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Notes* I

FURTHER TESTS OF ASPIRATION LEVEL EFFECTS IN RISKY CHOICE BEHAVIOR†

JOHN W. PAYNE,‡ DAN J. LAUGHHUNN‡ AND ROY CRUM§

This Note extends the work reported in Payne, Laughhunn, and Crum [3] on the need to incorporate a target return, reference point, or aspiration level concept in the analysis of risky choice behavior. Two experiments are reported. The first experiment provides a more complete test of the model of reference point effects developed by Payne, Laughhunn, and Crum. A translation of outcomes procedure, which adds a constant to all outcomes, was used to vary the relationship of pairs of gambles to an assumed target or reference point. The results fully support the model. The second experiment provides evidence of the conceptual validity of the model by using explicit instructions to vary the target levels of managers, while holding gamble values constant.
(DECISION MAKING; ASPIRATION LEVEL; UTILITY PREFERENCE)

1. Introduction

In a recent paper [3], Payne, Laughhunn, and Crum (hereafter referred to as PLC) presented evidence on the need to incorporate a target return [1], reference point [2], or aspiration level concept in the analysis of risky choice behavior. In that study, students and managers were provided with several pairs of gambles to choose from, under conditions where the target return t was set at $t = 0$ (to represent status quo) and where each pair of gambles always had equal expected values. The first gamble in each pair, denoted GI, had the form $\mathrm{GI} = (a, p; b, q; c, 1 - p - q)$ to represent an option which yielded an outcome a with probability p, outcome b with probability q, and outcome c with probability $1 - p - q$. The outcomes were ordered such that $a > b > c$. The second gamble in each pair, denoted GII, had a similar form given by $\mathrm{GII} = (x, r; y, s; z, 1 - r - s)$ and was similar in interpretation, where $x > y > z$. The outcomes for GI and GII were constructed so that $a > x$, $b = y$, $c < z$. The study examined how choices made by subjects varied when GI and GII were translated by adding constants (positive and negative) to all outcomes, particularly translations that altered the relationships of outcomes to the target $t = 0$. A typical choice was between $\mathrm{GI} = (\$14, 0.5; -\$30, 0.1; -\$85, 0.4)$ and $\mathrm{GII} = (-\$20, 0.3; -\$30, 0.5; -\$45, 0.2)$. For this choice, GI involved one outcome above $t = 0$ while GII had all outcomes below. Faced with this choice, the majority of subjects chose GI. In contrast, when the gambles were translated, by adding \$60 to all outcomes and creating two new gambles denoted $\mathrm{GI}' = (\$74, 0.5; \$30, 0.1; -\$25, 0.4)$ and $\mathrm{GII}' = (\$40, 0.3; \$30, 0.5; \$15, 0.2)$ respectively, the majority of subjects chose GII.

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‡ Duke University.
§ University of Florida.

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TABLE 1

Summary of Propositions, Stimuli, and Results for Experiment 1

Choice Propositions	Example Gambles	Observed Choice Proportions of GI
1. If the outcomes of both GI and GII are above t, then $P(\text{GI}) < P(\text{GII})$. However, $P(\text{GI})$ will be greater in this case than in the situation described in proposition 2, and the relative preference for GI will increase as the minimum assured gain is increased.	GI = (\$80, .5; \$48, .1; \$8, .4) GII = (\$58, .3; \$48, .5; \$33, .2)	0.44
2. If GI has at least one outcome below t and GII has all outcomes above t, then $P(\text{GI}) < P(\text{GII})$. Furthermore, $P(\text{GI})$ will be close to zero.	GI = (\$56, .5; \$24, .1; −\$16, .4) GII = (\$34, .3; \$24, .5; \$9, .2)	0.19
3. If both GI and GII have outcomes above and below t, then either $P(\text{GI}) > P(\text{GII})$ or $P(\text{GI}) < P(\text{GII})$. However, given a greater sensitivity to losses as compared to equivalent gains, it is likely that $P(\text{GI}) < P(\text{GII})$.	GI = (\$32, .5; \$0, .1; −\$40, .4) GII = (\$10, .3; \$0, .5; −\$15, .2)	0.48
4. If GI has at least one outcome above t and GII has all outcomes below t, then $P(\text{GI}) > P(\text{GII})$.	GI = (\$8, .5; −\$24, .1; −\$64, .4) GII = (−\$14, .3; −\$24, .5; −\$39, .2)	0.67
5. If the outcomes of both GI and GII are below t, then $P(\text{GI}) > P(\text{GII})$. However, $P(\text{GI})$ will be less in this case than in the situation described in proposition 4, and the preference for GI will decrease the further the outcomes of GI and GII are below t.	GI = (−\$16, .5; −\$48, .1; −\$88, .4) GII = (−\$38, .3; −\$48, .5; −\$63, .2)	0.55

PLC summarized their results, together with the ideas of other researchers, in the form of a set of propositions (See Table 1) about the effects of aspiration levels on risky choice behavior. These propositions refer to predictions about choice behavior as a function of the relationship between two gambles, of the type described above, and a target return t. In Table 1, $P(\text{GI})$ and $P(\text{GII})$ refer to the proportion of choices of GI and GII, respectively.

In this note, we report on two experiments that replicate the findings reported in [3] and extend them in two important ways. First, a test of all five of the propositions presented in Table 1 is conducted using the translation of outcomes procedure described above. The earlier work reported in [3] provides evidence on only propositions 2, 3, and 4. Second, the conceptual validity of aspiration level effects on risky choice behavior, upon which the translation of outcomes procedure and the propositions are based, is examined experimentally by varying the target levels of managers through explicit instructions, while holding gamble outcomes constant.

2. Experimental Results

Experiment 1

Method. The stimuli consisted of 30 pairs of three-outcome gambles. These pairs were constructed by first generating six pairs of gambles that had the properties outlined above and, in addition, were "regular gambles" as defined in [2], i.e., gambles that had outcomes $b = y = \$0$. If one assumes that \$0 (or the status quo) represents a natural target return for most individuals, then $t = \$0$ and the initial pairs of gambles represent choice problems of the type described by proposition 3 in Table 1. The relationship of these initial pairs of gambles to $t = \$0$ was then varied by translating the outcomes of each gamble by the amounts of \$48, \$24, −\$24, and −\$48. These translations produced choice problems of the type described by propositions 1, 2, 4 and 5, respectively. An example of one pair of gambles under each translation is given in Table 1.

The subjects were 30 undergraduate students at Duke University. They were run individually and told to indicate which gamble in a pair they would prefer to play. The pairs of gambles were presented to each subject using a computer terminal connected on-line to an HP-2000 computer. The presentation of the pairs and position of gambles within each pair was counterbalanced and randomized across subjects and pairs. No time constraints were placed on the subjects.

Results. The proportion of subjects choosing the gambles in each pair corresponding to gamble GI was determined for each of the 30 pairs of gambles. The propositions presented in Table 1 predict that the choice of GI will vary as a function of the gamble translations. In particular, the propositions predict a clear reversal in choice for those pairs of gambles where a translation will lead to one gamble in a pair having outcome values either all above or all below the target, while the other gamble has outcomes both above and below the target. Table 1 presents the mean proportion of choices for those particular types of pairs of gambles for each of the five translations. The choice proportions are perfectly consistent with the predictions and indicate that the frequency of choice of GI did vary as a function of the translation of outcomes ($\chi^2(4) = 26.42$, $p < 0.01$).

The results for the translations of \$24 and $-$\$24 in the present study replicate very closely the results reported by PLC using both students and managers as subjects. Furthermore, the results for the additional translations of \$48 and $-$\$48 support the predictions of propositions 1 and 5, respectively, that were not tested in that study.

Experiment 2

The previous experiment, and the experiments reported in [3], manipulated the relationship between a set of risky alternatives and an *assumed* reference point through positive and negative translations of the alternatives. The second experiment combines this translation procedure with a methodology designed to change the aspiration level held by an individual through explicit instructions. The main purpose of this experiment was to support the importance of a target or an aspiration level as developed in our previous research.

Method. The subjects were 54 managers from a number of different firms in various industries. The managers, who held a variety of positions within the firms from middle to senior levels, were randomly divided into three groups of equal size denoted Groups T0, T16, and T32. The three groups differed in the exact values of the gambles pairs that were presented and in terms of advance instructions.

The instructions for each group asked the subjects to indicate their choices from the perspective of a corporate manager. However, the instructions differed across the three groups in terms of the standard that the subjects were told would be used to evaluate their performance. The instructions for Group T0 included the following paragraph:

> "The profit level of zero will be used as a standard to evaluate your performance. That is, if you accept projects that ultimately lead to positive profits for the division, you will be evaluated as being a successful budget manager. In addition, you will be evaluated as being a more successful manager when you make the profit earned from accepted projects as large as possible. Conversely, negative profits (losses) that arise from a project will diminish your own performance evaluation. Again, the more negative the poorer your evaluation."

In contrast, the instructions for Group T16 included the following two paragraphs in place of the one given above:

> "The standard used to evaluate your performance as capital budget manager will be the average profit level obtained by managers in the same position in other divisions of the company. These managers evaluate projects with profit characteristics that are similar to those you will decide upon. Last year, the average profit earned on projects selected by managers in other divisions was $160,000. The same average profit is anticipated for the time period during which you will be making your capital budgeting decisions."
>
> If you select projects that ultimately lead to profits for your division that exceed those obtained by the average manager in the company, you will be evaluated as a successful manager. Of course, the larger the profit the more successful you will be evaluated. Conversely, if you select projects that ultimately lead to profit levels for your division below the average profit level of other company budget managers, your own evaluation will be diminished. Again, the more profits fall below the average level of profits, the more diminished will be your own evaluation."

The instructions for Group T32 were the same as the instructions for Group T16 except that the average profit earned on projects selected by managers in other divisions was reported as $320,000, not $160,000.

The stimuli again consisted of pairs of three-outcome gambles under various translations of outcomes. Each of the three groups of subjects was presented with a total 15 pairs of gambles (3 pairs × 5 translation levels) but the pairs received by each group differed in terms of the amounts by which the outcomes were translated to generate the pairs. Group T0 received the pairs of gambles generated using the five translation levels of −$32, −$16, $0, $16, and $32 measured in units of $10,000. With the explicit instructions given to group T0, these pairs of gambles conform to the range of gambles and target levels used in experiment 1. That is, the pairs of gambles under the translation −$32 correspond to a choice problem consistent with proposition 5 of Table 1; the pairs of gambles under the translation −$16 correspond to a choice problem consistent with proposition 4, etc.

Group T16 received the pairs developed by the five translations: −$16, $0, $16, $32, and $48. Groups T32 received the pairs of gambles generated by translations of $0, $16, $32, $48, and $64. With the explicit instructions used for these two groups the pairs of gambles presented to the subjects also corresponded to choice problems involving the propositions of Table 1. However, the specific pairs of gambles that correspond to the various target levels differed among the three groups of subjects.

The choice problems were presented to the subjects in a booklet with each choice problem on a separate page. The order of the problems was randomized and the position of the alternatives on a page was counterbalanced. The subjects responded to each choice problem separately and were not permitted to return to a previous problem once a response was provided. Ample time to respond was given.

Results. While each group of subjects responded to some pairs of gambles not seen by both of the other two groups, three sets of gambles were presented to all three groups of subjects. These three sets of gambles involved translation amounts of $0, $16, and $32. The values for one pair of gambles under the three translation levels are presented in Table 2. The fact that the three groups responded to identical pairs of gambles, but under different instructions for target levels is crucial. Consider, for example, the pair of gambles under the translation of $16 in Table 2. For the subjects in group T0, this pair of gambles would involve one gamble in a pair having values all above the target of zero, while the other gamble in the pair would have values both

TABLE 2

Example Stimuli, Predicted Patterns of Choice, and Observed Choice Proportions for Experiment 2

Stated Target Level	Translation Amount and Example Gamble Values: $0 — GI ($20, 0.5; $0, 0.1; −$25, 0.4)[3] GII ($8, 0.3; $0, 0.5; −$12, 0.2)	$16 — GI ($36, 0.5; $16, 0.1; −$9, 0.4) GII ($24, 0.3; $16, 0.5; $4, 0.2)	$32 — GI ($52, 0.5; $32, 0.1; $7, 0.4) GII ($40, 0.3; $32, 0.5; $20, 0.2)
$0	$P(\mathrm{GI}) < P(\mathrm{GII})$: 3 0.44[2]	$P(\mathrm{GI}) < P(\mathrm{GII})$: 2 0.44	$P(\mathrm{GI}) < P(\mathrm{GII})$: 1 0.46
$16	$P(\mathrm{GI}) > P(\mathrm{GII})$: 4 0.56	$P(\mathrm{GI}) < P(\mathrm{GII})$: 5 0.46	$P(\mathrm{GI}) < P(\mathrm{GII})$: 2 0.56
$32	$P(\mathrm{GI}) > P(\mathrm{GII})$: 5 0.52	$P(\mathrm{GI}) > P(\mathrm{GII})$: 4 0.63	$P(\mathrm{GI}) < P(\mathrm{GII})$: 3 0.43

[1] Predicted pattern of choices for the specified combination of gambles and target levels; the number after the colon refers to the relevant proposition number of Table 1.

[2] Observed mean proportion of choices of GI across subjects and gamble pairs.

[3] Outcome values and target levels are in $10,000 units.

above and below the target. Consequently, the predicted pattern of choice is given by proposition 2, i.e., $P(\mathrm{GI}) < P(\mathrm{GII})$. On the other hand, consider the same pair of gambles when presented to the subjects in group T32. With the target at $32, this pair would involve one gamble with outcomes both above and below the target and one gamble with outcomes only below the target. Consequently, the predicted pattern of choices would be given by proposition 4, i.e., $P(\mathrm{GI}) > P(\mathrm{GII})$. More generally, each of the three sets of gambles under the three translation levels, when combined with a different explicit target value, would yield a unique predicted pattern of choices (See Table 2). The focus of our analysis will be on the responses to these three gamble pairs by each of the three groups of subjects.

The mean choice proportions of GI for the pairs of gambles under the translations of $0, $16, and $32 for each of the three groups of subjects is given in Table 2. For eight of the nine predictions, the observed proportions of choice of GI are in the predicted direction. Of particular interest is the fact that the proportion of choices for the same pairs of gambles appear to differ as a function of the unique targets, given by explicit instruction to groups T0, T16, and T32. The responses to the pairs of gambles translated by $16, where the PLC model predicts the greatest difference in choice behavior, show a definite trend in the predicted direction ($p < .14$). More importantly, note that the choice proportion for the pairs translated by $16 for group T0 was .44. The choice proportion for the same pairs for group T32 was .63, and significantly larger than for group T0 ($p < .05$). Such a shift in choice pattern is consistent with the earlier choice reversals found in experiment 1 and the experiments in [3].

While the choices in this experiment were apparently affected by instructions in a manner similar to that found with the translation procedure, it is clear that the differences in choice proportions are not as great with instructional changes for targets as was found earlier for translation changes, with a fixed target. Moreover, the mean choice proportion for the gamble pairs translated by $32 for subjects in group T16 is in the wrong direction. Apparently, in that case all the subjects did not code the smaller, but *positive*, outcome for gamble GI in each pair as a complete loss, even though the explicit target was $16. Nevertheless, it is encouraging that the reversal in choices found in the earlier experiments, as a function of the translation of outcomes, were also obtained in the present experiment by manipulating aspiration levels through explicit instructions.

3. Conclusion

The results of this study are consistent with those reported in the earlier series of experiments [3]. Evidence was obtained in experiment 1 that supports the complete set of the PLC propositions about the effects of aspiration levels on risky choice behavior. In addition, the interpretation of results in experiment 1 and those in [3], developed using a translation of outcomes procedure, was supported in experiment 2 through a convergent experimental procedure that involved setting targets through advance instructions, while holding gamble values constant. Collectively, the complete series of experiments provides strong support for the importance of a target return, reference point, or aspiration level in models of risky choice behavior.

As discussed in [3], the extensive reversals in choice observed in the series of experiments are not consistent with other frequently used models of risky choice behavior, such as mean-variance dominance and utility theory with uniformly concave (risk averse) utility functions. While the experimental results might be consistent with a utility model that incorporates one or more inflection points (hence incorporating risk averse and risk seeking behavior), these results indicate that an aspiration level concept is likely to be a fundamental cause of such inflections.[1]

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