

Probability of Regret: Anticipation of Uncertainty Resolution in Choice

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In choice between uncertain options, uncertainty may be eventually resolved for all options, or just for the chosen option. The findings described here demonstrate that preference between uncertain options is systematically affected by expectations concerning uncertainty resolution: Prospects which are less likely to yield worse outcome than the alternative are selected more often when all options are to be resolved (complete resolution). Two experiments examined choice between statistically independent lotteries for which the chances of being worse off with the low-risk alternative were nearly as high, or higher than the chances of being worse-off with the high-risk alternative. For these gamble pairs it was found that subjects who expected complete resolution chose the high-risk high-gain option more often than subjects who expected only their selected gamble to be resolved. A third experiment suggests that the preference changes due to resolution are related to the probability of the low-risk gamble yielding the worse obtained outcome. The results are interpreted as compatible with the hypothesis that in choosing between uncertain options, people are more inclined to compare outcomes per states of the world if they expect to learn what would have happened with each option. In those cases, the outcome of a foregone option is more likely to serve as a salient comparison point for evaluating the outcome of the selected option. An alternative explanation is also discussed. © 1996 Academic Press, Inc.

Many decision problems one faces, in real life as well as in laboratory experiments, involve a choice between two or more uncertain alternatives. Whether one chooses to invest in a specific share in the stock market, or one makes a managerial decision in favor of applying one efficiency measure over another, one normally expects to find out what the result of the choice will be. Indeed, in both these examples, one would “know the

result” in the sense that one would be informed of the outcome obtained for the chosen alternative: The value of the stock one invested in or the data related to efficiency subsequent to implementation of the efficiency measure. However, the two decision problems differ with respect to the extent of uncertainty resolution. In stock investment, one invariably knows both the value of the chosen share and those of the alternative shares one had considered. In implementing procedural changes designed to achieve better efficiency, one seldom knows for certain what would have happened had one chosen differently. The present study is designed to examine the hypothesis that anticipation of uncertainty resolution for all alternatives in the choice set, as opposed to resolution of the chosen option only, affects preferences among some options, due to the probability of regret.

Recent research provides some evidence for experienced regret, associated with comparing the outcomes of the chosen and unchosen alternatives. Boles and Messick (1995) show that the judged goodness of an outcome is closely related to the alternative outcome. Thus, a winner in one gamble was judged to be less satisfied than a loser in another gamble, if the winner would have won more with the alternative, and the loser would have lost more. Similarly, Baron and Ritov (1994) found that comparison to the alternative outcome affected rating of the decision maker's emotions, as well as judgment of the choice's advisability. In particular, the bias toward omission was greater when the act led to the worse of the alternative outcomes, even when this outcome represented a gain relative to the previous status quo.

If people are aware of the possibility of experiencing regret, it seems plausible to assume that they would take this into consideration when making decisions whose outcomes are uncertain. Indeed, according to Regret Theory, anticipation of the ex post experience affects choice between two uncertain alternatives (Bell, 1982; Loomes & Sugden, 1982). The decision process through which anticipated regret is assumed to affect choice entails that for each decision problem a juxtaposition of consequences in an action/state matrix can be

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TABLE 1

State-Contingent Consequences for a Single Lottery

Prospect	Probability of state of the world			
	I $p_1 * (1 - p_2)$	II $(1 - p_1) * p_2$	III $p_1 * p_2$	IV $(1 - p_1) * (1 - p_2)$
A_1	G_1	0	G_1	0
A_2	0	G_2	G_2	0

constructed. Originally Regret Theory has been confined only to those decisions in which complete resolution is expected (Bell, 1982). However, as noted earlier, complete information concerning the consequences of each option in all states of the world is not always available. In order to apply Regret Theory in those cases where state-contingent consequences are not defined, it has been assumed that the options can be treated as statistically independent. It has further been proposed that choosing between statistically independent options for which state-contingent consequences are not defined is the same as choosing between statistically independent options for which all state-contingent consequences are defined (Loomes & Sugden, 1987).

To illustrate how preference may be affected by potential regret, imagine that one has to choose between two prospects, A_1 and A_2 , of similar expected value. A_1 offers G_1 , with probability p_1 (otherwise zero), and A_2 offers G_2 , with probability p_2 (otherwise zero). The two prospects are said to be statistically independent if the probability of each prospect yielding a gain, given that the other prospect yielded a gain, is the same as the unconditional probability. Thus, in each of the following situations A_1 and A_2 are statistically independent: (a) The outcomes of A_1 and A_2 depend upon separate and independent lotteries. Only the lottery corresponding to the chosen prospect will be played out. (b) The outcomes of A_1 and A_2 depend upon separate and independent lotteries. Both lotteries will be played out. (c) The outcomes of both A_1 and A_2 depend upon a single lottery, with the state/consequence matrix given in Table 1.

Consider, as an example, a choice between gamble A_1 , which offers 80% chance of winning \$18 (otherwise zero), and A_2 , which offers 50% chance of winning \$29 (otherwise zero). Each gamble could be resolved by drawing a ball from an urn containing marked and unmarked balls. The price will be won if a marked ball is drawn from the urn. The urn corresponding to A_1 contains 80% marked balls, and the one corresponding to A_2 contains 50% marked balls. Situation (a) will be realized if a ball is drawn only from the urn correspond-

ing to the selected gamble. Situation (b) will be realized if, after a choice has been made, a ball is drawn from each of the urns. Finally, a single urn could be used, with balls marked (with different marks) for both gambles. In this case, drawing a ball from the urn simultaneously resolves both gambles.

If the three situations detailed above are equivalent, as the later version of Regret Theory maintains, the choice between A_1 and A_2 should be the same in all three cases. Contrary to this prediction, the present study will demonstrate that subjects' choice between two statistically independent lotteries is systematically affected by whether or not they expect both lotteries to be eventually resolved.

Although A_1 and A_2 are statistically independent in all three situations detailed above, the ex post evaluation of outcomes may be different in those situations. Indeed, some recent studies (Ritov and Baron, 1995) suggest that the evaluation of the same outcome substantially varies, depending on whether or not the outcome of the unchosen option is known. In particular, acts leading to bad outcomes were judged worse than omissions leading to identical outcomes, provided that only the outcome of the selected option was known. When all outcomes were known, if the outcome of the foregone option was better than the outcome of the selected option, commission was judged better than omission, and the order reversed if the foregone option's outcome was worse than the obtained outcome. Ritov and Baron interpreted the above result as suggesting that the degree of resolution (partial vs complete) determines the reference points for evaluation of the obtained outcome. In partial resolution, the obtained outcome is likely to be compared to a preexisting status quo, or, perhaps to some expected outcome. When uncertainty is resolved for all options, however, the obtained outcome of the unchosen alternative serves as a salient comparison point.

The findings of Ritov and Baron (1995) suggest that postresolution evaluation of outcomes in choice between gambles may differ, depending upon whether or not both gambles are resolved. Feelings about the actual outcome are likely to be affected by comparison to the outcome of the unchosen alternative, in those situations where both outcomes obtain. Consequently, if anticipated regret affects choice, preference between gambles in a given pair may vary, depending upon whether one expects resolution of both gambles, or just the chosen one. Consider, once again, the choice between gamble A_1 which offers 80% chance of winning 18, and gamble A_2 which offers 50% chance of winning 29. The gamble with the higher probability of winning (A_1 , in this example) is often referred to as the "P bet,"

TABLE 2

State-Contingent Consequences for the Choice between A_1 (80% Chance to Win \$18) and A_2 (50% Chance to Win \$29)

Prospect	Probability of state of the world			
	I	II	III	IV
Probability:	.4	.1	.4	.1
A_1	\$18	0	\$18	0
A_2	0	\$29	\$29	0

and the other member of the gamble pair, which offers a lower probability of winning a higher price (A_2 , in this example) is referred to as the “\$ bet.” In experimental settings employing partial resolution, subjects have often expressed preference for the P bet over the equal expected value \$ bet. Thus, the difference between the 80 and 50% chances of winning seems more salient than the difference between the corresponding potential gains.

Imagine now, the same two independent gambles, in the complete resolution setting described earlier. Table 2 presents the state-contingent consequences for this choice. Anticipation of complete resolution, as has been argued above, changes the subjective evaluation of any particular outcome by having it compared to the alternative outcome, under each possible state of the world. Thus, winning 18, in the example above, may be positively evaluated when it is paired with a foregone win of 0 (in state I), but it is likely to produce a less positive evaluation when paired with a foregone gain of 29 (in state III). Similarly, the subjective value of winning zero, in gamble A_1 varies, depending upon whether the foregone gamble won 18 or 0. As choice between gambles depends upon the subjective value of expected outcomes, as well as the weighting of probabilities, the overall utility of gamble A_1 and gamble A_2 may be different, in this case, from the utilities calculated under partial resolution.

The impact of anticipating resolution, in itself, received little attention in previous research until quite recently. One study which did test for the effect of resolution expectations (Kelsey & Schepanski, 1991) failed to demonstrate a significant effect of anticipated resolution on choice. Kelsey and Schepanski, however, tested only choice between a “sure thing” and a risky prospect. In their study, choice of the risky prospect was always followed by complete resolution. Hence it is unclear whether the lack of resolution effect in their study could be directly extended to choice between two gambles. Josephs, Larrick, Steele, and Nisbett (1992) showed that expectations about feedback on an uncho-

sen (as well as chosen) alternative leads low self-esteem subjects to make more risk averse choices.

Zeelenberg, Beattie, van der Pligt, and de Vries (1996) point out that risk aversion has often been confounded with regret aversion. In the Josephs *et al.* (1992) study, for example, risk averse choices were also the choices which minimized potential regret. Zeelenberg *et al.* (1996) demonstrate that preference for relatively safe or risky prospects can be changed by manipulating which of the prospects is resolved. Preference for regret minimizing, rather than risk averse choices, under expectation of complete resolution, has also been demonstrated by Larrick and Boles (1995), who studied the impact of feedback expectations in negotiation. In their study negotiators who expected feedback on the foregone alternative were more risk seeking. The authors interpret this result as an indication of regret aversion: anticipation of uncertainty resolution of all options entails a possibility of regret.

Complete resolution of all options grants the possibility of regret. Yet the likelihood of experiencing regret varies, depending on the options in the choice set. Hence, change in preference due to anticipation of complete resolution for both options would depend upon the specific parameters employed. In order to make exact predictions for all values of the parameters, one needs to have a detailed utility model, pertaining to the weighting of both outcomes and probabilities. The present paper does not aim at developing such a model. Instead, it will draw upon earlier findings to suggest possible parameter ranges in which reversals due to anticipated resolution may occur.

Extensive research on subjective evaluation of outcomes (i.e., Tversky & Kahneman, 1991; Tversky & Kahneman, 1992) suggests that people are particularly averse to losses relative to their reference point. Thus, to the extent that the outcome of the foregone option serves as a natural reference point, regret over obtaining a lower outcome than the foregone option will loom larger than rejoicing over obtaining the higher of the two outcomes. Given the notable asymmetry, it seems plausible to assume that preference between two gambles, both of which are expected to be resolved, would be substantially affected by a desire to avoid regret. Hence, under these circumstances, the probability of obtaining the worse of the two outcomes is likely to play a major role. In order to illustrate the effect of anticipated regret consider, once more, the independent gambles described in Table 1. If $G_1 < G_2$, gamble A_1 yields a worse outcome than gamble A_2 in both state II and state III. The combined probability of these two states is p_2 . State I is the only state of the world in which A_2 yields a worse outcome than A_1 . The probabil-

ity of obtaining this state is $p_1^*(1 - p_2)$. If $p_2 > p_1^*(1 - p_2)$ then the probability of regret with gamble A_1 is higher than the probability of regret with gamble A_2 .

Naturally, there is a quantitative aspect to the experience of regret: a larger (negative) difference between obtained and alternative outcomes is likely to generate more regret than a smaller difference. However, for the present study we adopt the clearly oversimplified assumption that the decision maker is concerned most with avoiding regret, and the absolute value of the monetary difference between the obtained and foregone outcomes is considered less important. Under this assumption preference for A_1 over A_2 should be determined primarily by comparing $p_1^*(1 - p_2)$ and p_2 . For instance, consider, once again, the choice presented earlier, between a gamble which offers 80% chance of winning 18 (the P bet), and another gamble which offers 50% chance of winning 29 (the \$ bet). For this pair, one would predict that the attractiveness of the P bet will decrease as the decision maker, anticipating complete resolution, will come to realize that in selecting this bet he faces 50% chance of regretting his choice, while selecting the \$ bet entails only 40% chance of regret.

In the following three experiments, subjects were presented with a series of pairs of gambles with similar expected values. For each pair, subjects indicated which gamble they would prefer to own. In Experiment 1, the gambles involved either a single lottery or two separate lotteries. Although neither lottery was played out in this experiment, the single lottery presentation ensures that had the lottery been played out, both gambles would have been resolved simultaneously. In Experiment 2 each gamble is represented by a separate lottery. In one condition, subjects are presented with the resolution of both lotteries after making each choice, while in the second condition subjects are presented only with the outcome of the lottery of their choice.

In both Experiment 1 and Experiment 2 the list of gambles included only pairs for which, under complete resolution, the P bet entailed nearly as high (or even higher) probability of obtaining the worse outcome as the \$ bet. Thus, the probability of regretting having selected the P bet is roughly the same as the probability of regret over a \$ bet selection. Previous research suggests that under partial resolution, subjects will tend to prefer the P bet over the \$ bet. It follows from the above discussion that for the pairs included in Experiments 1 and 2 preference for P bets will diminish under complete resolution.

Finally, regret is expected to reverse preferences primarily in those cases where regret avoidance and risk

avoidance would lead to different (contradictory) choices. If, on the other hand, the same gamble would minimize both perceived risk and probability of anticipated regret, complete resolution is not expected to affect preference in a systematic way. This hypothesis is tested in Experiment 3. Experiment 3 replicated the basic design of Experiment 2, while varying the values of the probability parameter. In addition to the set of pairs used in Experiment 2, another set of pairs was presented, in which the probability of regret in selecting the \$ bet was considerably higher than the probability of regret in selecting the P bet. The effect of resolution on preferences among those pairs is expected to be greatly reduced (relative to its effect in the original set of pairs).

EXPERIMENT 1

This questionnaire study compares choices between pairs of gambles which depend either on a single lottery draw, or on two separate independent lotteries. Since no lottery is actually played, no gamble will eventually be resolved. However, the mechanism of resolution in the single-lottery condition entails that both gambles must be resolved simultaneously. Under this condition one can easily imagine that as the outcomes obtain, the outcome of the foregone alternative will be as salient (or nearly as salient) as the outcome of the chosen alternative. In contrast, under the separate lotteries condition, only the outcome of the chosen alternative will obtain. As the chances for being better-off with the \$ bet are nearly as high, or even higher than the chances of being better-off with the P bet in the three pairs used here, the \$ bets are expected to be more attractive in the complete resolution (single lottery) condition.

Method

Subjects were 108 industrial engineering students at Ben-Gurion University, who volunteered to participate in this experiment. The experiment was run during regular class sessions. Subjects were randomly assigned to the two conditions.

Three pairs of gambles were used, with expected values ranging between 8 and 12.5 shekels. The gambles were presented in the form of boxes containing marked balls. In the single-lottery (complete resolution) version, each choice concerned one box. The 20 balls contained in this box were marked in two different ways. Thus, if the probability of winning in the two gambles was p_1 and p_2 , respectively, p_1 of the 20 balls were painted gray (the others remaining white), and p_2 of the same 20 balls were marked by X's (the others re-

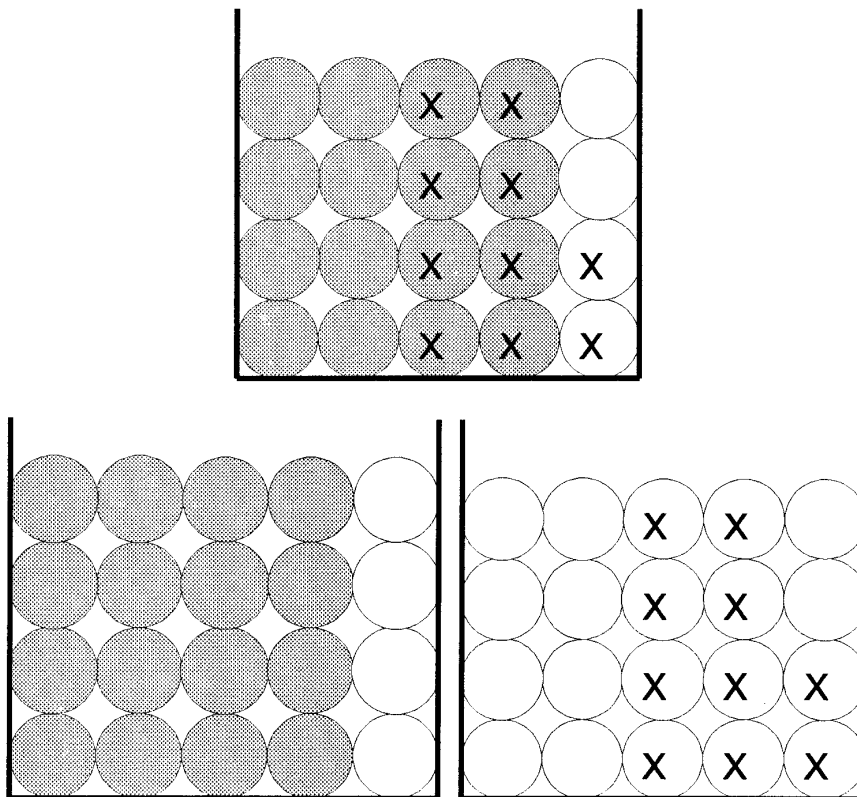


FIG. 1. Experiment 1. Presentation format of lotteries. (Top) Complete resolution version. (Bottom) Partial resolution version.

maining unmarked by X's). In order to keep the two gambles independent, the proportion of balls which were both painted gray and marked by X was exactly $p_1 * p_2$. Figure 1 presents an example of this display. A description of the gambles, in the form of lottery tickets, appeared below the box. The tickets were of the following format: Ticket A, drawing of a gray painted ball guarantees a winning of Y shekels. Ticket B: drawing of an X-marked ball guarantees a winning of Z shekels. Subjects were asked to indicate which of the two tickets they would prefer to own. The values of p_1 , p_2 , Y , and Z are given in Table 3.

TABLE 3

Experiment 1: Percentage of Subjects Preferring the \$ Bet

Gamble pairs		Probability of regret		Percentage \$ bet choices	
				Complete resolution (single lottery)	Partial resolution (two lotteries)
P bet	\$ bet	P bet	\$ bet		
(.8, 10)	(.5, 25)	.5	.4	30	19
(.9, 10)	(.5, 18)	.5	.45	33	8
(.7, 15)	(.5, 21)	.5	.35	76	49

In the two-lottery (partial resolution) version two boxes were used for each choice. One box contained a proportion of p_1 gray painted balls (the other balls unpainted), and the second box contained a proportion of p_2 X-marked balls (the others unmarked). An example of such a pair appears in Fig. 1. The same description of lottery tickets was used as in the first version. However, in choosing their preferred ticket, subjects were asked to assume that only the chosen lottery will be played.

Results

Table 3 presents, for each pair of gambles, the percentage of subjects choosing the high-risk gamble in each of the two conditions. As in numerous past experiments using choice between gambles of similar expected value, here too subjects were generally risk averse: across both conditions the P bet was chosen more often than the \$ bet. However, in all three pairs the percentage of subjects preferring the \$ bet was higher in the single-lottery condition than in the two-lottery condition. On the average, subjects preferred the \$ bet in 1.35 pairs (out of 3) in the single-lottery presentation, and only in 0.74 pairs, in the two-lottery presentation ($t = 3.74$, $p < .001$). Thus, the attrac-

tiveness of the high-risk gamble was clearly enhanced by the use of a single device, ensuring simultaneous resolution of both gambles.

The results obtained here are compatible with the prediction that preferences are affected by the potential for regret if the mechanism of resolution entails simultaneous resolution of both gambles. However, it can still be argued that the format of presentation, rather than expectation of complete resolution, induced subjects in the single-lottery (complete resolution) condition to compare the options per states of the world. In this condition, the outcomes of the two gambles were juxtaposed, by having both outcomes on each ball. Thus, to support the claim that expectation of uncertainty resolution for both gambles is the source of the effect found here, one needs to show that it would also occur when the format is kept fixed and expectation of complete resolution is manipulated independently. Experiment 2 provides this demonstration.

EXPERIMENT 2

The present experiment elicits choices between gambles which are consequently played out. Every subject performs a series of choices between pairs of gambles, each choice followed by a resolution procedure. Thus, expectations concerning outcome information are likely to be formed. Anticipating the impact of outcome information on satisfaction with one's choice may, in turn, affect preferences among gambles.

The two versions included in this experiment do not differ in the information presented at the choice stage: both the parameter values, the resolution mechanism, and the very format of the display are identical. The versions differ only in the resolution following each choice: In the complete resolution version both gambles are played, whereas in the partial resolution version, only the chosen gamble is played. Hence, in making a choice, the subject would anticipate learning either of both outcomes (in the complete resolution version) or only of the outcome of his chosen gamble (in the partial resolution version). Those different expectations are predicted to affect preference among the gambles.

Method

Subjects were 32 industrial engineering graduate students at Ben-Gurion University who volunteered to participate in this experiment. The experiment was run on a computer, in individual sessions. Subjects were randomly assigned to one of the two conditions, run on alternating sessions.

A list of 12 pairs of gambles of similar expected values was used. The list included 4 different pairs of

TABLE 4

Experiment 2: Percentage of Subjects Preferring the \$ Bet

Gamble pairs		Probability of regret		Percentage \$ bet choices	
				Complete resolution (both lotteries)	Partial resolution (chosen lottery)
P bet	\$ bet	P bet	\$ bet		
(.8, 15)	(.5, 24)	.5	.4	20	36
(.7, 7)	(.4, 12)	.4	.42	27	18
(.6, 10)	(.4, 15)	.4	.36	47	24
(.9, 8)	(.5, 15)	.5	.45	33	24
(.7, 9)	(.4, 16)	.4	.42	53	12
(.6, 8)	(.4, 12)	.4	.36	33	12
(.8, 11)	(.5, 18)	.5	.4	27	24
(.9, 12)	(.5, 21)	.5	.45	47	29
(.6, 13)	(.4, 20)	.4	.36	73	41
(.7, 6)	(.4, 11)	.4	.42	47	12
(.9, 7)	(.5, 13)	.5	.45	40	18
(.8, 18)	(.5, 29)	.5	.4	60	41

values for the probability of winning. Each of these pairs of probability values was matched with three different pairs of monetary values, thus generating the 12 pairs of gambles. The order of the pairs, as well as the left-right presentation within each pair were randomized. The same random order was used in both conditions. The complete list of pairs appears in Table 4, in the order of presentation. Subjects did not know the sequence before making their choices.

The gambles were presented in the form of two boxes containing 10 balls, some red and the others yellow. The boxes were presented side by side on a computer screen. Below each box a statement indicated the amount that would be gained should a red ball be drawn from the box. Subjects, in both conditions, were asked to choose which gamble they would prefer to own, given that the outcome of each gamble would be determined by a random drawing of one ball from the given box.

In the complete resolution condition, after the subject made his choice, both lotteries were played out. The balls were seen bouncing around in the boxes, until one ball fell out of each box. A statement appearing on the screen below the boxes indicated the amount of money the subject won (if any), and the amount he would have won had he chosen the other gamble. The program then proceeded to present the next pair of gambles. The same procedure was used in the partial resolution condition, except that once a choice had been made, the unchosen gamble was eliminated from the screen, and only the chosen gamble was played out. Accordingly, the subject was then informed of his winning only.

Results

Table 4 presents, for each pair of gambles, the percentage of subjects choosing the \$ bet in each of the two conditions. Although subjects were overall risk averse, preference was affected by the experimental manipulation: In all except the first (warm up) pair, the percentage of subjects preferring the \$ bet was higher in the complete resolution condition than in the partial resolution condition. The difference between the two conditions across the 12 pairs is significant: subjects preferred the \$ bet in 5.2 pairs (out of 12) in the complete resolution version and 2.8 pairs in the partial resolution version ($t = 2.24$, $p = .03$). Thus it seems that expecting to learn the outcome of both gambles made the high-risk, high-gain gamble seem more attractive.

The results of the present experiment confirm the prediction that for the pairs of gambles used here preference for the \$ bet is higher when complete resolution is anticipated. In all 12 pairs, the probability values were chosen so as to make the probability of regret over a P bet nearly as high, or even higher than the probability of regret over a \$ bet selection. It is clear, though, that the probability of regret by itself cannot predict preferences: percentages of subjects who chose the \$ bet in each gamble pair vary considerably.¹ Furthermore, the results thus far do not preclude the possibility that expecting complete resolution makes people more risk seeking in general, regardless of the specific probability of regret. Experiment 3 will test the hypothesis that the probability, rather than the mere possibility of regret, modifies the impact of resolution on choice. This hypothesis will be tested by varying the values of probability of gain.

EXPERIMENT 3

Two types of gamble pairs are compared in this experiment, differing in the probability of regret, following resolution of both gambles: pairs in which the probability of regret over a P bet is nearly as high or higher than the probability of regret over a \$ bet selection, and pairs in which the probability of regret over a P bet is distinctly lower than the probability of regret

¹ In order to test whether the effect of resolution systematically varies between the probability value pairs employed in this experiment the following analysis was carried out. For each subject and each of the four probability pairs, the number of \$ bet selections (out of three possible choices) was computed. Those four values served as dependent variables in a 2×4 ANOVA with resolution condition and probability values as between- and within-subjects factors, respectively. The analysis yielded a significant resolution effect ($p < .05$), but no significant effect of probability value ($p = .38$) or interaction ($p = .14$).

over a \$ bet selection. If expectation of complete resolution makes potential regret more pertinent, then the effect of complete resolution on choices among gambles should be more marked in the former than in the latter type of pairs.

Method

Forty-eight undergraduate psychology students at Ben-Gurion University participated in this study, as partial fulfillment of course requirement. As in Experiment 2, the experiment was run on a computer, in individual sessions. Subjects were randomly assigned to one of the four conditions.

Two lists of 12 pairs of gambles of similar expected value were used. One list was identical to the list used in Experiment 2. The second list was made up using the same P bets as in the first list, coupling each of them with a new \$ bet. The probability of winning in those \$ bets was either .2 or .3. These values ensure that the probability of having the better outcome occur in the P bet is distinctly higher than the probability of it occurring in the \$ bet. The complete list of pairs is given in Table 5.

The presentation of the pairs was the same as that in Experiment 2. The two presentation conditions were crossed with the two lists of gambles, to form a 2×2 between-subject design.

Results

Table 5 presents, for each pair of gambles in each of the presentation conditions, the percentage of subjects choosing the \$ bet. The effect found in Experiment 2 was essentially replicated for the first set of pairs. For 10 of these pairs, preference for the \$ bet was higher in the complete resolution condition than in the single-outcome condition. For the new set of gambles, however, no distinct pattern emerges. The complete resolution condition yielded greater preference for the \$ bet in 5 of the 12 pairs. Table 6 presents the average within-subject number of \$ bet choices (out of 12 choices), in each experimental condition. Clearly, preference for the \$ bet was higher in the two-outcome condition than in the single-outcome condition ($p = .017$). However, the predicted interaction is also significant: The effect of outcome information is stronger in the original set of gambles than in the new set ($p < .05$).

In addition to replicating the basic finding of Experiment 2, the present results indicate that anticipation of complete resolution does not enhance the attractiveness of high-risk gambles in every choice between a pair of gambles. For the pairs in which chances of being worse-off with the \$ bet are substantially higher

TABLE 5
Experiment 3: Percentage of Subjects Preferring the \$ Bet

	Gamble pairs		Probability of regret		Percent \$ bet choices		
	P bet	\$ bet	P bet	\$ bet	Complete resolution	Partial resolution	
Set 1	(.8, 15)	(.5, 24)	.5	.4	42	8	
	(.7, 7)	(.4, 12)	.4	.42	8	25	
	(.6, 10)	(.4, 15)	.4	.36	25	17	
	(.9, 8)	(.5, 15)	.5	.45	8	8	
	(.7, 9)	(.4, 16)	.4	.42	58	25	
	(.6, 8)	(.4, 12)	.4	.36	42	0	
	(.8, 11)	(.5, 18)	.5	.4	58	0	
	(.9, 12)	(.5, 21)	.5	.45	58	17	
	(.6, 13)	(.4, 20)	.4	.36	42	17	
	(.7, 6)	(.4, 11)	.4	.42	33	8	
	(.9, 7)	(.5, 13)	.5	.45	17	8	
	(.8, 18)	(.5, 29)	.5	.4	75	25	
	Set 2	(.8, 15)	(.3, 40)	.3	.56	8	17
		(.7, 7)	(.2, 24)	.2	.56	25	8
(.6, 10)		(.2, 30)	.2	.48	33	42	
(.9, 8)		(.3, 24)	.3	.63	17	33	
(.7, 9)		(.2, 32)	.2	.56	33	33	
(.6, .8)		(.2, 32)	.2	.48	67	42	
(.8, 11)		(.3, 29)	.3	.56	8	17	
(.9, 12)		(.3, 36)	.3	.63	8	42	
(.6, 13)		(.2, 39)	.2	.48	50	42	
(.7, 6)		(.2, 21)	.2	.56	50	25	
(.9, 7)		(.3, 21)	.3	.63	8	17	
(.8, 18)		(.3, 48)	.3	.56	42	33	

than chances of being worse-off with the P bet no systematic effect of complete resolution was recorded.

Discussion

All gains in the three experiments described above were hypothetical. Subjects were not actually paid the amounts of money their chosen lotteries yielded. Thus, admittedly, one should be cautious in extending the implications of the findings to real-life situations. However, several studies (e.g., Irwin, McClelland, & Schulze, 1992) demonstrated that laboratory experiments using hypothetical payoffs provide reasonable approximations for behavioral patterns with real monetary consequences. Furthermore, hypothetical payoffs

are less likely to generate cumulative wealth effects, which could influence preference among gambles.

Notwithstanding the above reservation, the results reported here demonstrate shifts in preference generated by changes in the extent of uncertainty resolution. The impact of uncertainty resolutions was not uniform across all gambles, however. It occurred mostly in gamble pairs which had nearly as high (or higher) probability of being worse-off with the low-risk gamble (the P bet) as with the high-risk one (\$ bet). For those pairs, expectation of complete resolution, generated either by the mechanism of resolution (Experiment 1), or by prior experience (Experiments 2 and 3) resulted in enhanced preference for the high-risk option. Other gamble pairs, which did not fall in the above category, did not show systematic effect of resolution (Experiment 3).

The findings described above suggest that the resolution effect is related to the anticipated experience of regret. The ex post experience of regret is evoked by a comparison of the outcomes obtained in the selected and foregone options. To anticipate this experience, one would have to compare the two possible outcomes in each state of the world. It seems reasonable to speculate that people are more likely to rely on a process of comparing outcomes per state of the world if they ex-

TABLE 6
Experiment 3: Average Number of \$ Bet Choices within Subject (out of 12 Pairs)

	Complete resolution (both lotteries resolved)	Partial resolution (chosen lottery resolved)
Set 1	4.67	1.58
Set 2	3.5	3.5

pect to learn what would have happened with each option. Hence, by this account, shifts in preference reflect a change in the decision process. The change in process involves a shift in reference points: When the outcome of the unchosen option is expected to be made known, it becomes a salient comparison point.

The present study does not preclude an alternative account for the impact of anticipated resolution. By this account, choice between two gambles generally relies on a process of comparison of outcomes in each state of the world. Hence a comparison of the obtained outcome to the imagined, though unknowable, outcome of the unchosen option may also generate feelings of regret. However, it must be further assumed that the experience of regret over the very same outcome combination varies, depending upon whether or not the unchosen gamble is actually resolved. Presumably, regret is less intense when the foregone outcome is hypothetical. Thus, if choice is affected by anticipation of regret, it would yield different preferences under different resolution conditions.

As stated above, the present study does not provide the means to test the two alternative explanations for the mechanism through which anticipated uncertainty resolution affects choice. Future research, focusing more directly on the relation between preferences and feelings of regret, may shed light on this problem. However, the basic notion, common to both accounts, that anticipated regret affects choice in some situations with complete outcome information is clearly supported by the data described here. Furthermore, the experimental results also imply that the impact of availability of outcome information on the decision maker's preferences varies with the probability of obtaining the better outcome. While the possibility (by one account) or intensity (by the second account) of regret depends first and foremost upon the availability of outcome information for unchosen options, its likelihood is necessarily affected by the probability of receiving the worse obtained outcome.

The present study does not attempt to develop a complete account of the conditions under which anticipation of complete uncertainty resolution would lead to shifts in preferences. The primary aim of the data presented here is to propose that expectations concerning the extent of uncertainty resolution play an important role in choice. Regardless of the normative issue, the present study suggests that descriptive theories of

choice under uncertainty should strive to account for the distinction between situations in which one expects complete resolution of uncertainty, and other situations in which one does not expect uncertainty to be completely resolved. Indeed, a separate research effort currently underway (Mellers, Schwartz, & Ritov, in preparation) strives to develop a comprehensive model of choice and experienced outcomes, incorporating outcome knowledge of unselected options, when such outcome is available.

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