling process is not

[1] I use uppercase letters to represent a sequence and lowercase letters to represent elements within the sequence.

unbiased; on the contrary, the decision maker aims to retain more of the information that they consider more relevant in the sample. Such a notion has a long history in psychological research.[2] In recent years, many theories grounded in this (or similar notions) have made significant progress in explaining choice anomalies, such as decision field theory (Busemeyer and Townsend, 1993), decision-by-sampling (Stewart et al., 2006), utility-weighted sampling (Lieder et al., 2018) and efficient coding theory (Heng et al., 2020). In the next subsection, I describe the sampling and valuation process in detail.

References

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[2]Weber and Johnson (2009) and Chun et al. (2011) provide good reviews for such studies.