

Cox, James C.; Sadiraj, Vjollca; Schmidt, Ulrich

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Vjollca Sadiraj
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Alternative Payoff Mechanisms for Choice under Risk

James C. Cox, Vjollca Sadiraj, and Ulrich Schmidt

Abstract:

Most experiments on decision theory ask individual subjects to make more than one decision. The isolation hypothesis is commonly used to justify the choice of the random lottery incentive mechanism as the preferred payoff protocol. This research note reports on the main findings on the theoretical and empirical performance of different payoff mechanisms on eliciting individuals' attitudes toward risk. It challenges the conventional view that the random lottery incentive mechanism introduces no biases in inducing risk preferences.

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James C. Cox

Vjollca Sadiraj

Ulrich Schmidt

University of Kiel, and
Kiel Institute for the World Economy
Kiellinie 66
D-24105 Kiel, Germany
phone: +49-431-8814209
E-mail: Ulrich.schmidt@ifw-kiel.de

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Experiments on choice under risk typically ask subjects to make several decisions in order to conduct within-subjects tests of hypotheses. To incentivize the subjects an experimenter must decide how to pay them. Is the subject paid the realized outcome from each chosen lottery before a subsequent decision is made? Or, pay only for one choice randomly selected at the end of the experiment? Or maybe all chosen lotteries are paid at the end of the experiment. If so, are the realizations of choices generated independently or correlated? All of these payoff protocols and some others have been used in the experimental literature. How can one interpret this apparent “wild west” of experimental methodology? Is choice of payoff mechanism not important? That would be true if subjects in experiments isolate each individual decision from the context of other decisions (Kahneman and Tversky (1979)). Alternatively, perhaps subjects do not generally isolate individual tasks but the “correct” payoff mechanisms, in the sense of being incentive compatible for given hypotheses, are implemented by experimenters.

The issue of incentive compatibility of payoff mechanisms was addressed in literature sparked by a classic paper on the preference reversal phenomenon (Grether and Plott, 1979). Holt (1986) argued that, given the axiom of reduction of compound lotteries, randomly selecting one choice for payoff is incentive compatible only for expected utility theory; it is not incentive compatible for alternative theories such as cumulative prospect theory (Tversky and Kahneman, 1992) or rank dependent utility theory (Quiggin, 1982). This poses a particular problem for experimental studies, such as Hey and Orme (1994), that seek to compare the empirical validity of alternative theories of decision under risk: the random lottery incentive mechanism that is theoretically right (i.e. incentive compatible) for one of the theories – expected utility theory – is *not* incentive compatible for the other theories being compared. This leaves open the question of

whether conclusions about the relative empirical success of alternative decision theories is confounded with empirical properties of the payoff mechanism.

An alternative defense of random selection of one decision for payoff – or indeed any of the other common payoff mechanisms – is the isolation hypothesis in which it is held that subjects make each risky decision in isolation from the other decisions in an experiment. The isolation hypothesis as an empirical defense of the random selection mechanism has been advanced by various researchers, including Starmer and Sugden (1991) and Camerer (1989), who report no significant distorting effect of the mechanism.

Cox, Sadiraj and Schmidt (2012), hereafter CSS (2012), designed an experiment to systematically explore the theoretical and empirical properties of seven alternative payoff mechanisms. They report a dramatic empirical inconsistency with the isolation hypothesis: (a) differences across payoff mechanisms in the proportion of safe (rather than risky) lottery choices vary by factors of three to one; and (b) 95% confidence intervals for observed risky choice frequencies are disjoint across mechanisms. This result makes clear the importance of exploring the theoretical and empirical properties of the payoff mechanisms as a central question of experimental methodology.

CSS (2012) explore the theoretical incentive compatibilities of alternative mechanisms and empirical deviations from these theoretical properties. They report that the One Task (OT) “mechanism” in which each subject makes only one decision is incentive compatible for all decision theories. If within-subjects treatments are to be implemented: (i) paying one decision randomly (POR) is incentive compatible only for expected utility theory; (ii) paying all decisions independently (PAI) at the end of the experiment is not incentive compatible for any decision theory; (iii) paying all decisions sequentially (PAS) is incentive compatible for decision theories

defined on income such as cumulative prospect theory and the expected utility of income model; and (iv) paying all decisions correlated at the end of the experiment (PAC) is incentive compatible for the dual theory of expected utility (Yaari, 1987).

CSS (2012) examine the behavioral properties of alternative mechanisms and identify cross task contamination effects that are inconsistent with the isolation hypothesis. They find that: (i) the POR mechanism exhibits choice order effects that distort revealed risk preferences; (ii) the risky option choices are positively correlated across rounds with the PAI mechanism; and (iii) the PAS mechanism is found *not* to exhibit wealth effects on choices, which is consistent with previous research reporting absence of wealth effects (Cox and Epstein, 1989; Cox and Grether, 1996).

The central conclusion in CSS (2012) is that the OT and PAS mechanisms are the best candidates for use in experiments on decisions under risk. OT is incentive compatible for all theories. PAS is incentive compatible for theories defined on income, rather than terminal wealth, and its possible wealth effects are found to be empirically insignificant for models defined on terminal wealth.

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