

Genes and Decisions under Uncertainty

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When Jane Doe makes an investment decision, she can't possibly know all the facts. Neither can John Doe or his brother, Joe. It doesn't matter whether one or more is a super charged analyst, CEO, or running a hedge fund. She or he just doesn't have all the facts. Think Enron. This is decision making under uncertainty.

Though Jane, John, and Joe can't be familiar with the unknown, which is specific external information unavailable to them, scientists are working on something more personal. It is understanding how the brain makes complex decisions under uncertainty. If this is understood, it could help investors manage themselves so that they would have better decision making skills, even if information about external factors continues to be out of their reach.

A group of researchers at the Institute of Cognitive Neuroscience, University College London recently published work that is relevant to this approach. It suggests our genetic makeup predisposes us to one decision over another under uncertainty. Jonathan P. Roiser was the lead author. The paper, "[A Genetically Mediated Bias in Decision Making Driven by Failure of Amygdala Control](#)" was published in the May issue of *The Journal of Neuroscience*.

The London group worked with 30 healthy volunteers who had variants of a serotonin transporter gene which was previously shown to affect the response of the amygdala, an area in the brain that processes emotion. The subjects carried either a recognizable pair of short or long variants of this gene involved in the recycling of serotonin. There were eight males in the latter group and nine in the first.

The participants were tested by giving the subjects the same gambling question, which was framed in two different ways. Framing refers to the manner in which the problem is presented. It can affect outcome. For example, if I offer a computer for one dollar a day for 600 days, the purchaser is more likely to buy it than if I make the same offer by saying, "the computer is 600 dollars now and will last 600 days". The earlier scenario is the 'gain frame' and the latter is the 'loss frame'.

In the study, the volunteers were given fifty pounds and offered two alternatives. One was to maintain twenty of the fifty pounds ('gain frame'). The other was to gamble with a 40% chance of keeping the money and a

60% chance of losing everything ('loss frame'). In another session, the first alternative was changed into a 'loss frame' by stating that thirty of the fifty pounds would be lost if that option was chosen. The second choice was the same.

Though the first alternative yielded the same results during both tests, the framing differed. As a result, the participants were more likely to gamble (second alternative) if the first option was framed as a loss. Additionally, those volunteers with the short variants of the serotonin transporter gene were more disposed to this framing effect. They also had greater amygdala activity when making decisions influenced by framing.

In contrast to this, those volunteers less affected by framing with the long variant, had more interaction between the amygdala and the prefrontal cortex than the short variant group. One interpretation of this is that the long variant might regulate involuntary emotional responses driven by the amygdala, which lessens vulnerability to framing. The final conclusion of the authors: "These data suggest that genetically mediated differences in prefrontal-amygdala interactions underpin inter-individual differences in economic decision making." Dr. Roiser wrote in a recent E-mail to me, "Few behavioral genetics studies have taken this approach - i.e. first finding out the effect of a gene on functional neuroanatomy and then explaining/predicting some different behavior on that basis."

This work is significant to investors in several ways. One is that it suggests there is genetic modulation of our decisions. Second, if in real life, this influences our decisions (and it almost certainly does), investor awareness could only benefit financial choices. This is because cognizance of a pattern, whether generated from a genetic source or experience, can lead to attenuation of those that are not beneficial and accentuation of those that are helpful. This could only mean that better financial decisions are made under uncertainty.