



11/15/02

SCIENCE JOURNAL

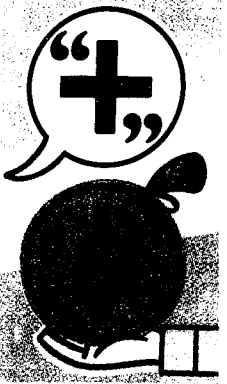
By SHARON BEGLEY WSTJ

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This Is Your Brain. This Is Your Brain On a Surging Stock

AT A BRAIN-IMAGING center in Massachusetts, a team of scientists that includes one of this year's Nobel laureates in economics makes functional magnetic resonance imaging scans of volunteers' brains. When people anticipate monetary rewards, the fMRI shows, the circuits that switch on are the very ones that go wild when you anticipate a delectable chocolate truffle, sex or (in the case of addicts) cocaine.

At a lab in Virginia, researchers measure brain activity in subjects who cooperate to maximize financial gain. By comparing it with the activity in people who take the money and run—but wind up with less dough—the scientists are unearthing the neuronal basis for the fundamental trust that underlies financial transactions.



David Bamundo

Welcome to neuroeconomics. Although still in its infancy (with fewer than 50 researchers in the world), this marriage of brain science and economics recently held its first conference (last month at the University of Minnesota in Minneapolis), will see its first book (in January, by neurobiologist Paul Glimcher of New York University) and now has its first full-fledged labs, including Prof. Glimcher's and economist Paul Zak's at Claremont Graduate University in Claremont, Calif.

EVEN IF ALL this activity doesn't yield a this-is-your-brain-on-derivatives discovery tomorrow, its premise is intriguing. This year's economics Nobelists recognized that economic decisions, like all others, reflect brain activity. Vernon Smith pioneered experimental economics, which examines the choices people make in a lab setting; Daniel Kahneman helped create behavioral economics, which probes the psychology behind those decisions.

Just as mainstream psychology started looking for brain-based explanations of behavior, so economics is now smitten with synapses. "To understand economic decisions," says Prof. Zak, "you need to understand the brain."

Take the question of why investors punish once favored stocks out of all proportion to bad news. The brain seizes on even the slimmest evidence of a pattern. After only a couple of repetitions of some event, the anterior cingulate begins to fire in anticipation of another: As a result, we're convinced that a stock that beat profit forecasts two quarters in a row will do it a third time.

And if it doesn't? Then neurons in emotion-processing regions fire like crazy, generating a sense of anxiety and dread, researchers at Duke University in Durham, N.C., report. Result: When a nice, reliable stock misses its earnings target by even a little, investors abandon ship in a fury. Often, the longer a stock has held up, the worse the beating, because the longer a pattern has persisted the more alarmed the brain gets when it's broken.

Not surprisingly, the same brain system that responds to sensory rewards also perks up at the prospect of monetary ones. The reward circuit runs on the neurochemical dopamine. We get a dopamine surge when we anticipate a nice, healthy 4% return on a money-market fund. But dopamine neurons get extra juiced when a long shot comes in—and the addictive nature of dopamine makes us willing to take financial risks for those long shots. We whip out our checkbooks for managed mutual funds even though, historically, few beat the indexes.

ONE PROMISE OF neuroeconomics is revealing the basis for "irrational" financial behavior. Econ 101 says it is irrational to trust others, for instance, since they could swindle you. Why, then, does anyone trust anyone?

To find out, researchers ran an experiment in which they created a two-person game. To start, player 1 got \$10. If that player kept the money, player 2 also got \$10 and the game ended. But if player 1 chose to let player 2 take a turn, then player 2 faced a choice: take home \$40 and leave nothing for player 1, or take \$25 and leave \$15 for player 1.

About half the time, finds economist Kevin McCabe and colleagues at George Mason University in Fairfax, Va., player 1 chooses to let player 2 into the game, forgoing a sure \$10. In response, nearly three-quarters of the player 2s give up the \$40, rewarding player 1's trust by splitting the money \$25 to \$15.

The fMRI scans show that trust is marked by high activity in two brain regions, the researchers reported. Area 10 seems to be involved in delaying gratification, which tends to increase one's final reward. Area 8 figures out what other minds are thinking, in this case registering that the other player is trying to maximize gain through reciprocity. Some people, at least, seem wired to delay gratification and act in a mutually beneficial way.

Neuroeconomists have also looked at brain activity during an extended (simulated) financial losing streak. A string of losses ramps up activity in brain regions that process emotional memories, swamping mere reason. That may partly explain why markets tend to linger near lows.

Neuroeconomics represents one step toward what biologist E.O. Wilson called "consilience" in his 1998 book by that name: explaining economics by psychology, psychology by neurobiology, neurobiology by chemistry ... until physics explains everything. That may be a simplistic, impossible dream. Still, an infusion of real science may be just what the dismal science needs.