Available online at www.sciencedirect.com
ScienceDirect
Journal of Economic Psychology 29 (2008) 715–723
JOURNAL OF Economic Psychology
www.elsevier.com/locate/joep

The rejection of attractive gambles, loss aversion, and the lemon avoidance heuristic

Eyal Ert, Ido Erev *

Max Wertheimer Minerva Center for Cognitive Studies, Faculty of Industrial Engineering and Management, Technion, Haifa 32000, Israel

Received 13 February 2007; received in revised form 24 June 2007; accepted 26 June 2007
Available online 7 July 2007

Abstract

Previous studies of mixed gambles (gambles that yield gains and losses) reveal mixed results. Whereas some studies show a tendency to reject highly attractive mixed gambles, other studies show indifference between mixed gambles with an expected value of 0 and the status quo. The current paper presents three studies that explore this discrepancy. The results highlight a strong sensitivity to the format and the context of the choice task. People tend to reject attractive mixed gambles when they are asked to decide whether to accept them, but tend to prefer these gambles over a sure payoff of 0 in a choice task. The tendency to reject mixed gambles is larger in a response to a hallway questionnaire than in the laboratory. This pattern can be summarized with the assertion that people behave as if they use a "lemon avoidance heuristic" that can be described as an intuitive implementation of SPAM killer techniques.

JEL classification: C91; D81

PsycINFO classification: 2340; 2343

Keywords: Status quo bias; Omission bias; Framing; Prospect theory; Quality uncertainty; Market for lemons

* Corresponding author.
E-mail address: erev@tx.technion.ac.il (I. Erev).

0167-4870/$ - see front matter
doi:10.1016/j.joep.2007.06.003

1. Introduction

Samuelson (1963) notes that one of his colleagues prefers the status quo over a gamble that offers an even chance to win \$200 or lose \$100.[1] Follow up studies suggest that preferences of this type are rather common (e.g., Redelmeier & Tversky, 1992; Tom, Fox, Trepel, & Poldrack, 2007; Wedell & Bockenholt, 1994). According to prospect theory (Kahneman & Tversky, 1979) these preferences reflect loss aversion: The gamble is rejected because the possible loss (of \$100) looms larger than the possible gain (of \$200) (see Tversky & Kahneman, 1991).

The robustness of the tendency to reject objectively attractive mixed gambles is highlighted in Redelmeier and Tversky (1992). In one of their studies participants were faced with the following problem:

Problem "High EV" (Redelmeier & Tversky, 1992):

> *Imagine that you have the opportunity to play a gamble that offers a 50% chance to win \$2000 and a 50% chance to lose \$500. Would you play the gamble?*

The results reveal that only 43% of the participants were willing to play the hypothetical gamble although its expected value was much higher (+\$750) than the status quo of not playing.

In light of the clear results summarized above, the results of several recent studies (e.g., Erev, Ert, & Yechiam, 2007; Ert & Erev, 2007) have come as a surprise. Rather than indicating loss aversion, observed choices revealed indifference between mixed gambles with an expected value of 0 and safer prospects with the same expected value. In one of these studies, the participants (70 Technion students) were presented with the following hypothetical choice problem (the payoffs are in Sheqels, 4 Sheqels = \$1):

Problem "Equal EV" (Ert & Erev, 2007):

Please choose between:

a. 0 with certainty

b. 1000 with probability of 0.5
−1000 with probability of 0.5

Half the participants (50%) preferred the risky gamble, even though it had the same expected value as the status quo option (i.e., the zero) and it was associated with a relatively high loss. This observation contradicts the common assumption that the typical decision-maker behaves as if losses loom larger than equivalent gains.[2] The main objective of the current study is to explore the apparent contradiction between Redelmeier and Tversky's (1992) and Ert and Erev's (2007) results. The starting point of the current investigation is the observation that the inconsistency can be a result of the format of the question. Specifically, we hypothesize that people exhibit aversion to mixed gambles when they

[1] Samuelson original analysis focused on the difference between one-shot and repeated play. His colleague rejected one-play but was willing to accept a repeated play of the same gamble. The current paper focuses on a one-shot play.

[2] This result was replicated in two other studies: one in which the outcomes were converted to real (and small) payoffs, and another in which the problem was presented as part of a larger problems dataset (see Ert & Erev, 2007).

are asked to accept or reject them (the format used by Redelmeier & Tversky, 1992), but not when they are asked to choose between two abstract prospects (the format used by Ert & Erev, 2007). Experiment 1 tests this format hypothesis by comparing the two formats on the same subject population using the same (objective) decision problem.

2. Experiment 1 – Direct evaluation of the format hypothesis

2.1. Method

Experiment 1 studies Problem "High EV", presented above, under two formats. In Condition "Accept/reject" participants were presented with the original format studied by Redelmeier and Tversky (1992). That is, they were asked if they would accept an opportunity to play Gamble "High EV" as presented in the introduction.

In condition "Choice" the problem was presented as follows:

Please choose between
a: \$0 with certainty *b: \$2000 with probability of 0.5*
−\$500 with probability of 0.5

The two conditions were compared in a between-participants design. One hundred and ten Technion students participated in the current study. Fifty-five of these participants were randomly assigned to the accept/reject condition and the remaining participants were assigned to the choice condition. The two conditions were run separately in two different rooms.[3] The participants were given a description of the problem on a paper and then marked their choice by circling their preferred option in the choice condition, and circling "Yes" or "No" in the accept/reject condition.

2.2. Results

The results reveal that 78% of the respondents preferred the gamble in the choice condition. In the accept/reject condition, however, only 55% of the respondents accepted the gamble. This significant difference [$t(108) = 2.68$, $p < .01$] suggests that the disparity between Ert and Erev (2007) and Redelmeier and Tversky (1992) results can be captured with the format hypothesis.[4]

3. Experiment 2: Hallway versus laboratory

Our favorite explanation of the format effect, documented above, is based on "Email analogy". Many of the Email messages that we receive propose trading opportunities that

[3] Seventy participants responded to this problem after they completed an experiment on social choice (a replication of Charness & Grosskopf, 2001) in two large rooms, one for each condition. The remaining 40 participants marked their preference in the laboratory after they completed a matching task in which they compared a prospect of $(\$a, p; \$b)$ with a prospect of $(\$c, p; \$x)$ where $a < c < b$ and x was systematically varied. There was no significant difference between these two groups.

[4] The current result implies that participants violated the procedure invariance principle assumed under rational choice. This result is consistent with previous studies that showed violations of this principle (e.g., with choice vs. pricing; see Tversky, Slovic, & Kahneman, 1990 for a review).

seem tricky; under Akerlof's (1970) classical analysis these Emails are likely to sell "lemons".[5] For example, while writing the first draft of the current paragraph we received the following message:

> *Are you interested in how you can increase your lottery chances by exactly 3,600%? Of course. But make no mistake! Our e-LOTTERY 'MULTI-WIN' SYNDICATE SYSTEM is nothing like any syndicate you may have played in before. It's unique!... Giving you a fun, hassle-free way to play online every week and a huge, proven, mathematical advantage over playing the lotteries on your own the normal way. In fact, so huge an advantage you have a massive 702% greater chance of scooping a UK National Lotto jackpot and an even better 3600% greater chance of scooping a EuroMillions jackpot!*
>
> *To get the full 'inside-track' on the e-Lottery Advantage, go to our website right now! Go now to: ...*"

In order to avoid the temptation of lemons and to save time (and money) we usually try to erase messages of this type without even reading them. Recently, our university applied a "SPAM killer" rule to our Email system that tries to do this automatically. The SPAM killer erases a message if it has features of a typical SPAM. Notice that rules of this type use multiple criteria. For example, the algorithm is typically programmed to detect whether the message or its headline include words such as "lottery", "win", or "success". These and similar words are relevant because they appear in SPAM with high probability (relative to non-SPAM messages).

We believe that a similar rule is used intuitively in many settings. The "Lemon Avoidance heuristic" implies that offers that look like (have features of) lemons would be rejected. Under this hypothesis, people are more likely to reject the mixed gamble under the accept/reject format because this format includes more features of typical lemons. Specifically, we assert that the requirement to explicitly accept a gamble can trigger the lemon avoidance heuristic.

Like SPAM killers, the hypothesized lemon avoidance heuristic can be triggered by more than one feature of the environment. Experiment 2 focuses on one additional feature of this type. It examines situations in which the decision-maker is approached by a stranger. Interestingly, it seems that we explicitly instruct our kids to use the lemon avoidance heuristic in this setting: they should "never take a candy from a stranger". Thus, it is natural to hypothesize that offers from strangers trigger the lemon avoidance heuristic.

3.1. Method

The experiment focuses on the two conditions of the problem "High EV", studied in Experiment 1, in a different physical environment. Instead of presenting the problem as part of a structured experiment, the experimenter approached students casually in the faculty hallways, and presented them with one of the two conditions. Under the working assumption of this experiment, the situation of being casually stopped by another person and responding to her request (in this case to mark your preference for a gamble on a

[5] Akerlof's analysis suggests that rational individuals should avoid trades when the other side is likely to be similar to them (in his valuation of the traded option), and have better estimation of this value. Product that are traded in violation of this principle are likely to be "lemons" (i.e., likely to be realized as bad products).

paper) is a feature of a typical "lemon offer". This situation is more similar (than the laboratory setting) to natural settings in which we are offered tricky deals.

Under the lemon avoidance hypothesis (and the current working assumption), the tendency to prefer the mixed gamble in Experiment 2 is predicted to be lower than the tendency documented in Experiment 1.

One hundred and ten students participated in the current study.[6] Fifty-five participants were assigned randomly to the accept/reject condition. The remaining participants were assigned to the choice condition. As in the first experiment, the participants marked their choice on papers provided.

3.2. Results

The proportion of people willing to play the gamble was 51% in the choice condition and only 42% in the accept/reject condition. As predicted by the lemon avoidance hypothesis, the acceptance rate over the two conditions was much lower (46%) in the current study than in Study 1 (66%). This difference is significant [$t(108) = -3.37$, $p < .001$]. It seems that when people are stopped casually in the hallway they are less willing to play the gamble than when they evaluate it in a structured experiment.

It is worth noticing, however, that the proportions of gamble acceptance in each condition of the current study did not significantly differ from 50%. Thus, an alternative explanation to the current results might be that people who are stopped casually in the hallway might act randomly simply to be left alone as quickly as possible. Experiment 3 is designed to evaluate this alternative explanation.

4. Experiment 3: Are people in the hallway conservative or indifferent?

The current experiment is designed to address the alternative interpretations to the effect of the physical environment on choice as demonstrated above. The lemon avoidance hypothesis suggests that people are less willing to play the gamble when they are stopped casually than in structured experiment since the former situation is associated with lemon dilemmas. According to the indifference hypothesis, however, the apparent decrease in the peoples' willingness to play the gamble in the hallway results from random responses that reflect their disengagement with the task.

4.1. Method

In order to compare these two hypotheses, Experiment 3 studies the Equal EV problem, presented in the introduction (and considered by Ert & Erev, 2007), in the physical environment studied in Experiment 2. To further examine the format effect, Experiment 3 compares the two format conditions examined above: accept/reject and choice.

Recall that when the Equal EV gamble was presented in a choice frame and in a structured experiment (in Ert & Erev, 2007), the proportion of gamble acceptance was 50%. Thus, the lemon avoidance hypothesis predicts that the proportion of people willing to

[6] The experimenter approached students randomly in the hallways of one of the Technion buildings and asked them to mark their preferences on a paper she gave them. Almost all students agreed to participate.

play this gamble in the hallway will be lower than 50% in the choice condition, and even lesser in the accept/reject condition. The indifference hypothesis, on the other hand, predicts that both proportions will not differ significantly from random choice.

One hundred students participated in the current study. Fifty participants were assigned randomly to the accept/reject condition. The remaining participants were assigned to the choice condition. The procedure was identical to the procedure reported in Experiment 2, except that the current study focused on the Equal EV problem.

4.2. Results

The results reveal that the proportion of gambles acceptance in the choice condition (38%) was again much higher than the proportion of gamble acceptance in the accept/reject condition (22%). This significant difference [$t(98) = -1.76$, $p < .05$, one tail] is similar to the differences observed between these two conditions in the previous experiments. In addition, the proportion of gamble acceptance over the two conditions (30%) was lower than the overall choice in the High EV problem in Experiment 2 (46%), [$t(103) = -2.46$, $p < .02$]. Finally, the proportion of gamble acceptance in the choice condition was lower (though insignificantly) in the hallway (38%) than the proportion of gamble acceptance in this condition when studied in class (50%). All these observations support the lemon avoidance hypothesis. It seems that people are sensitive to the attractiveness of the gambles and do not simply act randomly when they are approached in the hallway.

5. Discussion

The main objective of the current paper is to improve our understanding of the apparent inconsistency between previous studies of mixed gambles. Experiment 1 shows that this inconsistency can be explained as a product of a format effect: When deciding between accepting and rejecting a mixed gamble, many participants (45%) rejected a highly attractive (expected value wise) gamble. This behavior that can be described as an indication of loss aversion replicates previous findings by Redelmeier and Tversky (1992). However, the tendency to prefer the status quo was reduced by half (to 22%) when the format of the question was modified and the participants were asked to select between two options. This behavior, that shows only weak indication of loss aversion, is consistent with the results reported by Ert and Erev (2007).

Experiments 2 and 3 suggest that the format effect can be a product of the usage of a lemon avoidance heuristic. They show that increasing the similarity of the experimental task to experiences with tricky offers (lemons), by approaching the participants in the hallway, increases the tendency to reject the gamble.

The main shortcoming of the lemon avoidance explanation involves the "not even wrong" argument.[7] That is, it is hard to think about behaviors that cannot be explained as a product of a usage of some reasonable heuristic.

[7] A scientific concept is said to be "not even wrong" if it is not falsifiable in the Popperian sense, or if it is not useful in predicting the physical world. The phrase is attributed to the physicist Wolfgang Pauli following a remark he made about a piece of research that he was asked to evaluate (see Peierls, 1960).

We have three partial answers to this important critique. First, Experiments 2 and 3 demonstrate that it is possible to derive testable predictions from the lemon avoidance hypothesis in the current context.

A second answer involves the observation that the reliance on SPAM killer is an example of an implementation of the lemon avoidance heuristic in computer programs. Thus, there are important settings in which the usage of the lemon avoidance heuristic is explicit and observable.

Finally, note that the hypothesized lemon avoidance heuristic can be naturally described as a refinement of the loss aversion hypothesis (Kahneman & Tversky, 1979). In order to clarify this assertion it is constructive to start with the distinction between of two classes of explanations of behavioral decision phenomena. One class involves general (typically perceptual) phenomena. Our favorite example of an explanation of this type is provided by the diminishing sensitivity assumption captured in prospect theory. A second class involves heuristics (see Gigerenzer & Todd, 1999; Tversky & Kahneman, 1974). Heuristics are assumed to be cognitively simple rules that lead to efficient outcomes in many situations, but can lead to biases in some settings.

Kahneman and Tversky (1979) original abstraction of loss aversion treats this construct as a general phenomenon. That is, loss aversion is captured with the same value function that captures the diminishing sensitivity assumption. Note, that this function is assumed to describe behavior in both formats that were studied here. The current results suggest that the loss aversion tendency is less general. This tendency is better described as a heuristic: People are likely to behave in accordance with loss aversion when the situation is similar to an environment in which most offers should be rejected.

5.1. Relationship to the status quo, omission, and commission biases

Previous research demonstrates that in many cases people deviate from rational choice in the direction of favoring the status quo (see Samuelson & Zeckhauser, 1988) and of favoring the omission of actions (Ritov & Baron, 1992). Both tendencies can be explained as indications of loss aversion.

Whereas these biases are rather robust, the opposite biases are also observed in some settings. For example, in the ''Acquiring a company'' exercise (see Samuelson & Bazerman, 1985)[8] people deviate from the status quo (of not buying) when the status quo maximizes expected payoff and avoids losses. Similarly, recent studies that highlight people's tendency to conform to established norms have showed reversals of the omission bias (e.g., Bar Eli, Azar, Ritov, & Schein, 2007; Zeelenberg, van den Bos, van Dijk, & Pieters, 2002). The current analysis suggests a possible explanation to the concurrence of both phenomena. It suggests that problems that involve accepting/rejecting decisions (such as deciding whether to accept or reject a proposed alternative to the status quo) facilitate

[8] In the ''Acquiring a company'' task a potential buyer considers buying a company. The target company's value, v is known to the seller but not to the buyer. The buyer only knows that v is uniformly distributed between 0 and 100. The seller sells the company *provided it is at a profitable price*. If the buyer purchases the company then it's value increases by 50%. In these conditions the final price that a rational buyer should suggest is zero since the selective acceptance implies negative expected returns to the buyer (see e.g., Samuelson & Bazerman, 1985 for an explanation). Yet, the typical bid is approximately \$50, and does not decrease even after experience with the task (e.g., Bazerman & Neale, 1992; Bereby-Meyer & Grosskopf, in press).

rejection. On the other hand, formats that are more related to choice tasks (as in the "acquiring a company" game) can reduce this tendency or even reverse it. Interestingly, the results of recent studies that focused on different variants of the ultimatum game are also consistent with this hypothesis (see Larrick & Blount, 1997; Stahl & Haruvy, 2007).

5.2. Concluding remarks

The current paper shows that the inconsistency between Redelmeier and Tversky's (1992) and Ert and Erev's (2007) results can be explained as a product of a format effect. The tendency to reject mixed gambles is larger when people are asked if they accept it, than when they are asked to choose between two prospects. Moreover, approaching the participants in the hallway increases the tendency to reject the gamble. These observations suggest that the tendency to exhibit loss aversion is situation-dependent, and can be captured with the abstraction of loss aversion as a product of reliance on the lemon avoidance heuristic. Under this abstraction the tendency to exhibit loss aversion is determined by the psychological similarity of the choice environment to experiences in which this tendency is reinforcing.

Acknowledgement

This research was supported by a grant from Israel Science Foundation, and benefited from comments from Shahar Ayal, and the participants of the "International Conference on Affect, Motivation and Decision Making" Ein Boqeq, Israel, December 2006. We thank Dana Dahan for help in data collection. We also would like to thank the editor and an anonymous reviewer for their constructive comments.

References

Akerlof, G. A. (1970). The market for "lemons": Quality uncertainty and the market mechanism. *Quarterly Journal of Economics, 84*, 488–500.

Bar Eli, M., Azar, O. H., Ritov, I., Keidar-Levine, Y., & Schein, G. (2007). Action bias among elite soccer goalkeepers: The case of penalty kicks. *Journal of Economic Psychology, 28*(5), 606–621.

Bazerman, M. H., & Neale, M. A. (1992). *Negotiating rationally*. New York: Free Press.

Bereby-Meyer, Y., & Grosskopf, B. (in press). Overcoming the winner's curse: An adaptive learning perspective. *Journal of Behavioral Decision Making*.

Charness, G., & Grosskopf, B. (2001). Relative payoffs and happiness: An experimental study. *Journal of Economic Behavior and Organization, 45*, 301–328.

Erev, I., Ert, E., & Yechiam, E. (2007). Loss aversion, diminishing sensitivity, and the effect of experience in repeated decisions. Working paper, Technion.

Ert, E., & Erev, I. (2007). Loss aversion and the value of a symmetric simplification of prospect theory. Working paper, Technion.

Gigerenzer, G., & Todd, P. M. (1999). *Simple heuristics that make us smart*. Oxford: Oxford University Press.

Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decisions under risk. *Econometrica, 47*, 263–291.

Larrick, R. P., & Blount, S. (1997). The claiming effect: Why players are more generous in social dilemmas than in ultimatum games. *Journal of Personality and Social Psychology, 72*, 810–825.

Peierls, R. (1960). *Biographical Memoirs of Fellows of the Royal Society, 5*, 174–192.

Redelmeier, D. A., & Tversky, A. (1992). On the framing of multiple prospects. *Psychological Science, 3*, 191–193.

Ritov, I., & Baron, J. (1992). Status quo and omission biases. *Journal of Risk and Uncertainty, 5*, 49–61.

Samuelson, P. A. (1963). Risk and uncertainty: A fallacy of large numbers. *Scientia, 98*, 108–113.
Samuelson, W., & Bazerman, M. H. (1985). Negotiation under the winner's curse. In V. Smith (Ed.). *Research in experimental economics* (Vol. 3, pp. 105–137). Greenwich CT: Jai Press.
Samuelson, W., & Zeckhauser, R. (1988). Status quo bias in decision making. *Journal of Risk and Uncertainty, 1*, 7–59.
Stahl, D.O., & Haruvy, E. (2007). Subgame perfection in ultimatum bargaining trees. Working Paper, University of Texas.
Tom, S. M., Fox, C. R., Trepel, C., & Poldrack, R. A. (2007). The neural basis of loss aversion in decision making under risk. *Science, 315*, 515–518.
Tversky, A., & Kahneman, D. (1974). Judgement under uncertainty: Heuristics and biases. *Science, 185*, 1124–1131.
Tversky, A., & Kahneman, D. (1991). Loss aversion in riskless choice: A reference dependent model. *Quarterly Journal of Economics*, 1039–1061.
Tversky, A., Slovic, P., & Kahneman, D. (1990). The causes of preference reversal. *American Economic Review, 80*, 204–217.
Wedell, D. H., & Bockenholt, U. (1994). Contemplating single versus multiple encounters of a risky prospect. *The American Journal of Psychology, 107*, 499–518.
Zeelenberg, M., van den Bos, K., van Dijk, E., & Pieters, R. (2002). The inaction effect in the psychology of regret. *Journal of Personality and Social Psychology, 82*, 314–327.