Efficient Coding and Risky Choice - Abstract

We present a model of risky choice in which the perception of a lottery payoff is noisy and optimally depends on the payoff distribution to which the decision maker has adapted. The perceived value of a payoff is precisely defined according to a core idea in neuroscience called the efficient coding hypothesis, which indicates that more perceptual resources are allocated to those stimuli that occur more frequently. We show that this principle implies that, for a given choice set of lotteries, risk taking varies systematically with the recently encountered distribution of payoffs. We test our model in two laboratory experiments. In the first experiment, we manipulate the distribution from which payoffs are drawn. Consistent with efficient coding of lottery payoffs, we find that risk taking is more sensitive to payoffs that are encountered more frequently in the choice set. Furthermore, sensitivity to extreme payoffs is initially small, but grows over time after repeated exposure. Our second experiment consists of a purely perceptual task, in which subjects classify which of two symbolic numbers is larger. We find that accuracy depends on the distribution of numbers to which the subject has adapted, which provides support for our key model assumption that perception of numerical payoffs is noisy and changes across environments.