A theory of framing, probability transformation, and decision under risk

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Abstract

This paper presents a descriptive theory of expected utility which explains how lotteries are framed and how the frame impacts the decision process and the revealed preference. The theory assumes that decision-makers are intuitively-rational in the sense that they rely on evidence to decide and have a sequential perception of the objects of choice. Moreover, framing and evidence are endogenously perceived with the aim of helping individuals to make decisions that they feel "reasonably sure" of. If decision makers perceive sequentially dissonant evidence, they may be led to reverse their preference within the decision process. We describe here the process of decision of intuitively-rational decision makers who start with a context-free, expected utility (EU) prior.

We consider decisions under risk among two independent prospects. When the *dominance* pattern is perceived, the decision raises no doubt *ex ante* and no regret *ex post*: the decision-maker opts for the dominant lottery which is her EU-preference and feels sure of making the right decision. Dominance prevails under certainty. Under risk or uncertainty, however, dominance is just a possibility, not a necessity. Whenever dominance cannot be observed, choosing the EU-preferred option always raises an *objection*. The role of framing is to reveal dominance or make the objection visible. However, objections are frame-dependent and so will be the revealed preference. We develop a Bayesian representation of the decision process based on the sequential perception of EU preference and a visible objection to the prior. In a pairwise comparison, individuals with doubt maximize an *objection-dependent expected utility* (ODEU) conditional on their prior EU preference.

We apply ODEU theory to predict *all* the anomalies of decision under risk exhibited by Kahneman and Tversky (1979) and a few more. This is done without their assumptions about the shape of the value function (risk aversion for gains and risk seeking for losses, and loss aversion) and with a simple (piecewise-linear) transformation of probabilities. Thus, we predict the certainty effect and the apparent overestimation of small probabilities and underestimation of large probabilities, the coexistence of insurance and gambling, and a pure reflection effect under risk neutrality.

All pairwise comparisons without dominance can be categorized in just two patterns: nested lotteries and overlapping lotteries. Overlapping lotteries exhibit stochastic dominance or "quasi-stochastic dominance", whereas nested lotteries exhibit generalized certainty effects. With this theory of framing under risk, we can predict with a single parameter in excess of risk aversion the Allais paradox, the possibility effect, and reflection effects, among other things. Finally, we present a simple test of the relevance of framing in the decision process in a risky context. We use a new set of incentivized choices of simple lotteries involving gains and losses.

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