

The Role of Emotion in Economic Behavior

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Scott Rick and George Loewenstein

Introduction: Immediate and Expected Emotions

Economic models of decision making are consequentialist in nature; they assume that decision makers choose between alternative courses of action by assessing the desirability and likelihood of their consequences and integrating this information through some type of expectation-based calculus. Economists refer to the desirability of an outcome as its "utility," and decision making is depicted as a matter of maximizing utility.

This does not, however, imply that consequentialist decision makers are devoid of emotion or immune to its influence. To see why, it is useful to draw a distinction between 'expected' and 'immediate' emotions (Loewenstein et al. 2001; Loewenstein and Lerner 2003). Expected emotions are those that are anticipated to occur as a result of the outcomes associated with different possible courses of action. For example, in deciding whether to purchase a stock, a potential investor might imagine the disappointment she would feel if she bought it and it declined in price, the elation she would experience if it increased in price, and possibly emotions such as regret and relief that she might experience if she did not purchase the stock and its price either rose or fell. The key feature of expected emotions is that they are experienced when the outcomes of a decision materialize, but not at the moment of choice; at the moment of choice they are only cognitions about future emotions.

Immediate emotions, by contrast, are experienced at the moment of choice and fall into one of two categories. 'Integral' emotions, like expected emotions, arise from thinking about the future consequences of one's decision, but integral emotions, unlike expected emotions, are experienced at the moment of choice. For example, in the process of deciding whether to purchase the stock, the investor might experience immediate fear at the thought of the stock losing value. 'Incidental' emotions are also experienced at the moment of choice, but arise from

dispositional or situational sources objectively unrelated to the task at hand (e.g., the TV program playing in the background as the investor called her brokerage house).¹

The notion of expected emotions is perfectly consistent with the consequentialist perspective of economics. Nothing in the notion of utility maximization rules out the idea that the utility an individual associates with an outcome might arise from a prediction of emotions – e.g., one might assign higher utility to an Italian restaurant dinner than a French restaurant dinner because one anticipates being happier at the former. While not explicitly denying the idea that utilities might depend on expected emotions, however, until recently most economists viewed detailed accounts of such emotions as outside of the purview of their discipline.

Integral immediate emotions can also be incorporated into a consequentialist framework, although it takes one farther afield from conventional economics. Integral emotions, it can and in fact has been argued, might provide decision makers with information about their own tastes – e.g., to help inform the investor of how she would actually feel if she purchased the stock and it rose or declined in value. However, this assumes, contrary to the usual assumption in economics, that people have an imperfect understanding of their own tastes.

An influence of incidental immediate emotions on decision making would pose a much more fundamental challenge to the consequentialist perspective because such emotions, by definition, are irrelevant to the decision at hand. Any influence of incidental emotions would suggest that decisions are influenced by factors unrelated to the utility of their consequences.

Figure 1 presents a schematic representation of the traditional perspective of economics. Although immediate emotions are represented in the figure, they would not be part of any

¹ Note that the distinction between expected and immediate emotions closely maps onto other commonly discussed distinctions in economics and psychology, such as the broad distinction between cognition and emotion, or Adam Smith's (1759) distinction between the "impartial spectator" and the "passions."

traditional economist's representation of their framework because they play no role in decision making; they are 'epiphenomenal' byproducts of, but not determinants of, decisions.

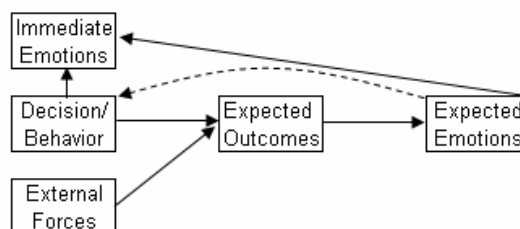


Figure 1. Consequentialist model of decision making

However, a great deal of market activity can be understood in terms of *both* expected and immediate emotions. Much advertising attempts to inform consumers, whether accurately or not, about emotions that they can expect to feel if they do or do not buy a particular good. “One-day-only” sales, for example, are likely effective because they make consumers think that they will regret not seizing the opportunity. Marketers also attempt to capitalize on immediate emotions – e.g., charitable organizations that make potential donors feel guilty about what they squander their money on while less fortunate people starve.

The food industry is particularly motivated to capitalize on immediate emotions. Mrs. Field’s Cookies, for example, has been known to pump enticing cookie smells into the atmosphere of shopping malls to stimulate hunger (Hoch and Loewenstein 1991). A company named “ScentAir” sells similar odors (e.g., “Glazed Donut,” “Iced Cinnamon Pretzel,” “Blue Cotton Candy”) to businesses looking to stimulate hunger.² By contrast, the dieting industry often attempts to market its services by focusing people on the positive emotions they can anticipate experiencing once they are finally able to fit into the perfect pair of jeans.

² On the surface, it seems somewhat unethical to artificially induce visceral states in order to sell products. However, it is likely the case that food companies that failed to prey on the affective vulnerability of consumers would be driven out of business by other companies that did. Hence, one could argue that food companies that pump artificial smells into the atmosphere to stimulate hunger are not evil, but rather are doing what they must to stay afloat.

Enter Behavioral Economics

The snapshot of economics presented above, however, is outdated; it is a snapshot of the discipline 20 years ago, but economics has developed. Behavioral economics, which imports insights from psychology to economics, first achieved prominence in the 1980s and has been gaining influence since then, and much of the thrust of behavioral economics has involved, or at least could be construed as involving, an enhanced understanding of emotions.

The first, and less controversial, interaction of behavioral economics with emotions was to question the neglect of the topic and to begin to inform exactly how utility depended on outcomes. For example, whereas conventional economics assumes that the utility of an outcome depends only on the outcome itself, some economists showed how counterfactual emotions (e.g., regret), which arise from considering alternative outcomes that could have occurred, can influence decision making. Note that these analyses focus on expected emotions and hence help to elaborate the connection between outcomes, emotions and utility, but do not challenge the consequentialist perspective.

More recently, economists as well as psychologists who are specifically interested in decision making, have begun to take greater account of immediate emotions. Some of the research has shown that immediate integral emotions play a critical role in decision making. However, other research has shown that immediate emotions, and especially but not exclusively incidental emotions, often propel decisions in different directions from expected emotions – i.e., in directions that run contrary to the predictions of a consequentialist perspective. The new research thus suggests that the consequentialist perspective is much too simple to be a descriptively valid account of actual behavior.

In this chapter we review some of the critical (consequentialist) assumptions and predictions of the dominant economic models of risky decision making, intertemporal choice, and social preferences. For each of these areas we first discuss behavioral phenomena that are anomalous from the consequentialist perspective, but that are rectified once the role of expected emotions is taken into account. Next, we discuss phenomena that can potentially be illuminated by taking account of immediate emotions, both integral and incidental. We conclude by proposing directions for future research on the role of emotion in decision making.

Decision Making Under Risk

Most decisions, including decisions of economic importance, entail an element of risk, because the consequences of alternative courses of action are rarely known with certainty. Thus, decision making under risk is a central topic in economics.

Since first proposed by Daniel Bernoulli in 1738, the expected utility (EU) model has served as the normative benchmark for decision making under risk in economics. EU assumes that people choose between alternative courses of action by assessing the desirability or “utility” of each action’s possible outcomes and linearly weighting those utilities by their probability of occurring. The normative status of the EU model was enhanced by von Neumann and Morgenstern’s (1944) demonstration that it could be derived from a primitive, intuitively appealing set of axioms – for example that preferences are transitive (if A is preferred to B, and B is preferred to C, then A should be preferred to C). In addition to its normative appeal, EU’s assumption that decisions are based on expected utility, rather than expected value, gives it descriptive appeal as well. For instance, EU assumes that the difference in happiness (i.e., utility)

between winning \$1 and winning \$2 is not necessarily equal to the difference in happiness between winning \$101 and winning \$102 (though the difference in *value* is equal).

However, empirical research has documented many behavioral phenomena that are inconsistent with the basic axioms, and thus inconsistent with the predictions of EU, and many of these anomalies can be attributed to unrealistic assumptions about the determinants of expected emotions and the influence of immediate emotions. Several models have accounted for some of these anomalies by making more realistic assumptions about the determinants of expected emotions. We next review some of these theoretical innovations. We then discuss anomalies that can potentially be explained by taking account of the influence of immediate emotions.

Innovations to EU involving expected emotions

Relaxing the asset-integration assumption: In its original form EU assumes that people do not narrowly focus on potential outcomes when making a decision, but rather on how those outcomes affect their overall wealth. Thus, the utility of a particular outcome is not simply based on that outcome, but is based on the integration of that outcome with all assets accumulated to that point. However, as originally noted by Markowitz (1952) and developed more fully by Kahneman and Tversky (1979), people typically make decisions with a more narrow focus. When evaluating the potential outcomes of a decision, people tend to think in terms of incremental gains and losses, rather than in terms of changes in overall welfare.

To illustrate this distinction, consider an individual who must decide whether to accept or reject a gamble that offers a 50% chance of winning \$20 and a 50% chance of losing \$10. If the individual currently possesses \$1 million in wealth, then EU assumes that she views this choice as one between the utility of \$1 million and a 50% chance of experiencing the utility of \$1,000,020 and a 50% chance of experiencing the utility of \$999,990. Markowitz (1952) argued,

however, that most people would instead frame the choice as one between the utility of gaining and losing nothing and a 50% chance of experiencing the utility of winning \$20 and a 50% chance of experiencing the disutility of losing \$10.³

Relaxing the assumption that utility is strictly defined over realized outcomes: Another problematic EU assumption is that unrealized outcomes do not influence how we feel about realized outcomes. For example, suppose you anticipate a pay raise of \$10,000 and subsequently receive a \$5,000 raise. Although the raise is a gain relative to the status quo, you may code it as a loss since it fails to meet expectations. Köszegi and Rabin (in press) recently proposed a model that assumes gains and losses are defined relative to expectations, rather than the status quo.

Additionally, several modifications of the EU model incorporate the tendency to compare what happens to what was expected to happen (e.g., Loomes and Sugden 1986; Mellers et al., 1997). Other theories attempt to account for regret, a counterfactual emotion that arises from a comparison between the outcome one experiences as a consequence of one's decision and the outcome one could have experienced as a consequence of making a different choice. Early versions of regret theory (Loomes and Sugden 1982) predicted that regret-aversion could lead to violations of fundamental axioms of the EU model, such as monotonicity (i.e., stochastically dominating gambles are preferred to gambles they dominate).

Regret can also lead to violations of transitivity. Consider, for example, the three gambles below. Assume there are three equally likely states of nature; the table lists what each gamble pays if a particular state of nature is realized. If people care more about one big regret than they do about two smaller ones, as assumed in the original paper, then Gamble A will be preferred to

³ Note that narrowly focusing on gains and losses rather than changes in overall welfare suggests that all people, regardless of their current wealth position, view gambles the same way. Indeed, such narrow focus may explain why some extraordinarily wealthy individuals take big risks to achieve small gains and avoid small losses (e.g., Martha Stewart, worth hundreds of millions of dollars, engaging in insider trading to avoid a loss of less than \$50,000).

Gamble B. Similarly, B is likely preferable to C. Since A is preferred to B, and B is preferred to C, then transitivity requires that A is preferred to C. However, in fact C is preferred to A, since choosing A over C exposes one to the risk of one large regret instead of two small ones.

	State 1	State 2	State 3
Gamble A	\$10	\$20	\$30
Gamble B	\$20	\$30	\$10
Gamble C	\$30	\$10	\$20

Disappointment- and regret-aversion theories have only met with modest empirical support. One problem with the predictive validity of regret-aversion theories may be that anticipated regret only influences decision making when the possibility of regret is salient (Zeelenberg and Beattie 1997; Zeelenberg et al. 1996). Consider, for example, the following gambles, in which one of four colors can be drawn with varying probability:

Gamble A	Gamble B
90% chance of White, which pays \$0	90% chance of White, which pays \$0
6% chance of Red, which pays \$45	7% chance of Red, which pays \$45
1% chance of Green, which pays \$30	1% chance of Green, which pays -\$10
3% chance of Yellow, which pays -\$15	2% chance of Yellow, which pays -\$15

Since Green wins \$30 in Gamble A and loses \$10 in Gamble B, choosing B could produce regret if Green is chosen. This very salient potential for regret could lead to a preference for A over B, even though such a preference violates monotonicity. However, the gambles can be rewritten to make the possibility of regret less salient:

Gamble A'	Gamble B'
90% chance of White, which pays \$0	90% chance of White, which pays \$0
6% chance of Red, which pays \$45	6% chance of Red, which pays \$45
1% chance of Green, which pays \$30	1% chance of Green, which pays \$45
1% chance of Blue, which pays -\$15	1% chance of Blue, which pays -\$10
2% chance of Yellow, which pays -\$15	2% chance of Yellow, which pays -\$15

Note that Gambles A' and B' are equivalent to Gambles A and B, respectively; A and A' both have an expected value of \$2.55, and B and B' both have an expected value of \$2.75. However, the potential for regret is no longer salient. Rather, B' pays at least as much as A' for each

possible color. Thus, even though A and A' are equivalent, A' would likely be less attractive than A, only because the way A' and B' are framed obfuscates the potential for regret.⁴

However, note that regret is often more salient in prospect than in retrospect.⁵ Consider, for example, a recent study by Gilbert et al. (2004) that examined the extent to which subway passengers regretted missing their train. Passengers who entered a subway station within six minutes of missing the train (experiencers) were either told that they missed their train by one minute or five minutes. They were then asked to report how much regret they felt. These ratings were compared to the ratings of passengers leaving the station (forecasters), who were asked to imagine how much regret they would feel if they missed their train by one or five minutes. Forecasters anticipated feeling greater regret if they missed their train by one minute than by five minutes, though actual regret did not depend on how close experiencers came to catching the train. A subsequent study suggested the effect was driven by forecasters' inability to realize how quickly they would absolve themselves of responsibility for the disappointing outcome.

Although work remains to be done to incorporate more determinants of expected emotions into consequentialist models of decision making under risk, great progress has been made. We now discuss risky choice phenomena driven by immediate emotions.

Innovations to EU involving immediate emotions

⁴ As Sugden (1986) notes, another problem with regret-aversion models may be that it is *recrimination* – regret accompanied by the feeling that one should have behaved differently – rather than regret that people care about and attempt to avoid. Suppose, for example, you take your car to your regular mechanic for an oil change. You have never had a problem with the mechanic's work, but this time she used the wrong type of oil, which causes the car to break down. In this situation, you surely regret that the mistake was made, but you likely do not blame yourself for taking it to the mechanic, since you had no reason to anticipate such a mistake based on her past performance. Now suppose that you instead had decided to change your own oil. You have never done so before, but you decide it is worth trying to save the money. Your inexperience leads you to use the wrong type of oil, causing the car to break down. As in the previous scenario, you regret that the mistake was made. However, now there is likely recrimination: you think that you should have known better than to try to change your own oil.

⁵ Interestingly, however, Kivetz and Keinan (2006) show that regret from choosing virtues over vices increases over time, whereas regret from choosing vices over virtues diminishes over time.

Integral emotions influence risky decision making: When sufficiently strong, immediate emotions can directly influence behavior, completely precluding cognitive decision making (Loewenstein 1996). Ariely and Loewenstein (2005) experimentally examined the influence of sexual arousal on (hypothetical) risky decision making (see also Loewenstein, Nagin, and Paternoster 1997). Male participants were given a laptop computer and asked to answer a series of questions. In the control treatment, participants answered the questions while in their natural, presumably not highly aroused, state. In the arousal treatment, participants were first asked to self-stimulate themselves (masturbate) while viewing erotic photographs, and were presented the same questions only after they had achieved a high but sub-orgasmic level of arousal. When asked about their intention to use birth control in the future, aroused participants were less likely to report intending to use a condom. Though arousal affected participants' risk *attitudes*, it did not affect their risk *perception*. For example, aroused participants were no less likely to endorse the statement, "If you pull out before you ejaculate, a woman can still get pregnant." Although the authors did not ask questions that would permit mediational analyses, the preliminary results suggest that immediate emotions had a direct effect on (predicted) behavior.

Other research suggests that affect mediates the relationship between cognition and behavior, which is also inconsistent with the consequentialist perspective. Antonio Damasio and his colleagues (Damasio 1994; Bechara et al. 1997) have argued that decision makers encode the consequences of alternative courses of action affectively and that such "somatic markers" critically influence decision making (see Maia and McClelland 2004 and Dunn, Dalgleish, and Lawrence 2005 for recent critiques of the hypothesis). Damasio argued that the prefrontal cortex plays a critical role in this affective encoding process. Bechara et al. (1997) investigated the proposed role of the prefrontal cortex in an experiment in which patients suffering damage to the

prefrontal cortex and non-brain-damaged individuals played a game in which the objective was to win as much money as possible. Players earned hypothetical money by turning over cards that yielded either monetary gains or losses. On any given turn, players could draw from one of four decks, two of which included \$100 gains and two of which contained \$50 gains. The high-paying decks also included a small number of substantial losses, resulting in a net negative expected value for these decks. Bechara et al. (1997) found that both nonpatients and those with prefrontal damage avoided the high-paying decks immediately after incurring substantial losses. However, individuals with prefrontal damage resumed sampling from the high-paying decks more quickly than nonpatients after encountering a substantial loss. Thus, even though patients understood the game and wanted to win, they often went “bankrupt.” Bechara et al. (1997) reasoned that patients “knew” the high-paying decks were risky, but that their failure to experience fear when contemplating sampling from these decks made risky draws more palatable.⁶

Other evidence suggesting that integral emotion influences decision making comes from studies of consumers’ willingness to insure against a variety of risks. Johnson et al. (1993), for example, asked participants how much they would be willing to pay for flight insurance that protected against death due to “any act of terrorism” or “any reason.” Since terrorism is only one of many reasons why a plane might crash, consequentialist models of decision making predict that participants will pay more for insurance covering all types of crashes than for insurance just covering terrorism. However, Johnson et al. (1993) find that participants are willing to pay slightly more for insurance protecting against terrorism.⁷

⁶ Note that the extent to which emotional deficits lead to poor decision making largely depends on situational factors. In a similar study in which risky choices had a higher expected value than riskless choices, Shiv et al. (2005) found that patients with damage to regions associated with processing emotion earned *more* than control participants.

⁷ One natural explanation for these results is that “unpacking” vivid subsets of a larger set provides a more effective retrieval cue when recalling past causes of plane crashes (e.g., Tversky and Koehler 1994). Such an account would be consistent with a consequentialist model of decision making that allows for errors in judging probabilities. However, other work suggests that this result should not be interpreted in purely cognitive terms. Slovic, Fischhoff,

Additional evidence of integral emotions' impact on risky decision making comes from studies of probability weighting. EU assumes that the weight an outcome's probability receives in decision making is independent of the outcome; in fact, EU assumes linear probability weighting – i.e., that outcomes are weighted in exact proportion to their likelihood of occurring. However, more recent models of decision making under risk have challenged this assumption, suggesting instead that probabilities are weighted nonlinearly, as in Figure 2 (Kahneman and Tversky 1979). Kahneman and Tversky's (1979) proposed "probability weighting function" suggests that small probabilities are overweighted and large probabilities are underweighted.

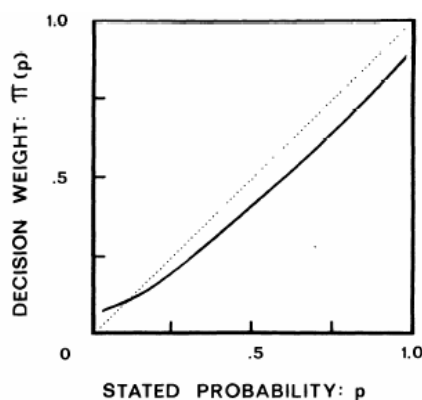


Figure 2. Kahneman and Tversky's (1979) probability weighting function

Despite the innovation, models such as Kahneman and Tversky's (1979) still assume that probability weights are independent of outcomes. This suggests, for example, that a one percent chance of losing a dollar has the same psychological impact as a one percent chance of losing your life. Rottenstreich and Hsee (2001) suggest that the probability weighting function is flatter for affect-rich outcomes than for affect-poor outcomes. They speculate that affect-rich prizes

and Lichtenstein (1980), for example, speculated that people's willingness to insure against unlikely losses may be related to how much these potential losses cause worry or concern. Consistent with this view, a number of studies have shown that knowing someone who has been in a flood or earthquake, or having been in one oneself, greatly increases the likelihood of purchasing insurance (Browne and Hoyt 2000). Although this finding, like that of Johnson et al. (1993), could be explained in consequentialist terms as resulting from an increase in individuals' expectations of experiencing a flood or earthquake in the future, the effect remains significant even after controlling for subjective expectations (Kunreuther et al. 1978).

elicit greater degrees of hope and fear and, thus, an extreme overweighting of small probabilities and an extreme underweighting of large probabilities. Indeed, Rottenstreich and Hsee (2001) find that participants' willingness to pay to avoid an electric shock is insensitive to the probability of the shock, whereas willingness to pay to avoid losing \$20 is extremely sensitive to the probability of the loss.⁸

Incidental emotion influences risky decision making: In a study of market index returns across 26 countries from 1982 to 1997, Hirshleifer and Shumway (2003) find that amount of sunshine (relative to expected amount of sunshine for a given time of year) is positively and significantly correlated with market returns. The authors speculate that the phenomenon may be driven by people incorrectly attributing their good mood to positive economic prospects rather than correctly attributing it to the sunshine (see, e.g., Schwarz and Clore 1983). Similarly, Edmans, García, and Norli (in press) find that stock market returns plummet when a country's soccer team is eliminated from an important tournament (e.g., the World Cup). They also document a dip in market returns following important losses in other sports (e.g., cricket, rugby and hockey) in countries where those sports are popular.⁹

Intertemporal Choice

⁸ Similarly, Ditto et al. (2006) conducted an experiment in which participants were given the opportunity to play a game that would either result in winning chocolate chip cookies or being required to work on a boring task for an extra 30 minutes. Half of the participants were only told about the cookies, whereas for the other half the cookies were freshly baked in the lab and placed in front of the participants as they decided whether or not to play the game. Consistent with Rottenstreich and Hsee (2001), Ditto et al. (2006) found that participants' willingness to play the game was insensitive to the probability of winning cookies when the cookies were baked in the lab, whereas willingness to play was very sensitive to the probability of winning when the cookies were merely described.

⁹ Also, Lerner and Keltner (2001) find that dispositional (i.e., incidental) anger and fear have opposing effects on risk preferences. Specifically, angry people tend to prefer risk (see also Fessler, Pillsworth, and Flanson 2004), whereas fearful people tend to avoid it. The authors explain their results in terms of the cognitive appraisals generated by the emotions (Smith and Ellsworth 1985). Anger is generally associated with appraisals of certainty and individual control, whereas fear is generally associated with appraisals of uncertainty and situational control. These incidental emotions, through their associated appraisals, appear to have influenced participants' cognitive evaluations of the problem, thus influencing their subsequent decisions.

Models of intertemporal choice address how decision makers choose between alternatives involving costs and benefits that are distributed over time. The discounted utility (DU) model is the dominant model of intertemporal choice in economics (Samuelson 1937). Structurally, DU is closely parallel to EU. DU, like EU, has also been derived from a series of intuitively compelling axioms (Koopmans 1960). However, a number of anomalies have been identified that call into question the descriptive validity of these axioms and, thus, the predictions of DU (Loewenstein and Prelec 1992). We next review anomalies that can be reconciled with DU once more realistic assumptions are made about the determinants of expected emotions; we then discuss anomalies that can be explained by taking account of immediate emotions.

Innovations to DU involving expected emotions

Relaxing the assumption that utility is strictly defined over realized outcomes: Like EU, DU assumes that utility (and thus expected emotion) is only a function of realized outcomes. If people devalue future emotions, they should want to experience pleasurable outcomes immediately and postpone painful outcomes whenever possible. However, contrary to this basic assumption, in many situations people prefer to get unpleasant outcomes over with quickly, or 'leave the best for last'. In an early study documenting this phenomenon, Loewenstein (1987) asked 30 undergraduates how much they would be willing to pay immediately to obtain a kiss from the movie star of their choice and to avoid receiving a (non-lethal) 110-volt shock, after several time delays. Contrary to the predictions of DU, respondents were willing to pay more to experience a kiss delayed by three days than an immediate kiss or one delayed by three hours or one day, and were also willing to pay more to avoid a shock that was delayed for one year or ten years than to avoid a shock experienced within the next three days.

These anomalies can be reconciled with DU if one takes account of the observation that utility is not strictly a function of realized outcomes, but also of emotions experienced while waiting for those outcomes to occur. Loewenstein (1987) proposes a model that assumes that people derive utility from 'savoring' future good outcomes and disutility from dreading bad outcomes.¹⁰ Indeed, in a brain imaging study in which participants were confronted with the prospect of a *real* impending shock, Berns et al. (2006) found that brain regions associated with the 'pain matrix' (a cluster of regions that are activated during the experience of pain) are also activated in anticipation of shock and, moreover, that this activation intensifies as the shock becomes imminent. Further, providing support for the idea that utility from anticipation plays a causal role in the desire to expedite negative outcomes, individual differences in activation in response to anticipatory pain predict individual tendencies to expedite shocks.¹¹

Incorporating affective forecasting errors: For DU to be descriptively valid, people must be able to accurately forecast how they will emotionally react to future outcomes. However, there is by now substantial evidence that people have difficulty making such forecasts. Consider, for instance, a study by Brickman, Coates, and Janoff-Bulman (1978) in which lottery winners, paraplegics and quadriplegics, and a control group were asked to report their current happiness on a 5-point scale. The lottery group (n = 22) consisted of people who had recently won at least \$50,000 in the Illinois state lottery. The paraplegics and quadriplegics (n = 29) had become paralyzed within the past year. Lottery winners reported a mean level of happiness virtually identical to that of the control group (4.00 vs. 3.82), whose happiness was significantly different

¹⁰ Loewenstein's model applies only to deterministic outcomes (e.g., a guaranteed kiss from a movie star in the future). Caplin and Leahy (2001) note that many anticipatory emotions (e.g., suspense) are driven by uncertainty about the future. They propose a model that modifies EU to incorporate such anticipatory emotions and then show that it can explain a variety of phenomena (e.g., the overwhelming preference for riskless bonds over stocks).

¹¹ In addition to savoring and dread, an entirely different type of anticipation may also drive intertemporal choice: the anticipation of *memories* (Elster and Loewenstein 1992). For example, people may perform challenging but unpleasant activities (e.g., mountain climbing) partly because they savor the pleasant memories of conquering the challenge. Models of intertemporal choice have yet to incorporate the influence of anticipation of memories.

from, but surprisingly close to, the mean happiness level among paraplegics and quadriplegics (2.96). Although lottery winners, paraplegics, and quadriplegics were not prospectively asked to predict their future happiness (since they cannot be identified beforehand), it seems likely that both would have overestimated the hedonic importance of their future circumstances.¹²

Loewenstein and Adler (1995) examined whether people could predict falling subject to “endowment effect” (Thaler 1980), which refers to the tendency for people to value an object more highly if they possess it than they would value the same object if they did not. In the typical demonstration of the effect (see, e.g., Kahneman, Knetsch, and Thaler 1990), one group of participants (sellers) are endowed with an object and given the option of trading it for various amounts of cash; another group (choosers) are not given the object but are given a series of choices between receiving the object and receiving various amounts of cash. Although the objective wealth position of the two groups is identical, as are the choices they face, endowed participants hold out for significantly more money than those who are not endowed.¹³

Loewenstein and Adler (1995) informed some participants that they would be endowed with an object (a mug engraved with their school logo) and asked them to predict the price at which they would sell the object back to the experimenter once they were endowed. These participants, and others who did not make a prediction, were then endowed with the object and given the

¹² Addressing an important limitation of Brickman, Coates, and Janoff-Bulman (1978), Gilbert et al. (1997) conducted a study in which affective forecasts could be elicited prior to an important life event. Specifically, Gilbert et al. (1997) studied assistant professors’ forecasts of how they would feel after their tenure decision; the investigators compared these forecasts to the self-reported well-being of others whose tenure decision had been made in the past. The sample consisted of all assistant professors who were considered for tenure in the liberal arts college of a major university over a ten-year period, and it was divided into three categories: current assistants, those whose decision was less than five years earlier, and those whose decision was more than five years earlier. Current assistants predicted that they would be much happier during the first five years after a positive decision, but that this difference would dissipate during the subsequent five years. Thus, they expected to adapt much more slowly than others actually did: there was no significant difference in reported well-being between those who had and had not received tenure in either the first five or the next five years afterward.

¹³ Lerner, Small and Loewenstein (2004) find that incidental sadness *reverses* the endowment effect, presumably by motivating choosers and sellers to change their circumstances. Choosers can change their circumstances by obtaining an object, which is best achieved by setting high choice prices. Sellers can change their circumstances by giving up their object, which is best achieved by setting low selling prices.

opportunity to sell it back to the experimenter. Participants who were not yet endowed substantially underpredicted their own postendowment selling prices. In a second study, selling prices were elicited from participants who were actually endowed with an object and from others who were told they had a 50 percent chance of getting the object. Selling prices were substantially higher for the former group, and the valuations of participants who were not sure of getting the object were indistinguishable from buying prices of participants who did not have the object.

Loewenstein and Adler's (1995) results suggest that participants who were not endowed with an object failed to predict how painful it would be to part with the object once they possessed it. That is, participants made "affective forecasting" errors when predicting their future attachment to the object. However, a recent study by Kermer et al. (2006) suggests that it may be the *sellers* who are making the affective forecasting error (see also Galanter 1992). Kermer et al. (2006) first asked participants to report their baseline affect. Participants then received a \$5 show-up fee and were told that a coin would be flipped to determine whether they would win an additional \$3 or lose \$2. Next, they predicted how they would feel immediately after the coin toss. The experimenter then flipped a coin and paid participants accordingly. Participants then rated how they felt at that moment. Some participants were also asked to report what they would think after the coin toss, and, once the coin had actually been tossed, they were also asked to report their actual thoughts following the coin toss. Kermer et al. (2006) found that people expected losing \$3 to diminish their happiness (relative to happiness reported at the beginning of the experiment) more than it actually did.¹⁴ This suggests that the predictors in Loewenstein and Adler (1995) may have accurately based their predicted selling prices on how they would

¹⁴ By contrast, participants accurately predicted how much winning the coin flip would increase their happiness.

actually feel after losing an object. Sellers, by contrast, may have based their selling prices on unrealistically negative forecasts of how they would feel after losing an object.¹⁵

In a behavioral economic model of intertemporal choice that incorporates affective forecasting errors, Loewenstein, O'Donoghue, and Rabin (2003) propose that people exaggerate the degree to which their future tastes will resemble their current tastes. Conlin, O'Donoghue, and Vogelsang (2006) find evidence of such "projection bias" in catalog orders of cold-weather-related clothing items and sports equipment. People are over-influenced by the weather at the time they make decisions, as measured by their likelihood of returning the item: a decline of 30° *F* on the date an item is ordered increases the probability of a return by 3.95 percent.

Economists have incorporated more realistic assumptions about expected emotions into models of intertemporal choice. However, some phenomena, driven by immediate emotions, remain anomalous from the perspective of such models. We now turn to these phenomena.

Innovations to DU involving immediate emotions

Relaxing the assumption of exponential discounting: The DU model assumes that people discount future flows of utility at a fixed discount rate based on when the utility will be experienced. Discounting at a fixed rate (i.e., "exponential" discounting) means that a given time delay leads to the same amount of discounting regardless of when it occurs. According to DU, delaying the delivery of a good by one day leads to the same degree of time discounting whether that delay makes the difference between consuming the good tomorrow rather than today or in

¹⁵ Why are people often unable to accurately predict their affective reactions to negative events? Kermer et al. (2006) suggest that people do not realize how capable they are of finding 'silver linings.' For example, participants who were asked to report their thoughts before and after losing the coin flip were significantly more likely to think about their \$2 profit after losing the coin flip than before the coin was flipped. Conversely, participants were more likely to think they would focus on the \$3 loss before the coin was flipped than they actually did after losing the coin flip. Other researchers (e.g., Schkade and Kahneman 1998) attribute affective forecasting errors to "focusing illusions," whereby people exaggerate the impact of specific narrow changes in their circumstances on well-being). Both are plausible explanations of the affective forecasting errors documented in the studies discussed here.

101 days rather than 100 days. However, an overwhelming amount of empirical work suggests that people (as well as animals) do not discount the future exponentially (Kirby and Herrnstein 1995; Rachlin and Raineri 1992). Rather, people care more about the same time delay if it is proximal rather than distal, a general pattern that has been referred to as “hyperbolic time discounting” (Ainslie 1975). For example, delaying consumption of a pleasurable good from today to tomorrow is more distressing than delaying consumption from 100 days from now to 101 days from now. Hyperbolic time discounting predicts that people will behave farsightedly when the consequences of their decision are delayed. In such situations, decision makers will place great weight on long-term costs and benefits. However, when consequences are immediate, hyperbolic time discounting will produce behavior that appears impulsive.¹⁶

Consider, for example, an experiment by Read, Loewenstein, and Kalyanaraman (1999) in which participants were asked to select one of 24 movies to watch. Some of the movies were “high brow” (e.g., *Schindler’s List*), and some were “low brow” (e.g., *The Mask*). Some participants were asked to choose a movie to watch that night, whereas others were asked to choose a movie to watch in the future. Consistent with hyperbolic discounting, “low brow” movies (that are high in short-run benefits, but low in long-run benefits) were most popular among participants selecting a movie for immediate viewing.¹⁷

Behavioral economists have made great progress in modeling hyperbolic discounting (e.g., Laibson 1997). Such models assume that discounting leads to impulsive behavior by diminishing the importance of expected emotions. However, holding the timing of consumption

¹⁶ However, Kivetz and Simonson (2002) suggest that some people have a hard time selecting luxuries (that are presumably high in short-run benefits, but low in long-run benefits) over cash when either would be received shortly after the decision. They demonstrate that choosing luxuries over cash is easier when the consequences of the decision are delayed.

¹⁷ Goldstein and Goldstein (2006) document a similar phenomenon among Netflix customers who watch and return low-brow movies right away, but let high-brow movies sit around much longer before watching them.

constant, there are a variety of other situational factors that can also lead to impulsivity. Walter Mischel (1974) and colleagues, for example, have extensively studied the impact of physical proximity of rewards on the impulsivity of children. Children faced with the choice between a small immediate reward (e.g., one marshmallow) and a larger delayed reward (two marshmallows) tend to behave more impatiently when the immediate reward is proximal.

Thus, impulsivity may reflect factors other than a devaluation of expected emotions. Immediate emotions may also produce non-exponential discounting. To examine the influence of immediate emotions on impulsivity, McClure et al. (2004) measured the brain activity of participants with functional magnetic resonance imaging (fMRI) while they made a series of intertemporal choices between small proximal rewards ($\$R$ available at delay d) and larger delayed rewards ($\$R'$ available at delay d'), where $\$R < \R' and $d < d'$. Rewards ranged from \$5 to \$40 Amazon.com gift certificates and the delay ranged from the day of the experiment to six weeks later. McClure et al. (2004) investigated whether there were brain regions that show elevated activation (relative to a resting state benchmark) only when immediacy is an option (i.e., activation when $d = 0$, but no activation when $d > 0$) and whether there were regions that show elevated activation when making any intertemporal decision. McClure et al. (2004) found that time discounting results from the combined influence of two neural systems: limbic and paralimbic cortical structures, which are known to be rich in dopaminergic innervation, are preferentially recruited for choices involving immediately available rewards, whereas fronto-parietal regions, which support higher cognitive functions, are recruited for all intertemporal choices. Moreover, the authors find that greater activity in fronto-parietal regions than in limbic regions is associated with choosing larger delayed rewards, whereas greater activity in limbic

regions than in fronto-parietal regions is associated with choosing smaller immediate rewards.¹⁸ These results suggest that the experience of immediate emotion rather than the devaluation of expected emotion may, at least in some situations, drive impulsivity.¹⁹

Integral emotions influence intertemporal choice: Suppose you are deciding whether or not to buy a CD for \$10. DU predicts that you will buy the CD if the anticipated pleasure of listening to it exceeds its “opportunity cost” (i.e., the foregone pleasure that could have been purchased with the \$10). However, Frederick et al. (2006) suggest that people do not spontaneously consider opportunity costs when deciding whether or not to purchase goods. Frederick et al. (2006) asked participants if they would (hypothetically) be willing to purchase a desirable video for \$14.99. They simply varied whether the decision not to buy it was framed as “not buy this entertaining video” or “keep the \$14.99 for other purchases.” Although the two phrases describe objectively equivalent actions, the latter highlights the pleasure that is foregone by purchasing the video. Frederick et al. (2006) find that drawing attention to opportunity costs significantly reduces the proportion of participants willing to purchase the video, suggesting that some participants are not spontaneously considering opportunity costs.

If people do not take opportunity costs into account when deciding whether or not to purchase goods, then how do they make such decisions? Knutson et al. (2006) investigated this question in an experiment in which participants chose whether or not to purchase a series of

¹⁸ However, note that since the rewards were gift certificates, the consumption they afforded was not immediate in any conventional sense. To address this limitation, McClure et al. (2006) ran an experiment in which participants were asked not to drink any liquids during the three hours preceding their session. While having their brains scanned with fMRI, participants made a series of choices between receiving a small amount of juice or water immediately (by having it squirted into their mouth) and receiving a larger amount of juice or water up to 20 minutes later. Like McClure et al. (2004), McClure et al. (2006) found that limbic regions were preferentially recruited for choices involving immediately available juice or water, whereas fronto-parietal regions were recruited for all choices.

¹⁹ Further evidence suggesting that immediate emotion plays a role in impulsivity comes from a study by Shiv and Fedorikhin (1999) in which participants were given either a two- or seven-digit number to memorize and were then given a choice between cake and fruit salad. Participants asked to remember the seven-digit number chose cake significantly more often than did participants asked to remember the two-digit number.

discounted consumer goods while having their brains scanned with fMRI. The goods ranged from hedonic to utilitarian; they ranged in retail price from \$10-\$80, and were offered at a 75 percent discount. Participants were given \$20 to spend and were told that one of their decisions would be randomly selected to count for real. At the conclusion of the experiment, participants indicated how much they liked each product and how much they would be willing to pay for it.

Knutson et al. (2006) find that the extent to which participants reported liking the products correlated positively with activation in nucleus accumbens, a region previously associated with anticipation of gains and positive arousal (Kuhnen and Knutson 2005). Moreover, consumer surplus (i.e., the amount participants reported they would be willing to pay for each product *minus* the product's price) correlated positively with activation in medial prefrontal cortex, a region previously associated with the receipt of unexpectedly large gains (e.g., Knutson et al. 2003). They also find that activation in both regions correlated positively with purchasing decisions. However, they find that activation in insula, a region previously associated with anticipation of pain and negative arousal (e.g., Buchel and Dolan 2000), correlated negatively with purchasing decisions. Critically, these correlations remain significant after controlling for participants' self-reported attraction to the goods and willingness to pay for them.

Incidental emotions influence consumer choice: Based on the results of Knutson et al. (2006), Rick, Cryder, and Loewenstein (2006) investigated whether individuals differed in their tendency to experience anticipatory pleasure or pain when making purchasing decisions. They hypothesized that individuals who experience intense anticipatory pain may typically spend less than they would ideally (i.e., deliberately) like to spend, whereas individuals who experience intense anticipatory pleasure may typically spend more than they would ideally like to spend. They developed a "Tightwad-Spendthrift" scale to identify such individuals and found just as

many tightwads as spendthrifts in a sample of over 2,600 people. Rick, Cryder, and Loewenstein (2006) hypothesized that tightwads and spendthrifts could overcome their prepotent affective responses to spending if they thought more deeply about their decisions. They varied depth of thought in an experiment in which tightwads and spendthrifts decided whether or not to purchase consumer goods at discounted prices while listening to neutral or sad music. Sadness has been found to deepen deliberation (e.g., Bodenhausen, Sheppard, and Kramer 1994; Bodenhausen, Gabriel, and Lineberger 2000), and it was therefore predicted that sadness would affect tightwads and spendthrifts differently. As predicted, tightwads spend more when sad than when in a neutral state, and spendthrifts spend less when sad than when in a neutral state.

Social Preferences

While there are widely accepted normative benchmarks for risky decision making and intertemporal choice, no such benchmarks exist for how people should behave towards others. However, many economic models make the simplifying, but unrealistic, assumption that people are strictly self-interested. Below we review behavioral economic models of social preferences that have incorporated more realistic assumptions about the determinants of expected emotions in social interactions. We then review anomalies driven by immediate emotions.

Expected emotion: Relaxing the pure self-interest assumption

Economists frequently study social preferences in the context of the “ultimatum game” (Guth, Schmittberger, and Schwarz 1982). In the typical ultimatum game, a “proposer” offers some portion of an endowment to a “responder” who can either accept the offer or reject it. If the responder accepts the offer, the money is divided according to the proposed split. If the responder rejects the offer, both players leave with nothing. Since purely self-interested

responders should accept any positive offer, self-interested proposers should offer no more than the smallest positive amount possible. However, average offers typically exceed 30 percent of the pie, and offers of less than 20 percent are frequently rejected (see Camerer 2003).

Several behavioral economic models have emerged that incorporate a taste for fairness.²⁰ Rabin (1993) proposes a model in which people derive utility from reciprocating intentional (un)kindness with (un)kindness (see also Dufwenberg and Kirchsteiger 2004). Blout (1995) conducted an interesting variant of the ultimatum game to investigate the role of intentions in social behavior. Some responders were told that the proposer with whom they were paired would make an offer, as in the standard ultimatum game. Other responders were told that the offer would be randomly generated. Blout (1995) found that responders were willing to accept significantly less when the offer was generated randomly than when it came from the proposer.

Sanfey et al. (2003) conducted a similar study in which participants played the ultimatum game while having their brains scanned with fMRI. Participants, all responders, were told they would play the ultimatum game with 10 different human proposers (though offers were actually determined by the experimenters). Responders received five “fair” offers (\$5 for proposer, \$5 for respondent), and five unfair offers. In ten other trials, responders received the same offer, but this time from a computer. As in Blout (1995), participants were more willing to accept low offers from computer proposers than from human proposers. Moreover, activation in anterior insula, which has been implicated in the experience of negative emotions such as pain and disgust, was greater for unfair offers from human proposers than for fair offers from human proposers. Insula activation was also significantly greater in response to unfair offers from human proposers than in response to unfair offers from computer proposers. In fact, whether players reject unfair offers

²⁰ But see Dana, Weber, and Kuang (2005) for evidence suggesting that some actions that appear to reflect a taste for fairness may in fact reflect a desire to appear to have a taste for fairness.

from human proposers can be predicted reliably ($r = 0.45$) by the level of their insula activity. Thus, it appears that integral emotions influence responders' behavior in the ultimatum game (see also Bosman, Sonnemans, and Zeelenberg 2001; Haselhuhn and Mellers 2005).

Behavioral economists have created more descriptively valid models of social preferences by relaxing the assumption of pure self-interest. However, some phenomena driven by immediate emotion cannot be explained by such models. We review such anomalies below.

Integral emotions influence social preferences

Recent work on the “identifiable victim effect” (Small and Loewenstein 2003), which refers to the tendency to give more to identifiable victims than to statistical victims, suggests that integral emotions play a role in generosity towards others (see also Schelling 1968; Kogut and Ritov 2005). Differential sympathy towards identifiable victims (e.g., “Baby Jessica”) and statistical victims (e.g., thousands of casualties in a distant country) likely underlies the effect. Subsequent research has demonstrated that people are also more punitive toward identifiable wrongdoers than toward equivalent, but unidentified, wrongdoers, and that anger mediates the effect of identifiability on punishing behavior (Small and Loewenstein 2005).

Incidental emotions influence social preferences

Andrade and Ariely (2006) investigated the impact of incidental emotions on behavior in the ultimatum game. They induced either incidental happiness or anger and then had participants play the role of responder in an ultimatum game in which they were offered \$4 of a \$20 endowment. After deciding whether to accept or reject the offer, participants then played the role of proposer in a second ultimatum game with a presumably different partner than in the first game. Andrade and Ariely (2006) find that happy responders are less likely than angry

responders to reject unfair offers in the initial ultimatum game. Surprisingly, however, proposers who were initially induced to feel happy made *more* selfish proposals in the second ultimatum game. The authors reasoned that angry individuals, who are more likely to reject unfair offers than happy individuals in the initial ultimatum game, misattributed their behavior to stable preferences rather than to incidental affect. Later, due to a “false consensus effect” (Ross, Greene, and House 1977; but see Dawes and Mulford 1996), previously angry individuals infer that others are also likely to reject unfair offers and will therefore, as proposers, make very generous offers. By contrast, the authors reasoned that happy individuals, who are less likely to reject unfair offers than angry individuals in the initial ultimatum game, also misattributed their behavior to stable preferences. Accordingly, previously happy individuals infer that others are also unlikely to reject unfair offers and will therefore, as proposers, make very selfish offers.²¹

Conclusion

As the foregoing review indicates, emotions influence economic behavior in two distinct ways. First, people anticipate, and take into account, how they are likely to feel about the potential consequences of alternative courses of action. As discussed, such a role for *expected* emotions is entirely consistent with consequentialist economic accounts of decision making. Research on the role of expected emotions in decision making has taken a variety of directions. It has assessed the types of emotions that people actually experience when they experience different outcomes, with a special focus on counterfactual emotions. It has examined people's

²¹ Incidental emotion also influences prosocial behavior. Darlington and Macker (1966), for example, find that incidental guilt increases participants' willingness to donate blood. Alice Isen and her colleagues (e.g., Isen and Levin 1972; Isen, Horn, and Rosenhan 1973; Isen, Clark, and Schwartz 1976) have found in a variety of settings that incidental happiness (induced, e.g., by finding a dime in a phone booth or receiving free cookies) increases people's willingness to help others (e.g., by picking up their dropped papers or by helping the experimenter with a subsequent task; but see Isen and Simmonds 1978). Incidental gratitude also increases people's willingness to help others (Bartlett and DeSteno 2006). Although the preceding studies did not deal directly with money, note that the helping behavior they documented did involve expenditures of costly resources (e.g., blood, effort, attention).

predictions of what emotions they will experience, and the accuracy of such predictions. And, it has sought to determine the degree to which decisions are in fact guided by predicted emotions.

Second, substantial research supports the idea that immediate emotions also play an important role in decision making. Integral immediate emotions arise from contemplation of the potential outcomes of a decision. In some cases, these emotions seem to play an important role in decision-making, informing decision-makers about their own values. But in other cases, such as the disproportionate fear commonly associated with flying as opposed to driving, integral emotions may cause people to act contrary to their own material interests. In contrast to the mixed role played by integral emotions, it is much more difficult to justify the well-documented role of incidental emotions, which by definition are unrelated to the decision at hand.

In general, research on expected emotions is far more advanced than that on immediate emotions. As a result, there is a pressing need for more research to examine the causes and consequences of immediate emotions and to understand the complex interplay of immediate and expected emotions in the production of behavior. In some cases, immediate and expected emotions seem to complement one another. This is true, for example, when immediate emotions provide decision makers with a better understanding of their own values – an understanding which may help them to better predict their own future feelings. For instance, the experience of anticipatory guilt may help a student who is contemplating cheating on an exam to appreciate the guilt she would experience after doing so. In other cases, however, immediate and expected emotions come into conflict. For example, the immediate effect of a positive mood may be to make decision makers more risk-taking, but, by a different, consequentialist, path, a positive mood might also make the decision maker more risk-avoidant, with the goal of not risking a disturbance to the positive feelings (Isen, Nygren, and Ashby 1988; Kahn and Isen 1993).

The clash between immediate and expected emotions is also a major cause of self-control problems. For example, people are often driven by immediate emotions to eat, drink, and make merry, but in some of these situations, contemplation of expected emotional consequences may discourage indulgence. Psychologists have for decades been developing 'dual process' models that could be interpreted in such terms, and in recent years economists have begun to follow their lead. Thaler and Shefrin (1981) were the first economists to do so: their model adopts a principal-agent framework in which a farsighted planner (the principle) attempts to reconcile the competing demands of a series of myopic doers (the agents). More recently, a spate of dual process models have focused on the problem of self-control (Fudenberg and Levine 2005; Benhabib and Bisin 2004; Loewenstein and O'Donoghue 2004; Bernheim and Rangel 2004).

Although most of the dual process models proposed by economists have sought to adhere to the standard consequentialist perspective, introducing a role for immediate emotions should raise questions about whether such a perspective is 'up to the job' of providing a useful account of human behavior. Behavior under the control of immediate emotions bears little resemblance to the reflective weighing of costs and benefits that is the prototype of rational economic decision making. Instead, it is a much more reflexive process that often drives behavior in exactly the opposite direction than that suggested by a weighing of costs and benefits. Whether behavior driven by immediate emotions even warrants the label of 'decision making' seems doubtful.

In closing, we note two, we believe fruitful, potential directions for future research on the role of emotion in decision making. The first is the need to study stronger emotions than have generally been examined in the empirical literature. Many vitally important decisions are made 'in the heat of the moment', and indeed important economic decisions such as major purchases often evoke powerful emotions. But studying the impact of such emotions is difficult, in part

because it is difficult if not impossible to experimentally manipulate such strong emotional states and in part because people generally do not like to be studied when they are in heightened emotional states. Gaining a better understanding of the role of immediate emotions in economic decision making, therefore, is going to require creative researchers willing to extend themselves into 'hot' situations and creative enough to find natural experiments in which people are naturally assigned to different emotional states before they make important decisions.

The second pressing need is for economic research that takes fuller account of the range of insights that psychologists are developing into emotions. Thus, for example, economists studying the impact of weather on the stock market have generally taken a rather simplistic view – that bad weather should lead to negative emotions which should in turn lead to negative price movements. But psychologists studying the impact of emotions on risk-taking find that different specific negative emotions can have very different effects and, more relevant to the central theme of this paper, that the negative emotions can exert conflicting effects on risk-taking depending on whether the mechanism is consequentialist or more reflexive.

Economists' understanding of the role of emotions in economic behavior has made enormous strides in recent decades. However, there is still a long distance to go.

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