Case 1.1 Loss aversion in monkeys

Monkeys show the same "irrational" aversion to risks as humans

ECONOMISTS often like to speak of *Homo economicus* – rational economic man. In practice, human economic behaviour is not quite as rational as the relentless logic of theoretical economics suggests it ought to be. When buying things in a straight exchange of money for goods, people often respond to changes in price in exactly the way that theoretical economics predicts. But when faced with an exchange whose outcome is predictable only on average, most people prefer to avoid the risk of making a loss than to take the chance of making a gain in circumstances when the average expected outcome of the two actions would be the same.

There has been a lot of discussion about this discrepancy in the economic literature – in particular, about whether it is the product of cultural experience or is a reflection of a deeper biological phenomenon. So Keith Chen, of the Yale School of Management, and his colleagues decided to investigate its evolutionary past. They reasoned that if they could find similar behaviour in another species of primate (none of which has yet invented a cash economy) this would suggest that loss-aversion evolved in a common ancestor. They chose the capuchin monkey, *Cebus apella*, a South American species often used for behavioural experiments.

First, the researchers had to introduce their monkeys to the idea of a cash economy. They did this by giving them small metal discs while showing them food. The monkeys quickly learned that humans valued these inedible discs so much that they were willing to trade them for scrumptious pieces of apple, grapes and jelly.

Preliminary experiments established the amount of apple that was valued as much as either a grape or a cube of jelly, and set the price accordingly, at one disc per food item. The monkeys were then given 12 discs and allowed to trade them one at a time for whichever foodstuff they preferred.

Once the price had been established, though, it was changed. The size of the apple portions was doubled, effectively halving the price of apple. At the same time, the number of discs a monkey was given to spend fell from 12 to nine. The result was that apple consumption went up in exactly the way that price theory (as applied to humans) would predict. Indeed, averaged over the course of ten sessions it was within 1% of the theory's prediction. One up to *Cebus economicus*.

The experimenters then began to test their animals' risk-aversion. They did this by offering them three different trading regimes in succession. Each required choosing between the wares of two experimental "salesmen". In the first regime one salesman offered one piece of apple for a disc, while the other offered two. However, half the time the second salesman only handed over one piece. Despite this deception, the monkeys quickly worked out that the second salesman offered the better overall deal, and came to prefer him.

In the second trading regime, the salesman offering one piece of apple would, half the time, add a free bonus piece once the disc had been handed over. The salesman offering two pieces would, as in the first regime, actually hand over only one of them half the time. In this case, the average outcome was identical, but the monkeys quickly reversed their behaviour from the first regime and came to prefer trading with the first salesman.

In the third regime, the second salesman always took the second piece of apple away before handing over the goods, while the first never gave freebies. So, once again, the outcomes were identical. In this case, however, the monkeys preferred the first salesman even more strongly than in the second regime.

What the responses to the second and third regimes seem to have in common is a preference for avoiding apparent loss, even though that loss does not, in strictly economic terms, exist. That such behaviour occurs in two primates suggests a common evolutionary origin. It must, therefore, have an adaptive explanation.

What that explanation is has yet to be worked out. One possibility is that in nature, with a food supply that is often barely adequate, losses that lead to the pangs of hunger are felt more keenly than gains that lead to the comfort of satiety. Agriculture has changed that calculus, but people still have the attitudes of the hunter-gatherer wired into them. Economists take note.

Source: The Economist, *June 23, 2005*

Issues

This ingenious experimental study illustrates three particularly important aspects of behavioral economics:

1 *Methods*
The experimental approach, traditionally followed by psychologists, is used here, in order to achieve a degree of control that would be impossible to gain through mere observation. Three different trading regimes are used in order to compare responses and test the basic hypothesis of loss-aversion. Note the use of deception, although it is unlikely in this case to cause a general increase in cynicism among the population of capuchin monkeys available as subjects.

2 *Evolutionary psychology*
The purpose of the experiment is not just to test whether capuchin monkeys have loss-aversion, but more importantly to test whether the widely-observed loss-aversion in humans is likely to have an evolutionary explanation. The fact that loss-aversion has been observed in many different countries and societies constitutes evidence of an evolutionary origin, but the observation of the same characteristic in a fairly closely related species is even stronger evidence. This is a typical type of experiment carried out by evolutionary psychologists to test their hypotheses. It is also notable that the issue regarding why loss-aversion should be an evolved psychological mechanism or adaptation is also raised. This issue will be discussed in more detail in Chapter 5 on prospect theory.

3 *Rationality*
We have seen that the concept of rationality is a highly ambiguous term, which can be used in many different senses. However, in the current context, a 'rational' individual behaving according to the standard model should have no preference between the two 'salesmen' in the second and third trading regimes, since the outcomes from each are ultimately identical. The 'irrationality' observed in the monkeys is explained by the concept of loss-aversion, an important aspect of prospect theory. Thus behavioral economics is better able to explain the behavior observed in the experiment.

Case 1.3 Altruism·

The joy of giving

Donating to charity rewards the brain

Providing for relatives comes more naturally than reaching out to strangers. Nevertheless, it may be worth being kind to people outside the family as the favour might be reciprocated in future. But when it comes to anonymous benevolence, directed to causes that, unlike people, can give nothing in return, what could motivate a donor? The answer, according to neuroscience, is that it feels good.

Researchers at the National Institute of Neurological Disorders and Stroke in Bethesda, Maryland, wanted to find the neural basis for unselfish acts. They decided to peek into the brains of 19 volunteers who were choosing whether to give money to charity, or keep it for themselves. To do so, they used a standard technique called functional magnetic resonance imaging, which can map the activity of the various parts of the brain. The results were reported in this week's *Proceedings of the National Academy of Sciences*.

The subjects of the study were each given $128 and told that they could donate anonymously to any of a range of potentially controversial charities. These embraced a wide range of causes, including support for abortion, euthanasia and sex equality, and opposition to the death penalty, nuclear power and war. The experiment was set up so that the volunteers could choose to accept or reject choices such as: to give away money that cost them nothing; to give money that was subtracted from their pots; to oppose donation but not be penalised for it; or to oppose donation and have money taken from them. The instances where money was to be taken away were defined as "costly". Such occasions set up a conflict between each volunteer's motivation to reward themselves by keeping the money and the desire to donate to or oppose a cause they felt strongly about.

Faced with such dilemmas in the minds of their subjects, the researchers were able to examine what went on inside each person's head as they made decisions based

on moral beliefs. They found that the part of the brain that was active when a person donated happened to be the brain's reward centre – the mesolimbic pathway, to give it its proper name – responsible for doling out the dopamine-mediated euphoria associated with sex, money, food and drugs. Thus the warm glow that accompanies charitable giving has a physiological basis.

But it seems there is more to altruism. Donating also engaged the part of the brain that plays a role in the bonding behaviour between mother and child, and in romantic love. This involves oxytocin, a hormone that increases trust and co-operation. When subjects opposed a cause, the part of the brain right next to it was active. This area is thought to be responsible for decisions involving punishment. And a third part of the brain, an area called the anterior prefrontal cortex – which lies just behind the forehead, evolved relatively recently and is thought to be unique to humans – was involved in the complex, costly decisions when self-interest and moral beliefs were in conflict. Giving may make all sorts of animals feel good, but grappling with this particular sort of dilemma would appear to rely on a uniquely human part of the brain.

Source: The Economist, *October 12, 2006*

Issues

1 *The nature of economic behavior*
Economic behavior is not just about monetary transactions. 'Altruistic' acts and spiteful acts also are relevant. We need to understand the basis of such acts in order to explain and predict human behavior in a wide variety of different situations, such as donating to charity, labor strikes, lending the neighbor one's car and remonstrating with people who litter the streets.

2 *Fairness and social preferences*
This aspect is closely related to the first one. We need to understand the importance of inequality aversion, the perceived kindness of others, reciprocity and the intentions of others if we are to predict behavior in social situations when strategic interaction is important. This area is covered in Chapter 10.

3 *The role of neuroscience*
The study described above demonstrates clearly how useful neuroscience can be in explaining behavior that cannot easily be explained by the standard economic model. In particular it shows that 'self-interest' needs to be understood in a broad context. Charitable acts are thus self-interested acts because they make us feel good, contrary to the common narrow understanding of self-interested acts. It is important to realize that only by performing neuroscientific studies involving techniques like functional magnetic resonance imaging (fMRI) can we establish firm evidence regarding the real motivations behind 'altruistic' and spiteful acts, since people often deny these motivations, and even 'honest' introspection may not reveal them. This aspect is discussed in more detail in the next chapter and also in the concluding chapter.