Journal of Behavioral Decision Making
J. Behav. Dec. Making, **12**: 93–106 (1999)

Anticipated Regret, Expected Feedback and Behavioral Decision Making

MARCEL ZEELENBERG*
Tilburg University, The Netherlands

ABSTRACT

This paper addresses the effects of the anticipation of regret on decision making under uncertainty. Regret is a negative, cognitively based emotion that we experience when realizing or imagining that our present situation would have been better, had we decided differently. The experience of post-decisional regret is for a large part conditional on the knowledge of the outcomes of the rejected alternatives. A series of studies is reviewed in which it is shown that whether or not decision makers expect post-decisional feedback on rejected alternatives has a profound influence on the decisions they make. These studies, focusing on choice between gambles, consumer decision making and interpersonal decision making, also show that anticipated regret can promote risk-averse as well as risk-seeking choices. This review of empirical studies is followed by a discussion of the conditions under which we can expect the anticipation of regret to take place. Copyright © 1999 John Wiley & Sons, Ltd.

KEY WORDS regret; emotion; decision making; feedback

The Dutch postal code lottery owes its name to the process by which the winner is selected. The winning numbers are randomly drawn postal codes. There are a variety of prizes to be won in this lottery. For example, for the Street Prize a postal code is drawn and everyone who bought a ticket and has this postal code receives a 'relatively' small prize (between approximately $2000 and $20,000). By chance one of the ticket holders in that postal code area wins a larger prize. Also the Grand Prize in this lottery, which can be as large as 18,700,000 Dutch Guilders (grant prize January 1998, approximately $9,350,000), is selected on the basis of a postal code. The lottery ticket only costs 10 Guilders. If you are an inhabitant of the Netherlands should you decide to buy a ticket or not?

Before answering this question you might want to consider the following situation. Imagine that your postal code has been selected, but you did not buy a ticket. However, your neighbor, with whom you share your postal code, did buy a ticket and won the 18,700,000 Dutch Guilders. How would you feel? Probably you would kick yourself and think repeatedly 'if only I had bought a ticket ...',

* Correspondence to: Marcel Zeelenberg, Department of Marketing, Tilburg University, PO Box 90153, 5000-LE Tilburg, The Netherlands. E-mail: M.Zeelenberg@kub.nl

Contract grant sponsor: European Community TMR Marie Curie Fellowship.
Contract grant number: ERBFMBICT961052.

CCC 0894–3257/99/020093–14$17.50
Copyright © 1999 John Wiley & Sons, Ltd.
Accepted 1 September 1998

followed by bitter thoughts of all the ways in which your life could have been better. This unpleasant experience can be described as regret. Regret is a negative, cognitively based emotion that we experience when realizing or imagining that our present situation would have been better, had we decided differently. If you consider the possibility of regret *before* making your decision whether or not to play in the postal code lottery, it might prompt you to buy a ticket, because buying a ticket protects you against the possibility of severe regret. Thus, anticipating future regret may influence current decisions with uncertain outcomes. The organizers of the postal code lottery know the power of regret. In their advertisements, trying to persuade people to play this lottery, they state: 'Don't you have any tickets? Then your neighbors will win everything. So make sure that you buy some now.'

What makes the postal code lottery different from other lotteries is that, in fact, everybody already has a ticket (i.e. your postal code). The decision to make is whether or not to validate your ticket. The consequence of the structure of this lottery is that you will always learn the outcome of both options, playing the lottery versus not playing the lottery. In other lotteries you only learn the outcome of playing the lottery when you decide to do so.[1] The effects of this expected feedback on the anticipation of regret, and on decision making is the focus of this paper. More specifically, I will briefly describe theories and research that address the role of regret in decision making. Next I will review our own research program that was aimed at investigating the effects of anticipated regret, via manipulations of expected feedback, in various decision contexts. I will end with a discussion of other possible antecedent conditions under which regret will be anticipated.

REGRET THEORY

The idea that people might take into account emotional reactions to possible outcomes when making decisions has some history in research on decision making. For instance, the psychologists Janis and Mann (1977) focused more on the psychological aspects of anticipated regret. They expressed elegantly how decision makers fear for future regret influences their behavior. Janis and Mann maintain that the anticipation of regret induces us to make more 'rational' choices; that is, anticipated regret causes people to think more elaborately before making a final decision. They state that (p. 222):

> Before undertaking any enterprise 'of great pith and moment,' we usually delay action and think about what might happen that could cause regret ... Anticipatory regret is a convenient generic term to refer to the main psychological effects of the various worries that beset a decision maker before any losses actually materialize ... Such worries, which include anticipatory guilt and shame, provoke hesitation and doubt, making salient the realization that even the most attractive of the available choices might turn out badly.

Earlier, in the 1950s, researchers had already pursued a more formal approach to regret (e.g. Luce and Raiffa, 1957; Savage, 1951). These researchers argued that we sometimes base our decisions on a '*minimax regret*' *principle*. This principle holds that one computes the maximum of possible regret for each option, and then chooses the option where this maximum regret is smallest. Regret in this sense is defined as the difference between the actual outcome of the chosen option and the highest possible

[1] Unless, of course, the lottery allows you to pick the numbers yourself, and you know which numbers you would have chosen had you played the lottery. Because of their propensity of regret these lotteries, and the Dutch postal code lottery, can have dramatic consequences as is illustrated by the following event. In April 1995 an inhabitant of Liverpool, UK (aged 51) took his own life after missing out on a £2 million prize in the National Lottery. He did so after discovering that that week's winning combination were the numbers he always selected, 14, 17, 22, 24, 42 and 47. On this occasion, however, he had forgotten to renew his five-week ticket on time. It had expired the previous Saturday.

Copyright © 1999 John Wiley & Sons, Ltd.

Exhibit 1. Outcomes for choice options A and B for the different states of the world

	States of the world		
Options	Red (33.3%)	Yellow (33.3%)	Blue (33.3%)
A	\$100	\$200	\$0
B	\$0	\$100	\$200

Note: This exhibit displays a choice between options A and B. The outcome of both options depends on the color of the ball that is randomly picked from an urn. All three colors have an equal chance of being picked.

outcome of the rejected options.[2] The minimax regret rule is useful when there is no knowledge whatsoever about the probabilities of the possible outcomes, because this rule does not take probabilities into account. However, if there is knowledge about these probabilities, the minimax regret principle is suboptimal. In such cases a very unprobable negative outcome may have too large an influence on the decision to be made. Such an outcome can make an option very unattractive, because the possible regret associated with that option is very big, even though the occurrence of the regret is highly unprobable.

More recently, the economists Bell (1982) and Loomes and Sugden (1982) formulated decision theories that also take the probability of regret into account. Their *Regret Theory* is a modified version of standard Expected Utility (EU) theory. Both regret theory and EU theory assume that the expected utility of an option depends on the calculus of pain and pleasure associated with the outcomes of that option. Regret theory differs from EU theory in that the expected utility of an option *additionally* depends on the regret that one may experience by comparing the outcomes of that option to the outcomes of a rejected option. People experience regret when the outcome of the rejected option would have been better, and rejoicing when the outcome of the rejected option would have been worse. For example, Exhibit 1 depicts a choice between two options, A and B, where the outcome depends on which ball is picked from an urn. If a decision maker opts for A and a red ball is picked, he or she experiences the utility of the \$100, and an additional amount of utility (rejoicing) due to the knowledge that choosing B would have produced \$0. On the other hand, the same gain of \$100 after opting for B (when Yellow is picked) results in less utility since the utility of \$100 is adjusted for the regret that one did not choose A, and therefore missed the \$200.

Although regret and rejoicing are only felt after the outcomes of the decision are known, the idea is that these emotions are anticipated and taken into account when evaluating the different options. Thus, in the example above the decision maker must come to terms with the fact that either choice will leave him or her open to the possibility of regret. The decision maker must balance the fact that regret will be felt in B if either Blue or Yellow is picked, against the more intense regret that would be felt in A if Red was picked. Taken together, regret theory assumes that the tendencies to avoid negative emotions like regret and to strive for positive emotions like rejoicing are important determinants of human decision making.

How well does regret theory describe decision making? In principle regret theory can explain many of the deviations from utility theory (e.g. the common ratio effect, preference intransitivities). Empirical tests have produced results in line with the theory (e.g. Loomes, Starmer and Sugden, 1991,

[2] In the original minimax regret rule only comparisons between the obtained outcome and better foregone outcomes are included. When the foregone outcome is worse than the obtained outcome, the regret is fixed on zero. Recently Acker (1997) suggested an approach of *tempered regrets*, in which the zero regrets are replaced by a score representing the *rejoicing* felt when the obtained outcome is better than the foregone outcome. Acker argues that the tempered regret rule describes the decision process under total ignorance better than the minimax regret rule. Regret theory, described later in this article, also takes into account the possible rejoicing.

Copyright © 1999 John Wiley & Sons, Ltd.

1992). Some of this evidence (e.g. Loomes and Sugden, 1987) came from research showing *juxtaposition effects*, that is, demonstrations that preferences are influenced by how the states of the world match up, or in other words, by the juxtaposition of the consequences of the possible actions. Recently it has been suggested that these effects might not be caused by the juxtaposition of the outcomes, but rather by *event splitting*, increased weighting of consequences when they are split into two subevents than when it is considered as a single event (see, for details, Starmer and Sugden, 1993). Also other research aimed at directly testing predictions from regret theory did not provide unequivocal support (see Harless, 1992; Di Cagnio and Hey, 1988; Kelsey and Schepanski, 1991; Leland, 1998).

Despite the mixed success of regret theory, there is some support for the broader claim underlying the theory, that people take regret into account when making decisions. This support comes from studies that focus on the salience of post-decisional regret when making decisions, and on the role of the expectation of feedback on the outcome of unchosen options. This is the research to which I turn next.

EVIDENCE THAT ANTICIPATED REGRET INFLUENCES BEHAVIORAL DECISION MAKING

Manipulations of regret salience

A number of studies have focused on manipulations that make the possibility of post-decisional regret more *salient*. The idea behind these studies seems to be that when future regret is brought to the attention of the decision maker at the time the decision is made, this regret will receive a higher weight in the decision process. In a study of consumer decisions, Simonson (1992) simply asked consumers about the regret they would feel after having made the wrong decision. This question made them more likely to purchase an item that would shield them from possible regret (i.e. a higher-priced, well-known brand) over a potentially better, but more risky item (a less expensive, lesser-known brand). In a related study, Richard *et al.* (1996) showed that respondents who were asked to anticipate the regret and related emotions they would experience after engaging in unsafe sex reported less risky sexual behavior in the five months following the study than a group of control respondents. And finally, Parker, Stradling and Manstead (1996) tested four videos developed as an intervention to prevent people from committing driving violations. One of these videos focused drivers on the regret they might experience after exceeding the speed limit. This video brought about significant changes in beliefs and attitudes about unsafe driving.

The research described above seems to suggest, in line with the saying that you should 'better be safe than sorry', that regret results in risk aversion. And some theorists also explicitly state this. Kardes (1994), for example, argued that 'Concern about regret that may follow a bad decision promotes extreme risk-aversion' (p. 448). However, the research to which I turn now focuses on the effects of expectations of post-decisional feedback, and shows that anticipated regret may also result in risk-seeking tendencies.

Manipulations of expected feedback

Since regret and rejoicing stem from comparisons of obtained decision outcomes with forgone decision outcomes, feedback is a central issue in regret theory. An important assumption in regret theory is therefore that both the chosen and the unchosen option(s) will be resolved. If there is no explicit feedback on forgone outcomes, a decision maker cannot compare *what is* with *what would have been*.[3] In

[3] Research on counterfactual thinking (e.g. Roese, 1997; Zeelenberg *et al.*, 1998b, d) shows that people may also mentally construe feedback and compare the obtained outcome to this construed alternative. In general I assume that the regret stemming from comparisons with these construed alternatives is less painful than the regret stemming from comparisons with real forgone alternatives. The results of Bar-Hillel and Neter (1996) may suggest, however, that in some cases regret stemming from counterfactual thinking can be of equal strength.

Copyright © 1999 John Wiley & Sons, Ltd.

this case one would not run the risk of experiencing post-decisional regret. Hence, if one expects no feedback on what would have been there is no need to anticipate future regret. In recent years a number of studies have shown that feedback indeed influences experienced regret or satisfaction with decision outcomes (e.g. Boles and Messick, 1995; Inman, Dyer and Jia, 1997; Ritov and Baron, 1995; Taylor, 1997).

In real-life decisions people may occasionally receive information about forgone outcomes. For example, people choosing to invest in particular stocks will learn about future stock prices for the chosen stocks, but also for the non-chosen stocks. Likewise, gamblers who decide not to bet on the long shot in a horse race will learn after the race is over the position at which this horse finished, and thus whether this option would have been better. For some quite important life decisions, however, such feedback is often not present. If you decide to go in business with someone or to marry someone (else), you will never find out how successful each enterprise would have been had you chosen another partner or spouse, or none at all. In these cases there is only feedback on the chosen option.

How might this feedback influence our decisions? An important assumption to be made is that people are *regret-averse*. This means that people consider the experience of regret to be unpleasant and that they tend to make so-called *regret-minimizing choices*. In many of the past studies regret-minimizing choices were risk-averse choices. Take, for example, the often-used choice between a gamble and a sure thing. If you opt for the sure thing you normally do not learn whether the gamble would have been better. If you opt for the gamble you will always learn the outcome of the gamble and the outcome of the sure thing, thus you will always know whether the sure thing would have been better. Thus the sure thing protects you from regret, whereas the gamble carries some risk of regret. If you in this case anticipate regret you will opt for the sure thing, revealing risk-aversion.

In real life there may also be situations in which the risky option is the regret-minimizing option. These are situations in which there is a choice between two options, one being more risky than the other, and in which there will always be feedback on the outcome of the riskier option, while the safer option will only be resolved if chosen. When opting for the safer choice, you run the risk of learning that the riskier option turned out to be better, and thus suffer regret. As argued above, the possibility of post-decisional regret can make people decide to buy a lottery ticket in the postal code lottery. Buying a lottery ticket is risky compared to not buying the ticket, because the latter choice provides you with a sure outcome whereas the first provides you with an uncertain outcome. For another example, imagine that you are considering which second-hand car to buy: the reliable, but more expensive Saab (safer option), or the cheaper Renault which has a history of mechanical problems (riskier option). These are the only two cars that fit your requirements. You are leaning towards the Saab when your friend Nathalie, who joined you, says that if you don't buy the Renault she will. However, Nathalie is not interested in the Saab. Suddenly you worry that you will spend all this extra money on the Saab and then perhaps find out that Nathalie never has any problems with the Renault, and you will regret wasting your money. You realize that if you buy the Renault you will never know what will happen to the Saab (the safer option). Thus the Renault, the riskier option, also turns out to be the regret-minimizing option. Thus, in this case anticipated regret pushes you toward risk-seeking.

Larrick and Boles (1995) and Ritov (1996) have provided empirical evidence showing relatively risk-seeking behavior as a consequence of anticipated regret. In the Larrick and Boles experiment participants negotiated about a signing bonus they could earn when deciding to work for a certain company ALPHA. Participants either expected to learn or expected not to learn the offer of a competing company BETA after they reached an agreement with ALPHA. Participants who expected to learn the offer of BETA (Feedback condition), could regret or rejoice about their decision to accept the bonus offered by ALPHA. These participants were less risk-averse, wanted to have a higher bonus and were consequently less likely to reach agreement, than those who did not expect to learn the offer of BETA (No Feedback

Copyright © 1999 John Wiley & Sons, Ltd.

condition). Ritov (1996) had participants choosing between gambles and manipulated whether they expected feedback. She also found increased risk-seeking as a consequence of anticipated regret.

BETTER SAFE THAN SORRY VERSUS BETTER RISKY THAN REGRETFUL

Plainly, evidence exists for both risk-avoiding and risk-seeking tendencies as a consequence of the anticipation of regret. In recent studies we have examined *when* risk-aversion and *when* risk-seeking were to occur (Inman and Zeelenberg, 1998; Zeelenberg *et al*., 1996; Zeelenberg and Beattie, 1997). These studies also tested the robustness and generalizibility of regret effects in different decision contexts. To this research I turn next.

Anticipated regret in a choice between gambles task

The hypothesis of interest in the research described in this section is that anticipated regret can result in risk-averse and risk-seeking choices depending on which of the two is the regret-minimizing option. The design of the first series of experiments to test this prediction was as follows (Zeelenberg *et al*., 1996): Participants were given a choice between two gambles, one being relatively risky and the other being relatively safe. A matching procedure (cf. Slovic, 1975) ensured that these gambles were roughly of equal attractiveness. This was done in the following manner. Participants always knew the outcome of the riskier gamble and the probability of winning it. For example, in our Experiment 1 the riskier gamble would result in a gain of 130 Dutch Guilders with a probability of 35%, or in no gain with a probability of 65%. In the safer gamble they could gain an unknown amount X with a probability of 65%, or no gain with a probability of 35%. It was the participants' task to write down the value of X for which they found the gambles equally attractive.[4]

Next, feedback on one of the gambles was manipulated orthogonally to the riskiness of the gamble. In all three experiments we had a *Feedback Safer Gamble* condition, in which the safer gamble would always be resolved, and a *Feedback Riskier Gamble* condition, in which the riskier gamble would always be resolved. In addition to this feedback all participants always expected to learn the outcome of the chosen gamble. Participants in the Feedback Safer Gamble condition were predicted to choose the safer gamble. The safer gamble would provide them with feedback on the chosen gamble only, and protect them from threatening feedback on the riskier gamble. Likewise, participants in the Feedback Riskier Gamble condition, who would always learn the outcome of the riskier gamble, were predicted to opt for the riskier gamble. Exhibit 2 depicts the results. This pattern was found in all three studies, in both high and low variance gambles, and in gambles involving both gains and losses. This research thus demonstrates that the anticipation of regret can promote risk-averse but also risk-seeking tendencies, depending on which of the two is regret-minimizing.

One of the studies reported in Zeelenberg *et al*. (1996) provided additional information that confirmed the role of regret in these studies. Participants in this study were asked for justifications of their choices. Participants in the two feedback conditions reported significantly more regret related justifications than participants in a control condition did, where no feedback would be provided.

There may be some limitations to the research just described. First, a choice between matched gambles paradigm was used. Because participants made the gambles equally attractive, they would be more or less indifferent when choosing between the two. The expectation of feedback pushed

[4] Research by Tversky, Sattah and Slovic (1988) showed that decision makers are not necessarily indifferent between alternatives that are matched in attractiveness. For the present experiment it was sufficient that there was no strong *a-priori* preference for either of the alternatives.

Copyright © 1999 John Wiley & Sons, Ltd.

Exhibit 2. Percentage of participants choosing the safer or riskier gamble as a function of condition

Condition	Choice	
	Riskier gamble	Safer gamble
Feedback riskier gamble	60%	40%
Feedback safer gamble	30%	70%

Note: Data are taken from Zeelenberg *et al.* (1996), collapsed over all experiments.

participants' preferences either in the direction of the risky gamble or in the direction of the safe gamble. One might argue that the influence of regret on decision-making is exaggerated in such a paradigm, because of the initial indifference between the two gambles. A second possible limitation is that the standard, context-free, gamble paradigm was used. Although this paradigm allows one to study the regret effects in its purest form, some researchers have pleaded to move away from the gamble, on to richer contexts, because the gamble paradigm might have limited generality.

Recently we presented research that replicated and extended our earlier findings, and might help to overcome their possible limitations (Inman and Zeelenberg, 1998; Zeelenberg and Beattie, 1997). In these studies we focused on consumer decisions under uncertainty, and on decision making in an interpersonal context. In all experiments possible feedback on forgone alternatives was manipulated and the focus was on how this influenced behavioral choice. This research is described below.

Anticipated regret in consumer decision making

This experiment tested whether the manipulation of feedback can influence decision making in situations that bear more resemblance to the decisions we encounter in our daily life, and where the options were not matched on attractiveness (see, for details, Inman and Zeelenberg, 1998, Experiment 3). More specifically we studied the role of anticipated regret in three different consumer decisions. These were a decision about a long-distance telephone service, the purchase of a personal computer, and the choice of an apartment to live in during the last year in college. Participants were confronted with the scenarios that described a choice between two options (again one being more risky than the other). The expectation of post-decisional feedback was manipulated so that there could be feedback on the riskier option, on the safer option, or no feedback at all. For example, in the long-distance telephone service scenario there was a choice between two companies, the dominant ABC (safer option), or the newer and smaller DDE (riskier option). In the Feedback Riskier [Safer] Option condition participants read that the service of DDE [ABC] would be reviewed in the next issue of a local magazine. In the No Feedback condition such information would not be present. As the results in Exhibit 3 show, compared to the No Feedback condition, participants in the Feedback Riskier Option condition demonstrate an increased preference for the risky option and participants in the Feedback Safer Option condition demonstrate an increased preference for the safer option.

Note, though, that the preponderance of participants in the Inman and Zeelenberg (1998) experiment remain risk-averse in all conditions, which may lead one to conclude that anticipated regret may influence preferences but may not really cause a preference for risk-seeking in an absolute sense. However, in a similar experiment we found such a cross-over in risk attitude (see Zeelenberg and Beattie, 1997, Experiment 1). This study had two feedback conditions in which participants stated their willingness to invest in two financial investment options. Participants's preference in the No Feedback condition was risk-averse and in the Feedback Riskier Option it was risk-seeking.

Copyright © 1999 John Wiley & Sons, Ltd.

Exhibit 3. Percentage of participants deciding for the safer or riskier option as a function of condition

Condition	Decision	
	Riskier option	Safer option
Feedback riskier option	37%	63%
No feedback	21%	79%
Feedback safer option	11%	89%

Note: These are combined data from three scenarios from Inman and Zeelenberg (1998).

In sum, these results were obtained with paradigms where participants made decisions (or stated their willingness to invest) about options they could encounter in their own lives, instead of using the traditional gamble paradigm. Also, these options were not matched on attractiveness, as was the case in the research reported earlier. These findings thus corroborate and extend the findings described earlier.

Anticipated regret in interpersonal decision making: the ultimatum game

Another extension of the earlier findings was reported in Zeelenberg and Beattie (1997, Experiments 2a and 2b). Whereas most former experiments studied purely individual decision making, Zeelenberg and Beattie studied decisions that were made in an interpersonal context, namely in an ultimatum bargaining situation.

The ultimatum game is played by the following simple procedure. Two players are allotted a sum of money, e.g. \$10. Player 1 (often called the Proposer) offers some portion of the money (e.g. \$4) to player 2 (the Responder). If the responder accepts, she gets the \$4, and the Proposer gets the rest (\$6). If the responder rejects the offer, both players get nothing. The predictions from economic theory are straightforward. Responders should accept any amount of money, e.g. one cent, since this is more than they would get by rejecting the offer. Proposers know this and should thus offer responders only the one cent. Earlier research using this game, however, showed that people hardly ever offer the other player only one cent. Moreover, if they do so, the other players refuse the offer. Commonly the average offers are in the regions of 30–40%, with a 50–50 split often as the mode. Offers of less then 20% are frequently rejected (see Camerer and Thaler, 1995).

How might anticipated regret influence the behavior of proposers? Proposers can regret two things, offering too little money when the offer is rejected and offering too much when the offer is accepted. If we consider the fact that the modal offer is 50%, and that offers over 20% are almost always accepted, there is more chance of regretting offers that are too high. There are two reasons why regret about offering too much money is generally less severe than regret about offering too little money. First, when a proposer regrets offering too much, she still has money, whereas when a proposer regrets offering too little, she does not get any money at all. Second, the regret a proposer could feel when the offer is too high is less severe, because she does not know exactly what the responder's minimal acceptable offer was. Thus, normally the regret-minimizing option is offering too much. Although proposers know that their offer was probably too high, they do not know to what extent, and therefore the regret will not be that painful. But if the responder's minimal acceptable offer is communicated to the proposers, they might learn that a much lower offer would also have been accepted. Feedback of this kind can make regret about an offer that is too high more severe. Proposers who expect this feedback might anticipate the possible regret, and move away from the 50–50 split.

Copyright © 1999 John Wiley & Sons, Ltd.

It was manipulated whether or not proposers knew in advance that they would learn the responder's minimal acceptable offer after they made their offer. The expectation was that proposers who expect feedback on the minimal acceptable offer would make lower offers than proposers who do not expect this feedback. This is because lowering their offers does lower the amount of possible regret, as the offer will be closer to the minimal acceptable offers. At the same time lowering their offers does not need to result in a higher likelihood of the offer being rejected, since offers will only be rejected if lower than 20%.

We had students playing the ultimatum game. They were told that half of them were randomly selected to be proposer and the other half to be responder. In reality all of them were proposers. They were told that they had to divide an amount of 100 Dutch Guilders between themselves and the responder. Participants in the Feedback condition were told that they would always learn the respondent's minimal acceptable offer, and that they would thus learn the exact amount of money that they should have offered more to get their offer accepted or could have offered less and have their offer still accepted. The depended variable was simply the offer made. As expected, participants in the Feedback condition offered significantly less money to the responder ($M = 36$ Guilders) then did the participants in the No Feedback condition ($M = 43$ Guilders).

The results of this experiment clearly indicate that the expectation of feedback, a possible cause of regret, influences people's choices in the ultimatum game. When deciding how much to offer the responder, participants who expected feedback on the responder's minimal acceptable offer made lower offers than participants who did not expect to receive this feedback. This behavior reflects regret aversion because lower offers result in less regret if accepted. The offers were, in general, not so low that they would be rejected, which suggests that participants minimized both the regret that could arise from offering too much and the regret that could arise from offering too little.

This finding thus extends the previous findings reported in the present paper because it shows that the motive of minimizing regret can also influence decision making in interpersonal contexts. It thereby also replicates the findings from Larrick and Boles (1995) in a different negotiation context.

Discussion

Taken together, the research described above shows that the anticipation of regret caused by the manipulation of expected feedback on forgone options influences decisions in several contexts. Substantial effects were found for decisions involving matched gambles, in a consumer decision making context, and in interpersonal decision making. These findings and those reported in other recent publications (Josephs *et al.*, 1992; Larrick and Boles, 1995; Ritov, 1996; Ritov and Baron, 1995) clearly show that people are motivated to make choices that shield them from threatening feedback on forgone courses of action. Thus, people are motivated to avoid post-decisional regret. This *regret aversion* has a profound influence on their decisions, because the possibility of regret is anticipated, and subsequently taken into account when making decisions. As a result people can become risk-averse or risk-seeking, depending on which of the possible choice options is the regret-minimizing option.

WHEN DO WE ANTICIPATE REGRET?

Now that we have established that anticipation of regret influences decision making, and that this seems to be a robust finding, a necessary next step in this field is to study the conditions under which people anticipate regret. The research described in this paper shows that this is likely to be the case when people expect to learn the outcome of the rejected alternative, but there may be other determinants as well. Below I discuss five conditions that might determine when regret is anticipated and how substantial this

Copyright © 1999 John Wiley & Sons, Ltd.

anticipation is. Although these conditions were originally suggested some 20 years ago (Janis and Mann, 1977, p. 223), to my knowledge there has not yet been any attempt to empirically validate them.

1. *The most preferred alternative is not necessarily superior to another alternative*. The idea is that when there is one dominant alternative the decision maker does not spend much time thinking about the possible drawbacks of this alternative, because there is less self-recrimination when the obvious superior alternative results in a suboptimal outcome. There was no reason for the decision maker to have chosen another option; thus a bad outcome is not easily interpreted as indicative of a bad decision. When there are more alternatives or behavioral options of roughly equal attractiveness, people will worry more about the consequences. When deciding between the options, they will compare them more thoroughly and they will anticipate the regret they might feel when a rejected option proves to be better than the chosen one. In these cases a bad outcome can easily be interpreted as a signal that the wrong choice was made. This suggests that the more difficult a decision is, the more likely it is that people take regret into account when deciding (cf. Sugden, 1985).

At this point it is important to note that there are several ways in which a decision can be difficult. First, a decision may be difficult because the options are close in attractiveness (i.e. expected utility), as is implied above. Second, a decision may be difficult because there is no explicit knowledge of the probabilities and outcomes of each option.[5] A third reason why a decision may be difficult is because it implies a trade-off between two important attributes, for example the safety of a automobile and its cost (Beattie, 1988). I expect that for these first three sources of decision difficulty the hypothesized relation holds (i.e. the more difficult, the more regret is anticipated). However, decisions may also be difficult for a fourth reason, namely when the options themselves are difficult to compare (Bettman and Sujan, 1987; Johnson, 1984). Here the relation between difficulty and anticipated regret may be different. Regret is an emotion that stems from the comparison of outcomes. It may be the case that when outcomes are not easily compared, feelings of regret are not likely to occur. Therefore I expect that this particular sort of decision difficulty will not promote the anticipation of regret (or at least not to the same extent as the others).

2. *The negative consequences that might ensue from the decision could start to materialize almost immediately after the decision is made*. When the outcomes of the decision are not realized quickly, or when they are not known within a short time span, decision makers might discount the possible regret that this decision can cause. This can be related to research on intertemporal choice showing that decision makers have a tendency to discount outcomes that are distant in time and base their decisions on outcomes that are more proximal (e.g. Loewenstein, 1992; Roelofsma, 1996). In the research by Richard *et al*. (1996) referred to earlier, the time of occurrence of the outcomes was not manipulated, but their regret manipulation made the consequences of future outcomes more salient. The results of Richard *et al*. show that people do not take into account the more long-term risks related to unsafe sex, but they do take relatively immediate post-decisional affective reactions into account when these are made salient to them (see also Simonson, 1992, and Parker *et al*., 1996).

3. *Significant persons in the decision maker's social network view the decision as important and will expect him or her to adhere to it*. Although Janis and Mann (1977) refer to the specifically *social* aspect of the anticipation of regret (social factors have been neglected in empirical research on anticipated regret so far), I argue that the same holds for more individualistic contexts. Implicit in the statement above are two factors that promote anticipatory regret. The first is that the more important an outcome

[5] Interestingly, this might imply that examples of how anticipated regret influences decisions are easier to find in real life than in most experimental research. In experiments the choices are often between two options where probabilities and outcomes are provided (e.g. gambles where the outcome depends on the number of different colors of balls in an urn). These features might reduce the difficulty of the choice problem (cf. Sugden, 1985), and therefore reduce the extent to which regret is anticipated. Alternatively, one might argue that the choices in a laboratory experiment are often presented in such a way that the comparison of outcomes per state of the world is facilitated, which would promote the anticipation of regret (cf. Harless, 1992).

Copyright © 1999 John Wiley & Sons, Ltd.

is, the more likely it is that the decision maker engages in the anticipation of regret, because more important decisions will result in more intense regret when things go awry. This would be the case when the outcomes are important socially, as suggested by Janis and Mann, but probably also when outcomes are 'objectively' more important (e.g. when the stakes are higher).

The second factor to which Janis and Mann point is that other people might force the decision maker to stick to the decision initially made. This idea is related to the irreversibility of decisions and outcomes. I predict that regret would be especially painful when a decision is irreversible. When the possibility of reversing your decision exists, the regret caused by positive feedback on the unchosen option will be less painful. In these situations feedback can provide valuable information about how to improve your current position. This is consistent with research by McAllister, Mitchel and Beach (1979) showing that irreversibility results in more elaborated decision processes. Thus, when for some reason a decision has outcomes that are not easy to undo, decision makers are more likely to anticipate regret. This will probably hold for decisions that are irreversible, and for decisions that are in principle reversible, but in practice difficult to reverse because of social forces.

4. *New information concerning potential gains and losses can be obtained.* As this paper has shown, post-decisional feedback is a central determinant of experienced and anticipated regret. When this feedback is present people anticipate possible regrets, but when it is absent regret does not play a significant role in the decision process. In the present paper I assumed that feedback about the *chosen* option would always be present, and focused on feedback about the outcome of the *unchosen* options. Janis and Mann (1977) suggest that feedback on the chosen option can also play a role. This relates regret to post-decisional dissonance[6] (Festinger, 1957, 1964). Although the concepts of regret and post-decisional dissonance obviously have a lot in common, future research is needed in order to clarify the differences more exactly. Probably the main difference lies in the fact that regret is related to the feeling that arises from comparing outcomes of the chosen and rejected alternatives, whereas dissonance can also stem from thoughts and feelings concerning the chosen option only. This makes dissonance a broader concept than regret. It might even be the case that regret is a particular sort of dissonance.

5. *Significant persons in the decision maker's social network who are interested in this particular decision are not impatient about his current state of indecision and expect him to delay action until he has evaluated the alternatives more carefully.* Beattie *et al.* (1994) gathered empirical evidence that anticipated regret promotes decision aversion; e.g. the tendency to delay or avoid decisions (see also Thaler, 1980). Their research showed that decision aversion is an intrinsic motivation that might be promoted by the anticipation of regret. It is interesting to note that there are several reasons why anticipated regret and decision delay may be related. The delay may stem from a wish to gather more information in order to come to a better decision. But it may also result because the decision maker wants to avoid the negative consequences of the decision, or the responsibility for these consequences. Janis and Mann suggest that this tendency to delay or avoid decisions will be especially strong when people who are important to the decision maker stimulate careful consideration and delay.

In sum, these five factors that suggest when people anticipate regret or not are worthy of further investigation. An understanding of these factors and possible other factors might help us to specify the boundary conditions under which decisions are influenced by the anticipation of regret, and to formulate a psychological theory about regret aversion. I consider this to be a necessary next step in the research on anticipated regret.

---

[6] Landman (1993, p. 40) called regret 'the bête noir for the theory of cognitive dissonance', because it represents the opposite of dissonance reduction. Nevertheless, cognitive dissonance theorists also studied regret (e.g. Festinger, 1964; Wicklund and Brehm, 1976). It needs to be noted that their conceptualization of regret differs from the one in current regret research. In cognitive dissonance research regret is typically operationalized as the reversal of the initial decision. Although I agree that this sort of *undoing* is indicative of regret, present regret research views it as a consequence of regret and shows that regret is more than just that (e.g. Gilovich and Medvec, 1995; Zeelenberg *et al.*, 1998 a, c).

Copyright © 1999 John Wiley & Sons, Ltd.

SUMMARY AND CONCLUSIONS

In this paper I reviewed evidence concerning the role of anticipated regret in behavioral decision making. Although ideas about regret were long present in this field, only since the development of regret theory, in the early 1980s, did researchers start to empirically address issues related to the anticipation of regret. At present the support for regret theory seems to be mixed. There is, however, ample support for the most important idea on which the theory is based, namely that anticipated regret might influence the decision we make. This support comes from studies in which post-decisional regret is made salient to the decision maker at the time he or she makes the decision, and from studies in which the expectation of post-decisional feedback in unchosen alternatives is manipulated. Our own studies focused on these effects of feedback and showed effects in several domains. The results of our studies show that the anticipation of regret can result in risk-avoiding as well as risk-seeking tendencies. The article ended with a discussion of additional antecedent conditions under which the anticipation of regret is hypothesized to take place. This may be a fruitful direction for future research.

ACKNOWLEDGEMENTS

Most of the research described in this article has been developed and executed in close collaboration with Jane Beattie. Her untimely death from cancer on 25 March 1997 put a cruel end to our friendship and collaboration. Thanks are due to Henk Aarts, Rosie Murray, Rik Pieters and two anonymous reviewers for valuable comments on an earlier version of this article and to Eric van Dijk for his inputs during the whole project. A European Community TMR Marie Curie Fellowship (ERBFMBICT961052) allowing the author to work at the University of Sussex for a period of six months facilitated the writing of this article.

REFERENCES

Acker, M. A. 'Tempered regrets under total ignorance', *Theory and Decision*, **42** (1997), 207–213.

Bar-Hillel, M. and Neter, E. 'Why are people reluctant to exchange lottery tickets?' *Journal of Personality and Social Psychology*, **70** (1996), 17–27.

Beattie, J. (1988). *Perceived Differences in Tradeoff Difficulty*, unpublished doctoral dissertation, University of Pennsylvania, Philadelphia, USA.

Beattie, J., Baron, J., Hershey, J. C. and Spranca, M. D. 'Psychological determinants of decision attitude', *Journal of Behavioral Decision Making*, **7** (1994), 129–144.

Bell, D. E. 'Regret in decision making under uncertainty', *Operations Research*, **30** (1982), 961–981.

Bettman, J. R. and Sujan, M. 'Effects of framing on evaluation of comparable and noncomparable alternatives by expert and novice consumers', *Journal of Consumer Research*, **14** (1987), 141–154.

Boles, T. L. and Messick, D. M. 'A reverse outcome bias: The influence of multiple reference points on the evaluation of outcomes and decisions', *Organizational Behavior and Human Decision Processes*, **61** (1995), 262–275.

Di Cagnio, D. and Hey, J. D. 'A direct test of the original version of regret theory', *Journal of Behavioral Decision Making*, **1** (1988), 43–56.

Camerer, C. and Thaler, R. H. 'Ultimatums, dictators and manners', *Journal of Economic Perspectives*, **2** (1995), 209–219.

Festinger, L. *A Theory of Cognitive Dissonance*. New York: Row, Perterson and Company, 1957.

Festinger, L. *Conflict, Decision, and Dissonance*. Stanford, CA: Stanford University Press, 1964.

Gilovich, T. and Medvec, V. H. 'The experience of regret: What, when and why', *Psychological Review*, **102** (1995), 379–395.

Harless, D. W. 'Actions versus prospects: The effect of problem presentation on regret', *American Economic Review*, **82** (1992), 634–649.

Copyright © 1999 John Wiley & Sons, Ltd.

Inman, J. J., Dyer, J. S. and Jia, J. 'A generalized utility model of disappointment and regret effects on post-choice valuation', *Marketing Science*, **16** (1997), 97–111.
Inman, J. J. and Zeelenberg, M. 'What might be: The role of potential regret in consumer choice', In Abendroth, L. J. (Chair), *Regret Me Not: An examination of regret in pre- and post-purchase evaluations*, Symposium conducted at the SCP-Winter Conference, Austin, Texas, 1998, February.
Janis, I. L. and Mann, L. *Decision Making*, New York: The Free Press, 1977.
Johnson, M. 'Consumer choice strategies for comparing noncomparable alternatives', *Journal of Consumer Research*, **11** (1984), 741–753.
Josephs, R. A., Larrick, R. P., Steele, C. M. and Nisbett, R. E. 'Protecting the self from the negative consequences of risky decisions', *Journal of Personality and Social Psychology*, **62** (1992), 26–37.
Kardes, F. R. 'Consumer judgment and decision processes', In Wyer, R. S. Jr and Srull, T. K. (eds), *Handbook of Social Cognition*, Vol. 2, 2nd edn, Hillsdale, NJ: Lawrence Erlbaum Associates, 1994.
Kelsey, D. and Schepanski, A. 'Regret and disappointment in taxpayer reporting decisions: An experimental study', *Journal of Behavioral Decision Making*, **4** (1991), 33–53.
Landman, J. *Regret: The persistence of the possible*, New York: Oxford University Press, 1993.
Larrick, R. P. and Boles, T. L. 'Avoiding regret in decisions with feedback: a negotiation example', *Organizational Behavior and Human Decision Processes*, **63** (1995), 87–97.
Leland, J. W. 'Similarity judgments in choice under uncertainty: A reinterpretation of the predictions of regret theory', *Management Science*, **44** (1998), 659–672.
Loewenstein, G. 'The fall and rise of psychological explanations in the economics of intertemporal choice', In Loewenstein, G. and Elster, J. (eds), *Choice over Time* (pp. 3–34), New York: Russell Sage Foundation, 1992.
Loomes, G., Starmer, C. and Sugden, R. 'Observing violations of transitivity by experimental, methods', *Econometrica*, **59** (1991), 425–439.
Loomes, G., Starmer, C. and Sugden, R. 'Are preferences monotonic? Testing some predictions of regret theory', *Economica*, **59** (1992), 17–33.
Loomes, G. and Sugden, R. 'Regret Theory: An alternative theory of rational choice under uncertainty', *Economic Journal*, **92** (1982), 805–824.
Loomes, G. and Sugden, R. 'Testing for regret and disappointment in choice under uncertainty', *Economic Journal*, **97** (supplement) (1987), 118–129.
Luce, R. D. and Raiffa, H. *Games and Decisions*, New York: Wiley, 1957.
McAllister, D. W., Mitchel, T. R. and Beach, L. R. 'The contingency model for the selection of decision strategies: An empirical test of the effects of significance, accountability, and irreversibility', *Organizational Behavior and Human Performance*, **24** (1979), 228–244.
Parker, D., Stradling, S. G. and Manstead, A. S. R. 'Modifying beliefs and attitudes to exceeding the speed limit: An intervention study based on the theory of planned behavior', *Journal of Applied Social Psychology*, **26** (1996), 1–19.
Richard, R., van der Pligt, J. and de Vries, N. K. 'Anticipated regret and time perspective: Changing sexual risk-taking behavior', *Journal of Behavioral Decision Making*, **9** (1996), 185–199.
Ritov, I. 'Probability of regret: Anticipation of uncertainty resolution in choice', *Organizational Behavior and Human Decision Processes*, **66** (1996), 228–236.
Ritov, I. and Baron, J. 'Outcome knowledge, regret, and omission bias', *Organizational Behavior and Human Decision Processes*, **64** (1995), 119–127.
Roelofsma, P. H. M. P. 'Modeling intertemporal choices: An anomaly approach', *Acta Psychologica*, **93** (1996), 5–22.
Roese, N. J. 'Counterfactual thinking', *Psychological Bulletin*, **121** (1997), 133–148.
Savage, L. J. 'The theory of statistical decision', *Journal of the American Statistical Association*, **46** (1951), 55–67.
Simonson, I. 'The influence of anticipating regret and responsibility on purchase decisions', *Journal of Consumer Research*, **19** (1992), 105–118.
Slovic, P. 'Choice between equally valued alternatives', *Journal of Experimental Psychology: Human Perception and Performance*, **1** (1975), 280–287.
Starmer, C. and Sugden, R. Testing for juxtaposition and event-splitting effects. *Journal of Risk and Uncertainty*, **6** (1993), 235–254.
Sugden, R. 'Regret, recrimination and rationality', *Theory and Decision*, **19** (1985), 77–99.
Taylor, K. A. 'A regret theory approach to assessing consumer satisfaction', *Marketing Letters*, **8** (1997), 229–238.

Copyright © 1999 John Wiley & Sons, Ltd.

Thaler, R. H. 'Toward a positive theory of consumer choice', *Journal of Economic Behavior and Organization*, **1** (1980), 39–60.
Tversky, A., Sattah, S. and Slovic, P. 'Contingent weighting in judgment and choice', *Psychological Review*, **95**, (1988), 371–384.
Wicklund, R. A. and Brehm, J. W. *Perspectives on Cognitive Dissonance*, Hillsdale, NJ: Lawrence Erlbaum Associates, 1970.
Zeelenberg, M. and Beattie, J. 'Consequences of regret aversion 2: Additional effects of feedback on decision making', *Organizational Behavior and Human Decision Processes*, **72** (1997), 63–78.
Zeelenberg, M., Beattie, J., van der Pligt, J. and de Vries, N. K. 'Consequences of regret aversion: Effects of expected feedback on risky decision making', *Organizational Behavior and Human Decision Processes*, **65** (1996), 148–158.
Zeelenberg, M., van der Pligt, J. and Manstead, A. S. R. 'Undoing regret on Dutch television: apologizing for interpersonal regrets involving actions and inactions', *Personality and Social Psychology Bulletin*, **24** (1998a), 1113–1119.
Zeelenberg, M., van Dijk, W. W. and Manstead, A. S. R. 'Reconsidering the relation between regret and responsibility', *Organizational Behavior and Human Decision Processes*, **74** (1998b), 254–272.
Zeelenberg, M., van Dijk, W. W., Manstead, A. S. R. and van der Pligt, J. 'The experience of regret and disappointment', *Cognition and Emotion*, **12** (1998c), 221–230.
Zeelenberg, M., van Dijk, W. W., van der Pligt, J., Manstead, A. S. R., van Empelen, P. and Reinderman, D. 'Emotional reactions to outcomes of decisions: The role of counterfactual thought in the experience of regret and disappointment', *Organizational Behavior and Human Decision Processes*, **75** (1998d) 117–141.

Author's biography:
Marcel Zeelenberg (PhD University of Amsterdam) was recently a TMR Marie Curie Fellow at the University of Sussex (UK), and is currently an assistant professor of marketing at Tilburg University (The Netherlands). His research interests include cognitive approaches to decision making and emotion theory, with applications in the field of consumer psychology.

Author's address:
Marcel Zeelenberg, Department of Marketing, Tilburg University, PO Box 90153, 5000-LE Tilburg, The Netherlands. E-mail: M.Zeelenberg@kub.nl

Copyright © 1999 John Wiley & Sons, Ltd.