10-1-2012

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Asymmetrically Dominated Choice Problems and Random Incentive Mechanisms

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Abstract
A common methodology in experimental research is the use of random incentive mechanisms. This note investigates possible distortion induced by such mechanisms in the context of choice under risk. In the baseline (one task) treatment of our experiment we observe risk behavior in a given choice problem. We show that by integrating a second, asymmetrically dominated choice problem in a random incentive mechanism behavior can be systematically manipulated. This implies that the isolation hypothesis is violated and the random incentive mechanism does not elicit true preferences in our example.

Key words: random incentive mechanism, isolation, asymmetrically dominated alternatives

JEL classification: C91, D81

1 Introduction

Under a random incentive mechanism (RIM) subjects are asked to make several decisions (e.g. different binary choice questions, bidding for an object in several rounds, etc.) and at the end of the experiment one of the decisions is randomly selected and played out for real. RIM has been used in many important experimental studies. Also the choice list of Holt and Laury (2002) which is commonly used to assess the degree of risk aversion of experimental subject relies on RIM. Reasons for the widespread use of RIM include reduced expenditures, possibility to control for wealth effects (existent when all choices are paid sequentially) and portfolio effects (present when all choices are paid at the end of the experiment). The most appealing feature of this mechanism rests in the common belief that it provides subjects with incentives to truthfully reveal their preferences over objects in any given task.

The first study to challenge this view is Holt (1986). He shows that if the reduction of compound lotteries axiom holds then RIM is incentive compatible only for preferences that satisfy the independence axiom. Given abundant empirical evidence that violates the independence axiom, the incentive compatibility of RIM is challenged. This has motivated several experimental studies aiming to test whether RIM does elicit true preferences (e.g.

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Starmer and Sugden, 1991). None of these studies reported significant distortions induced by the use of RIM. The isolation hypothesis from prospect theory (Kahneman and Tversky, 1979) was put forward to reconcile violations of independence with incentive compatibility of RIM. The isolation hypothesis postulates that subjects evaluate each task in a RIM independently of the other tasks.

This note presents a simple experiment designed to test the isolation hypothesis and incentive compatibility of RIM in the presence of asymmetrically dominated choice problems. The literature of context-dependent choice has shown that adding asymmetrically dominated alternatives in the set of options can systematically influence choice behavior (see e.g. Huber et al., 1982). In contrast to these studies, in the present experiment asymmetrically dominated alternatives are not included in the set of options in a given task but asymmetrically dominated choice problems are included in a RIM as additional, independent tasks. Given that isolation holds, choice behavior under RIM in one task should not be influenced by the presence of a different task even if preferences are menu-dependent. Our study can be seen as a complement to Harrison and Swarthout (2012) – both studies were performed parallel and independently – who recently showed that preference estimates obtained under RIM differ from those obtained in a one-task design.

2 Method

In our study we are focusing on asymmetrically dominated choice problems of the following type. Suppose there is a choice between a safe lottery S and a risky lottery R. Then a second choice problem, also consisting of a safe alternative S' and a risky one R', *risky-dominates* the first problem if R' dominates R and S' is dominated by S. Analogously, a third problem, consisting of a safe alternative S'' and a risky one R'', *safe-dominates* the first one if S'' dominates S and R'' is dominated by R. Our hypothesis is that in the presence of a risky-dominating choice problem alternative R (S) looks less (more) attractive, leading to a higher fraction of S choices. The opposite should hold in the presence of a safe-dominating choice problem.

The experiment was run at the University of Kiel; a total of 284 subjects participated in it. Subjects were randomly assigned to one of five groups, referred to as Group 1, 2.1, 2.2, 3.1, and 3.2 in the sequel. The stimuli received by the groups (in each case printed on a single sheet of paper) are presented in Table 1.

In Group 1 subjects made only one decision, a choice between Option S (4€ for sure) and Option R (10€ or 0€ with probability 0.5). Subjects were told that everybody would receive the payoff of the chosen option in cash directly after the experiment and that the

payoff of Option R would be determined by a coin flip. In Groups 2.1 and 3.1 there were two choice problems (presented in the order of Table 1) and a RIM was employed, i.e. there was a first coin flip which determined whether the first or the second choice problem was played out for real and a second coin flip which determined the payoff in case one of the risky options (R, R', or R'') was chosen in the selected choice problem. Group 2.2 (3.2) differed from Group 2.1 (3.1) only by the order in which the choice problems were presented; i.e. the choice between Options S and R was presented first in Groups 2.2 and 3.2 and second (as in Table 1) in Groups 2.1 and 3.1. In all groups the left-right positioning of options was randomized.

	Group 1	Group 2	Group 3
First Choice	Option S: 4 € with 100% Option R: 10 € with 50% 0 € with 50%	Option S': 3 € with 100% Option R': 12 € with 50% 0 € with 50%	Option S'': 5 € with 100% Option R'': 8 € with 50% 0 € with 50%
Second Choice		Option S: 4 € with 100% Option R: 10 € with 50% 0 € with 50%	Option S: 4 € with 100% Option R: 10 € with 50% 0 € with 50%

Table 1: Design of the Experiment

Group 1 is our control group because it elicits true preferences of subjects between Options S and R as a design with one choice problem played out for real offers perfect incentives to state true preferences. Our treatment groups 2 (resp. 3) allow us to test for bias in elicited preferences between Options S and R as the design there involves additionally a risky-dominating (resp. safe-dominating) choice problem. If the isolation hypothesis holds, the fraction of subjects choosing S in Groups 1, 2, and 3 should be identical. If isolation is violated then the additional choice problem in Groups 2 and 3 may affect the choice between S and R. In Group 2, Option S dominates Option S' whereas R is dominated by R'. Analogously to the evidence of asymmetrically dominated alternatives in the context-dependent choice experiments this could make Option S look more attractive and Option R less so, leading to a larger proportion of subjects choosing S over R in Group 2 than in Group 1. The opposite is expected for Group 3 as here S is dominated by S'' whereas R dominates R''.

3 Results

The results are presented in Table 2 which shows for all groups and each choice problem the percentages of subjects choosing the risky lottery. First, we can see that in Groups 2 indeed by

far most subjects choose R'. These subjects may be reluctant to choose R leading to a higher fraction of observed S choices in Groups 2 as compared to Group 1. Also in Groups 3, most subjects chose as expected option S'' and for those S could look less attractive.

Group	1	2.1	2.2	3.1	3.2
N	58	54	54	62	56
% Choice of R	82.8	51.9	59.3	80.6	78.6
% Choice of R'(R'')	-	88.9	96.3	12.9	3.6

Table 2: Results

The differences between choices of R in the single groups are presented in Table 3 along with tests according to the test-statistics of Conlisk (1989). All tests are two-sided and ** (*) refers to a significance-level of 1% (5%). While 82.8% of subjects chose R in Group 1, this fraction reduces to 51.9% and 59.3% in Groups 2.2 and 2.2 respectively. In both cases, the difference is significant. As expected, S turns out to be more attractive in Groups 2 leading to a significant violation of isolation and, therefore, to a failure of isolation. In Group 3 we have expected the opposite effect as in Group 2 but the fraction of R choices is not significantly higher than in Group 1. This may be due to large fraction of subjects preferring R anyhow.

	Group 1	Group 2.1	Group 2.2	Group 3.1	Group 3.2
Group 1	-				
Group 2.1	30.9**	-			
Group 2.2	23.5*	-8.3	-		
Group 3.1	2.2	-28.7**	-21.3*	-	
Group 3.2	-4.2	-26.7**	-19.3*	2.0	-

Table 3: Differences in the Choice of R

All four tests show that there are significant differences between the choice of R in Groups 2 and 3. The highest difference is between groups 2.1 and 3.1 (28.7%) but also the lowest difference of 19.3% between groups 2.2 and 3.2 is rather substantial. All these observations indicate that behavior under RIM differs from true preferences (i.e. behavior in a one-task design) and depends on other choice problems involved.

The observed differences in ordering effects between Groups 2.1 and 2.2 as well as between Groups 3.1 and 3.2 are all in the expected direction. However, only one of these

effects (the difference between choice of R'' in Groups 3.1 and 3.2) is significant at the 10%-level, thus violating isolation again. The relatively small ordering effects might be due to the fact that in the instructions to Groups 2 and 3 all alternatives were presented prior to the response of subjects.

4 Conclusions

This note reports a very simple experiment designed to test effects of asymmetrically dominated alternatives in a random incentive mechanism on induced preferences. In our study isolation is violated significantly and RIM does not elicit true preferences; choice behavior in RIM depends substantially on the other tasks involved. Data in our study challenge the belief that RIM is generally incentive compatible. Since RIM is a commonly used payoff mechanism in many experimental studies, further research is needed in order to investigate how robust these distortions are and under which conditions they occur. Though different from the specific pattern of our design, also e.g. the choice list method of Holt and Laury (2002) and standard Allais paradoxes involve dominance relations across choice problems which may bias responses.

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