Why Do We Make Bad Stock Decisions?

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"You've got to know when to hold 'em, know when to fold 'em," sang Kenny Rogers in his famous tune "The Gambler." But the fact is that most people don't do this particularly well, especially when it comes to the stock market.

Generally, investors tend to hold onto losing stocks for too long and sell winning stocks too soon. Behavioral economists have a term for this: the "disposition effect." If we acted logically instead of being fallible humans, we would sell our failing stocks to prevent further losses and hold onto rising stocks in order to increase our gains. Other apparently irrational behaviors can be witnessed on the trading floor: one is "irrational exuberance," a phrase made famous by former Federal Reserve Board chairman Alan Greenspan during the 1990s dot-com bubble. And a bubble, of course, can lead to a crash.

CalTech behavioral economist and MacArthur Fellow Colin Camerer is trying to figure out what causes these puzzling and sometimes self-defeating behaviors. He is a pioneer in the fledgling field of decision neuroscience, and specifically neurofinance, whose practitioners use sophisticated brain imaging techniques to trace why individual investors make the choices they do. Researchers are also trying to shed more light on how markets function overall. A Wharton Neuroscience Initiative (WiN) Fellow, Camerer spoke recently at Wharton's Rodney L. White Center for Financial Research Conference on Financial Decisions and Asset Markets.

"Highly exploratory and extremely radical," was how Camerer characterized his lab's research. He added, "We have our fans and our foes."

Replicating Wall Street in the Laboratory

Decision neuroscience lies at the crossroads of traditional neuroscience and decision sciences including psychology, economics and statistics. Camerer highlighted differences between his research and a neuroscientist's. He said that of the approximately 30,000 neuroscientists who attend the Society for Neuroscience annual meeting, "95% of them don't study humans, because humans are too complicated." Instead, to unlock the mysteries of, say, sleep or genetics, they turn to simpler animals such as zebrafish larvae or fruit flies.

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Even neuroscientists who do focus on humans typically don't study collective activity, Camerer said, "which is clearly what we're interested in." In Camerer's case, that collective activity is the financial markets.

In his research, Camerer tries to replicate trading floor phenomena. He looks at how people value immediate and future rewards and costs, and how they anticipate what others will do when money is at stake. His research group uses techniques such as functional magnetic resonance imaging (fMRI), which measures changes associated with blood flow. It reveals what parts of the brain are involved in processing different tasks and experiences.

Camerer presented studies in which he monitored several dozen CalTech undergraduates' brain activity with fMRI while they made trading decisions. In one, the students were presented with three artificial stocks — A, B,

and C — and a pile of experimental "cash." At the outset, participants had to buy one of the three shares out of their cash. At any given time, they could hold only one share.

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"This is a very minimal design; it's not meant to be lifelike," noted Camerer. He compared it to a "sketch" that uses the least amount of ink, yielding something that captures essential properties.

The three stocks were designed to move independently of each other, and in each trial of the experiment the students were shown a price update about how they rose or fell. A few seconds later they were given a chance to trade their stock for a different one or hold on to it. Camerer and colleagues looked at how the brain reacted to news about earnings, and how brain activity reflected the basis for making decisions.

They found evidence of the aforementioned disposition effect in action: "Most of these subjects — these brilliant whiz kids — actually did sell more winners than losers." He noted that only three or four of the participants were even "within spitting distance" of what would have been the logical path to realizing the greatest gains.

He also witnessed a behavioral phenomenon known as the regret-repurchase effect. Basically, investors are more likely to re-buy a stock if they previously made money on selling it and can buy it again at a lower price. They're less likely to re-buy a stock that they sold for a loss. Researchers theorize that investors — like the rest of us — tend to want to repeat actions they associate with feeling good and avoid ones that make them remember feeling bad.

"You sold [stock X] here," Camerer said, pointing to one of his charts, "and it keeps going up. Do you want to buy it?" The answer should be yes, he said, because what you should care about is the expected future path. But because of regret-repurchase effects, said Camerer, your unconscious mind resists: "'Wait a minute, I sold it too early and if I buy it now, it's like announcing to myself that I made a mistake.'"

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Looking at the fMRI scans, Camerer detected negative reactions when subjects saw that a stock they had previously sold went up. "It's the brain's way of saying, I sold 'A' and now it went up again: Oh no, that's really, really bad for my portfolio." But it actually has no implications for your portfolio, he said; it's just bad for your ego. You could draw analogies to personal relationships, "like getting a wedding invitation in the mail for your ex."

In another, more complex experiment, Camerer explored bubble-related behavior, or irrational exuberance, in which stocks become overvalued. This time he allowed the test market prices to emerge from collective activity by the participants themselves. Afterwards, he separated participants into categories of high, medium and low earners based on their stock gains, and correlated the findings to brain activity.

Fear and Greed, Visualized

The fMRI scans showed that a brain area known as the insula cortex was very active during the experiments. Camerer noted that neuroscientists have already established this region as one that deals with financial uncertainty, as well as with — interestingly — negative body sensations like being afraid of getting a shock, or of a loved one experiencing pain.

But the level of activity wasn't equal across all participants. Camerer said the high earners in the experiment — the most successful "traders" — showed greater activity in the insula cortex than other individuals. He proposed that this area may contain "a kind of warning signal" that helps some investors successfully sell ahead of a crash. "We think that what's going on is — it could be luck or it could be skill — but some traders have an insula signal that is telling them, 'I'm not sure what's going to happen with this market; I'm worried about the future.'"

A second brain area lit up frequently the scans. This was the nucleus accumbens, which Camerer explained is known to respond to reward and reinforcement. Food, drink, addictive drugs, sex and exercise all stimulate the nucleus accumbens. Camerer found that this brain area was more strongly associated with the traders who ended up with the lowest gains. In the experiment, "they don't buy at all [at first] … they wait way too long and then they keep buying and buying and buying," which did not turn out to be a successful approach.

Speaking about his research at a recent American Finance Association meeting, Camerer drew a connection between his findings and a quotation from business magnate Warren Buffett about investing: "Be fearful when others are greedy, and greedy when others are fearful."

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"When Warren Buffet said, "'Be fearful when others are greedy'… I wouldn't call it fear, I'd call it something like discomfort or uncertainty… but what happens is that people who have this fear signal in the insula [cortex] are selling at the right time." He added that the individuals they're essentially selling *to* are the "people having a kind of greed, or [nucleus] accumbens signal." He concluded that traders who are more sensitive to the insula in selling will tend to earn more money.

Camerer pointed out that many financial experts besides Buffett often use emotion-related and body-oriented phrases when they talk about stock trading: "euphoria," "panic," "deep down, people know…," "people are uncomfortable with this fact…," "a morbid fear of recessions." He said that in the world of neurofinance research, language like this is taken seriously, not dismissed as simple metaphors. "We're trying to take these words and *see* them."

An audience member at the AFA meeting asked Camerer if his findings could be applied to actual stock trading in real time. Theoretically, could traders choose to alter their brains — chemically or even surgically — to suppress areas that interfere with optimal trading and enhance others?

Camerer emphasized that the research was still in the very early stages. "There [would be] years of carefully working through it [before] I would tell anything to a firm," he said. The next step would be to perform causal experiments, meaning to not just passively measure, but actually stimulate, different parts of the brain to see how trading decisions were affected. "If we think that more nucleus accumbens activity would generate more bubble buying … we're going to be able to make bubbles that way. Or we will be able to crash bubbles with insula activity."

But he suggested that in the future, traders might be able to monitor their own brain activity to gain an edge. This wouldn't necessarily entail being encased in an fMRI machine all day. While he referred to fMRI as the deepest level of observing these brain reactions, he speculated that one could probably get "pretty good signals" by monitoring things like skin conductance, pupil dilation or facial expressions.

"Maybe Apple will someday have a wearable sensor or something like that," said Camerer, tapping his wrist. Traders might be able to find out what their brains were up to, and act — or not act — accordingly.

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