The Impact of Emotions on Probabilistic Decision Making
A Research Proposal

Dominique Cappelletti

August, 2005

Introduction

Given their background as moral philosophers, classical economists were interested in passions and emotions which govern human nature[1]. This interest in emotions had persisted in economic theory until the marginal revolution. The aim of developing a formal body of theory based on mechanical laws necessitated the adoption of a more stylized concept of utility, i.e. ordinal utility. Formal modelling sustained by an ordinal approach sought to expunge the utility construct of its emotional content (Loewenstein, 2000). Thus, modern mainstream economics is characterized by rational decision makers maximizing a given utility function under constraints.

However, for a long time economists have been questioning the behavioural validity of this model of individual behaviour and seeking alternatives. Simons work and his concept of bounded rationality has remarkably influenced the evolution of economic analysis of decision making, by incorporating the cognitive dimension in the economic models. However, the emotional dimension have remained excluded. Recent contributions from neurological and psychological studies have given strong support to the idea that emotions play a constructive role in decision making. These contributions have given a new appeal to emotions even for economists.

As the next section will outline, different approaches to emotions are present in the literature on decision making. Some authors perceive emotions as limitations of the cognitive process leading to choice (e.g. bounded willpower) while others see them as a support for adaptive decision making performed by bounded rational agents in complex environments.

The Role of Emotions in Decision Making

It is widely believed among economists that the influence of emotions on reasoning is disruptive, in the sense that people can become more rational to the extent they free themselves of emotion.

[1] Adam Smith on the human attribute of sympathy: That we often derive sorrow from the sorrow of others, is a matter of fact too obvious to require any instances to prove it The Theory of Moral Sentiments, Chapter I

This attitude is represented in traditional models of intertemporal allocation of wealth. In these models self control problems rooted in emotional reasoning could negatively affect retirement savings and determine a sub-optimal allocation of wealth in the life-cycle. Instead of neglecting the presence of self control problems, recent contributions have tried to model them and provide some advice on how to mitigate sub-optimality due to compelling emotions when facing intertemporal choices (among others, O'Donoghue-Rabin, 2000). However, some researchers in other fields than economics, have taken a more positive approach to emotions. Indeed, there seem to be situations in which emotions can enhance decision making process. In particular, when information structures embedded in the environment can be exploited through simple search heuristics (Gigerenzer et al., 1999), emotions can fruitfully lead the decision making process (ecological rationality).

An important feature of emotions that has to be considered is the fact that emotions enable decision makers to avoid procrastination. On this point, LeDoux (1996) gives a telling example. If you were a small animal faced with a bobcat and had to make a deliberate decision about what to do, you would have to consider the likelihood of each possible choice succeeding or failing and could get so bogged down in decision making that you would be eaten before you made the choice (p. 176).

Moreover, emotions help to solve the frame problem, as they limit the range of possible consequences to be considered in a rational-decision process (e.g. de Sousa, 1987). As Ketelaar and Todd (2000) put it, specific emotions might help to solve the problem of what information to attend to in specific environmental circumstances.

According to Damasio (1994), while evaluating different alternatives, gut feelings may be triggered by particular images associated with certain consequences. These signals help people make approach-avoidance distinctions between options.

Anticipated Emotions

Prominent researchers have attempted to incorporate emotions in economics. Throughout the 1990s, Elster (1996, 1998) was committed to the study of emotion and rationality and tried to make an explicit link between emotion and economic theory.

Frank (1988) has argued that emotions are relevant for economics because they can help to solve important commitment problems. He has shown, for example, that players endowed with the emotion of guilt can sustain the cooperative outcome of a prisoners dilemma game. The importance of emotions for decisions making has also been evidenced by several other authors (Bell, 1982, 1985; Loomes and Sugden, 1982, 1986; Mellers et al., 1997, 1999) who have attempted to include some measure of emotional dimension into their theories of decision making under risk and uncertainty. A common feature of the models proposed by these scholars is that the emotions that have been taken into account are anticipated emotions. Anticipated emotions are not experienced at the moment of choice but are expected to occur when outcomes are experienced. These theories have focused on two counterfactual emotions, namely disappointment and regret, which result from unfavourable comparisons between alternative outcomes of the same option and between outcomes of alternative options respectively. The core issue of these theories is the fact that individuals are motivated to

avoid these negative emotions. The consequence of this is that subjects averse to regret or disappointment make decisions in a way that minimizes the likelihood of experiencing them.

Actual Emotions

Instead of dealing with anticipated emotions, a large body of research has focused on the role of emotions experienced at the time of decision making. The following three general findings have emerged.
First, feelings affect subjects learning process. Feelings make individuals focus attention on aspects of the situation that are congruent with their mood. Subjects in a negative affective state were found to acquire more negative than positive information to which exposed (Bower and Cohen, 1982; Blaney, 1986).

Second, feelings affect what information is retrieved from memory. Tversky and Kahneman (1973, 1974) have suggested that ideas that come to mind first or most easily may influence judgment. People in a positive affective state were found to be more likely to think about positive possibilities and be optimistic in their decisions (Isen et al., 1978, 1982). Wright and Bower (1992) found that happy people are optimistic, in the sense that they report higher probabilities for positive events and lower probabilities for negative events. The inverse pattern has been found for subjects in a negative affective state.

Third, feelings influence the choice of decision making strategy. Subjects in a positive affective, when compared with subjects in a negative affective state, tend to reduce the complexity of the decision task through the choice of a simpler process of information retrieval. They disregarded irrelevant information, considered fewer dimensions, rechecked less information and took significantly less time to make their choice (Isen and Means, 1983). This kind of processing could either facilitate or impair subjects performance, depending on the circumstances. From a normative point of view the authors suggest that where a feedback on the task is provided or where the task is extremely important, people in a positive affective state would not be expected to engage in the type of processing described above.

As briefly presented above, emotions play an important role in decision making. Although emotions affect all domains of behaviour, Loewenstein (2000) identifies three general categories of behaviour that are of particular relevance to economics, namely bargaining, intertemporal choice and decision making under risk and uncertainty. The directions for future research presented below will focus in particular on the third of these domains.

Directions for Future Research

How do emotions influence risk-taking behaviour? Previous research (e.g. Isen and Patrick, 1983; Isen and Geva, 1987; Isen et al., 1988) addressing the influence of affective states on risk taking has found that people in positive affective states try to maintain their positive state and attempt to avoid substantial losses. More precisely, peoples response to risk stimuli depends on the gambles stakes: when faced with high stakes, people in a positive state are more risk averse with a view to avoid large losses. In contrast, if stakes are low, decision makers become risk-seeking in order to benefit from the gain without putting too much on the

line (Mano, 1994). These results seem to contradict findings that people in a positive affective state are more optimistic about their probability of winning a given lottery and appear more willing to take risks. Experimental evidence on the topic seems not to be conclusive and room for further accurate investigation is present. Moreover, these studies have considered only background emotions, while emotions triggered by the decision situation, that is how people react emotionally to risk, may have a significant impact on choices.

A useful research guideline is provided by the conceptual framework outlined by Loewenstein and O'Donoghue (2004). The theoretical model proposed by the author considers individual behaviour as the outcome of an interaction between two systems: a deliberative system that assesses options with a broad, goal-based perspective, and an affective system that includes emotions and motivational drives. Individuals evaluate uncertain and risky alternatives at a cognitive level, as in traditional models, and at an affective level. Emotional reactions to risks can differ from cognitive evaluations of the same risk because their determinants are different. Cognitive evaluation is based largely on the probability and desirability associated to the consequences. On the contrary, affective evaluation is more sensitive to outcomes than to probabilities. Rubinstein (2003) provides an interesting empirical research on instinctive and cognitive reasoning in a game theoretical setting. Collecting a large amount of time response times when playing simple games on a purposely-built web site the author argues that choices affected by the emotional system require a lower time response than those driven by a cognitive and deliberative process. Relying on theoretical and empirical evidence some specific research questions will be outlined here following.

When the affective reaction to uncertain and risky situations is likely to have a larger influence on decision than cognitive reaction? Affect tend to occur in an early stage of the decision making process and seems to hold a kind of primacy over deliberation. An implication of the theoretical model provided by Loewenstein and ODonoghue (2004) is that the deliberative system can over-ride the affective one through willpower. Willpower can be undermined by repeated use of it, cognitive load and stress. The proposal is to test through laboratory experiments theoretical predictions provided by the model. Attention will be directed to the decision making process of subjects exposed to risky and uncertain decisions under alternative conditions: time pressure, cognitive load (e.g. memorization of a series of long numbers) and repeated choices.

Aim of the study proposed is to better understand how emotions interact with perceived probability of the outcomes in a prospect. Particular attention will be paid to the process leading to formation of subjective probabilities and to the weighting of objective probabilities.

As mentioned above, Damasio (1994) states that people create mental images of a decisions outcomes and that emotional responses result largely from these images. Slovic et al. (2002) have coined the expression affect heuristic to express the idea that representations of objects and events in peoples minds are tagged to varying degrees with affect. The outcome of this process is the generation of mental models in the form of images that guide judgment and decision making.

As such images do not essentially vary with respect to probability, also emotional responses tend to be insensitive to probabilities. For example, subjects images and feeling

toward winning a lottery are likely to be the same whether the chance of winning is 1 in 10 million or 1 in 10.000. Emotions in uncertain or risky situations seem to be sensitive to the possibility rather than the probability of strong positive or negative consequences, causing an overweight of very small probabilities (Loewenstein et al., 2001). Moreover, Rottenstreich and Hsee (2001) found that the strong sensitivity to departure from impossibility and certainty and the insensitivity to changes in probability within a broad midrange of values is even more dramatic for affect-rich than for affect-poor outcomes.

Another interesting point is to see how choices are affected by the introduction of contextual variables like the proximity of outcomes. Proximity is a variable which can be defined over different dimensions (e.g. temporal, spatial and social). Proximity measures should not have any impact on a cognitive-driven decision process; however, they could play a role in affective-driven one. The laboratory experimental method seems to be the most appropriate way to assess the impact of proximity on choices under uncertainty. In fact, relying on field data makes it difficult to disentangle the impact that proximity has on the cognitive perception of risk and the impact that it has on the emotional system. When moving the attention to contextual elements, several research questions may be addressed through experimental investigation. As an example, consider the following: do risk preferences change according to how vividly the outcomes are described? Do risk preferences change whether the resolution of uncertainty is immediate or delayed? Do individuals change their risk choices when the prize is placed in front of them? Are risk choices affected by the presence of other people at the moment of decision or at the moment of uncertainty resolution?

Methods

The research project proposed is mainly empirical in nature. Following the aforementioned guideline provided by theoretical contributions in the field of Economics and Social Psychology, the aim is to develop a systematic work of empirical research and theory validation. However, the purpose of the proposed research is not only to test existing theories but also to provide constructive evidence as a basis for a more accurate descriptive theory of decision making under uncertainty. The research project will be conducted relying mainly on laboratory experiments. In addition, field surveys may be conducted in order to provide external validity to data obtained in the laboratory. A potentially useful and relatively unexplored source of data comes from websites where decisions under risk and uncertainty are made (e.g. on-line gambling).

Summary

Emotions are a fundamental element of decision making under uncertainty. Theoretical contributions referring to the interplay between uncertainty and emotions in decision making have been proposed both in the economic and psychological literature. These works provide a useful guideline to develop original empirical contributions, mainly relying on laboratory experimental methodology.

Bibliography

- Bell, D.E. (1982). Regret in decision making under uncertainty. Operations Research, 30, 961-981.
- Bell, D.E. (1985). Disappointment in decision making under uncertainty. Operations Research, 33, 1-27.
- Blaney, P.L. (1986). Affect and memory: a review. Psychological Bulletin, 99, 229-246.
- Bower, G.H., and Cohen, P.R. (1982). Emotion influences in memory and thinking: Data and theory. In M.S. Clark and S.T. Fiske (Eds.), Affect and cognition, Hillsdale, NJ: Erlbaum, pp. 291-331.
- Damasio, A.R. (1994). Descartes error: emotion, reason and the human brain. Papermac, London.
- de Sousa, R. (1987). The rationality of emotions. MIT Press, Cambridge, MA.
- Elster, J. (1996). Rationality and Emotions. Economic Journal, 106, 1386-1397.
- Elster, J. (1998). Emotions and Economic Theory. Journal of Economic Literature, 36, 47-74.
- Frank, R.H. (1988). Passions within reason: the strategic role of the emotions. New York: W.W. Norton.
- Gigerenzer, G., Todd, P.M. and ABC Group (1999). Simple Heuristics that Make Us Smart. New York: Oxford University Press.
- Isen, A.M. and Geva, N. (1987). The influence of positive affect on acceptable level of risk: the person with a large canoe has a large worry. Organizational Behavior and Human Decision Processes, 39, 145-154.
- Isen, A.M., Nygren, T.E. and Ashby, F.G. (1988). Influence of positive affect on the subjective utility of gains and losses: it is just not worth the risk. Journal of Personality and Social Psychology, 55, 710-717.
- Isen, A.M. and Patrick, R. (1983). The effect of positive feelings on risk-taking: when the chips are down. Organizational Behavior and Human Performance, 31, 194-202.
- Isen, A.M., and Shalker, T.E. (1982). Do you accentuate the positive, eliminate the negative when you are in a good mood? Social Psychology Quarterly, 45, 58-63.
- Isen, A.M., Shalker, T.E., Clark, M.S. and Karp, L. (1978). Positive affect, accessibility of material in memory, and behaviour: A cognitive loop? Journal of Personality and Social Psychology, 36, 1-12.

- Ketelaar, T. and Todd, P.M. (2000). Framing our thoughts: ecological rationality as evolutionary psychologys answer to the frame problem. In S.P. Davies and H. R. Holcomb (Eds.), The evolution of minds: psychological and philosophical perspective, Kluvier, Dordrecht.

- LeDoux, J. E. (1996). The emotional brain. The mysterious Underpinnings of Emotional Life. New York: Simon and Schuster.

- Loewenstein, G. (2000). Emotions in Economic Theory and Economic Behavior. The American Economic Review, 90 (2), 426-432.

- Loewenstein, G. and ODonoghue, T. (2004). Animal Spirits: Affective and Deliberative Processes in Economic Behavior. Social Science Research Network; $(http://papers.ssrn.com/sol3/papers.cfm?abstract_id = 539843)$

- Loewenstein, G.F., Weber, E.U., Hsee, C.K., and Welch, E.S. (2001). Risk as feelings. Psychological Bulletin, 127, 267-286.

- Loomes, G. and Sugden, R. (1982). Regret Theory: an alternative theory of rational choice under uncertainty. Economic Journal, 92, 805-824.

- Loomes, G. and Sugden, R. (1986). Disappointment and dynamic inconsistency in choice under uncertainty. Review of Economic Studies, 53, 271-282.

- Mano, H. (1994). Risk-Taking, Framing Effects, and Affect. Organizational Behavior and Human Decision Processes, 57, 38-58.

- Mellers, B.A., Schwartz, A., Ho, K., and Ritov, I. (1997). Decision affect theory: emotional reactions to the outcomes of risky options. Psychological Science, 8, 423-429.

- Mellers, B.A., Schwartz, A., and Ritov, I. (1999). Emotion-based choice. Journal of Experimental Psychology: General, 128, 332-345.

- O'Donoghue, T. and Rabin, M. (2000). The Economics of Immediate Gratification. Journal of Behavioral Decision Making, 13 (2), 233-250.

- Rottenstreich, Y. and Hsee, C.K. (2001). Money, Kisses, and Electric Shocks: On the Affective Psychology of Risk. Psychological Science, 12, 185-190.

- Rubinstein, A. (2003). Instinctive and Cognitive Reasoning: A study of Response Times. Tel-Aviv and NYU Working Paper $(http://arielrubinstein.tau.ac.il/papers/Response.pdf)$.

- Slovic, P., Finucane, M.L., Peters, E., and MacGregor, D.G. (2002). The affect heuristic. In T. Gilovich, D. Griffin, and D. Kahneman (Eds.), Heuristics and Biases: The psychology of intuitive judgment, (pp. 397-420), New York: Cambridge University Press.

- Tversky, A., and Kahneman, D. (1973). Availability: a heuristic for judging frequency and probability. Cognitive Psychology, 5, 207-232.
- Tversky, A., and Kahneman, D. (1974). Judgment under uncertainty: heuristics and biases. Science, 185, 1124-1131.
- Wright, W.F. and Bower, G.H. (1992). Mood effects on subjective probability assessment. Organizational Behavior and Human Decision Processes, 52, 276-291.