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We Asked a Neuroscientist How Bitcoin's Highs and Lows Affect the Brain

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The price of a bitcoin is a fickle thing. Two years ago this week, Bitcoin reached its highest price ever (<http://www.forbes.com/sites/kitco/news/2013/12/10/2013-year-of-the-bitcoin/>): \$1,242 for a single coin in US dollars, up from \$12 at the beginning of 2013. Almost immediately after

that peak, the price began to sink, and today the virtual currency still hasn't regained its former glory. The price of a bitcoin simply continues to bob up and down, from around \$200 to just above \$400 this year alone.

Every dip in price elicits a state of emergency

(https://www.reddit.com/r/Bitcoin/comments/3hiwam/everybody_settle_down_the_price_crash from some corners of the community, and the slightest rally has people losing their ever-loving shit (<https://www.reddit.com/r/Bitcoin/comments/2m2xxk/400/>). But for all the volatility, a concise explanation for Bitcoin's price changes hasn't been found. Is it shadowy Chinese ponzi schemes (<http://www.ft.com/intl/cms/s/2/ee93bc2e-82f6-11e5-8095-ed1a37d1e096.html>)? Investor-driven speculation (<http://www.forbes.com/sites/kenrapoza/2013/12/04/the-bitcoin-bubble/>)? Intentional market manipulation (<https://willyreport.wordpress.com/2014/05/25/the-willy-report-proof-of-massive-fraudulent-trading-activity-at-mt-gox-and-how-it-has-affected-the-price-of-bitcoin/>)? Maybe Bitcoin really is the future after all?

The answer, it turns out, could be in our heads, because for every change in Bitcoin price, there are neurons that light up like a Christmas tree in response.

"It's all in the brain"

Researchers have done plenty of work (<http://www.pnas.org/content/105/16/6167.full.pdf?sid=923de3de-1794-448b-be58-5019925c299b>) analyzing the effects of changes in the stock market on the human brain, and vice-versa (<http://www.ncbi.nlm.nih.gov/pubmed/25002476>). The stock market's behaviour is ultimately the result of the collective decision-making of many people, after all (less so today now that high-frequency trading algorithms (<http://www.bloombergvew.com/articles/2015-10-30/money-managers-take-on-the-high-speed-traders>) are popular), and decisions are physiological things; they happen in the brain. And just like the price of a stock, Bitcoin price is largely a function of the decisions people make.

“It’s all in the brain, and looking at specific regions that we know are carrying information about risk and reward is kind of like eavesdropping,” said Dr. Gregory Berns (<http://www.ccnl.emory.edu/greg/>), a neuroeconomist and director of the Center for Neuropolicy (<http://neuropolicy.emory.edu/>) at Emory University. “If one area seems to be the one that collects all the information from other brain systems, if you will, and integrates it, then it represents an overall barometer for that person at that point in time as to what their expectation is. So, we can listen to that and tease out what they’re likely to do next.”

According to Berns, *information* and *expectation* are the key things to consider when teasing out how firing neurons direct the market. Information guides your expectations, and depending on what your expectation is—whether Bitcoin is about to skyrocket or crash, say—a region in the brain called the striatum (<https://en.wikipedia.org/wiki/Striatum>) will react differently. The striatum is closely associated with decision-making, and has the densest collection of dopamine receptors in the brain, Berns said.

This neuroscience might, at least in part, explain some of Bitcoin’s notorious highs and lows. Bitcoin still maintains a relatively small community of human users, at least compared to real-world stock markets. And while automated trading bots for Bitcoin certainly do exist—and according to Andrew Barisser, a developer at Bitcoin company Assembly (<http://assembly.com/>) who made his own trading bot earlier this year, some exchanges are “rife” with them—their widespread use in Bitcoin is nowhere nearly as well-documented as in the stock market.

Watch more from Motherboard: Life Inside a Chinese Bitcoin Mine

“The smaller the market, and anything with a greater role for human decision-making, is where you’d see greater benefit for understanding the physiology,” Berns said.

“With Bitcoin, information is more scarce, in that each little bit of information that comes out has a potentially big effect on people’s valuation of that thing,” Berns explained, “because of its history, and its past swings, people gravitate toward and grab onto any information they can, true or not.”

With every bit of news about new investors in Bitcoin, or perhaps the latest potential market scam (<http://motherboard.vice.com/read/yet-another-sketchy-bitcoin-exchange-implodes>) or hack (<http://motherboard.vice.com/read/mt-gox-allegedly-hacked-this-could-be-the-end-of-bitcoin->), the striatum of a bitcoin trader lights up with activity, and if they’re expecting something positive, dopamine is released. En masse, this big dopamine rush can look like a price rally.

But again, the key word here is *expectation*—positive or negative information can have paradoxical effects in the brain, based on the person. If something ostensibly bad happens in Bitcoin—the bottom falls out of the price, for example—then someone’s brain may actually

respond as if that were a positive thing. What goes down must come up, and all that. It doesn't make much sense, but then again, neither do people or their brains (<http://motherboard.vice.com/read/are-our-brains-computers>).

"It's illogical," Berns said, "but then again people aren't exactly logical when it comes to money."

Or Bitcoin.

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