

Money on Your Mind: The Brain's Role in Financial Decision-Making

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Since Daniel Kahneman and Amos Tversky won the Nobel Prize for their work in behavioral finance in 2002, the literature exploring the reasons that investors make irrational financial decisions has grown exponentially in depth and breadth. Most financial planners are familiar with concepts such as the herd mentality, overconfidence, and loss aversion. But some of the financial misadventures we see among clients go even deeper than these social and behavioral bad habits. Indeed, as we learn more about the brain, we come to new understandings about why people make the irrational financial decisions that they do.

In the wake of the financial downturn, financial planners have no shortage of stories about the kinds of decisions clients make under stress, but let's take a look at one such story and explore cognitive and behavioral hard-wiring at work, not only in our clients' minds, but also in our own.

A Case Study

John Sanders woke up in a sweat after a restless night tossing and turning. It was

Executive Summary

- The sophistication of modern civilization masks the fact that our brains have evolved little since the Stone Age. The neural programming of human beings was optimized for physical survival, not contemporary challenges such as financial decision-making.
- The human brain has separate, dedicated centers for coping with situations that present imminent danger or attractive rewards. When triggered by highly stimulating personal or financial events, these centers can cause the brain to react reflexively, dampening our ability to think analytically.
- Similarly, our predisposition to look for patterns in events works against us when making decisions about situations that are fundamentally random and unpredictable, such as market volatility and a financial downturn.
- Technology gives us ready access to our credit, savings, and investment accounts.

Unfortunately, this access makes it easier for people to act upon impulsive financial decisions.

- This paper examines a case study to demonstrate how perceived financial dangers or rewards can unconsciously trigger emotions that override our rational decision-making. In this example, an investor reacts to a sudden market downturn by selling his investments at a depressed price, thereby missing out on market recovery and locking in his losses.
- Recent neuroscience research shows that, with practice and intensified focus on our underlying values, we can retrain our brains to respond to financial situations more rationally. Financial planners also can help their clients develop new methods to react to financial situations in a more analytical manner that is consistent with the clients' primary values.

the morning of October 10, 2008, one day after the Dow Jones Industrial Average tumbled nearly 680 points. It was one of the largest single-day point losses ever, wiping out hundreds of billions of dollars in market value. The credit markets were frozen and the United States House of Representatives had created a crisis of confidence by voting down a \$700 billion bank bailout plan.

John and his wife Susi were in their

mid-50s and hoping to retire in about five years. The previous night before dinner, John had gone on Morningstar's Web site to survey the damage to their retirement accounts. Looking at a sea of ugly red arrows, John felt his heart pounding. His hands were shaking. He could barely sit still on his home office desk chair. Susi called him for dinner, but there was no chance he could swallow even a bite. "We can't afford to lose any more money than

we already have this month,” John decided. He clicked over to his retirement funds company, and transferred all his equity mutual funds into his linked money market account.

During the next few days the market rebounded. On October 13, the market rose 936 points—the largest single point gain in history—closing at 9,389.61. Driven by excitement, John made another quick decision, and bought back in to the funds he had abandoned only three days earlier, thereby locking in nearly \$100,000 in equity losses. The market rebound was short-lived, and by March 9, 2009, the DJIA had fallen to 6,547.05, down more than 25 percent from the beginning of that year. If John had either stayed in the market and never sold or stayed out of the market once he sold, his investment value would have been higher than it was by March 9, 2009.

As financial planners, we know some things about where John went wrong, but let’s take a look at the big picture. He reacted to the stock market dive as if it were a matter of life or death. He made several quick decisions driven by fear and greed. If a car had been about to crash through his home office wall on October 9, 2009, John’s quick reflexes could have saved the day. But as unpleasant as the decline in the stock market was, it wasn’t an emergency. In fact, the U.S. markets were, as always, closed for the night, and nothing more awful was going to happen before they reopened the following morning. John had plenty of time to think through what he should do about the sorry state of the stock market. And since he and Susi weren’t planning to retire for at least five years, nothing in their current life was in jeopardy because of the stock market’s performance during the previous days and weeks. But none of that reasoning made it into John’s thought process, because John, like all of us, was hampered by a Stone Age brain. John’s brain, like ours and our clients’, is well-equipped to handle physical survival, but pitifully unprepared to deal with the challenges of today’s complex financial environment.

Your Stone Age Brain

In the last 30 years or so, new technologies have revolutionized the way we live our lives. High-tech tools have profoundly affected the way we interact with money: We get cash from the ATM, make purchases with credit cards, pay our bills online, and check the latest stock prices on our smartphones. But all this technological sophistication is masking two dangers. One, technology makes it easier for us to spend money impulsively. Money is available 24/7. Credit cards let us buy things even if we can’t really afford them. Easy access to money, coupled with a culture that prizes material possessions, has created an epidemic of thoughtless and often catastrophic overspending across all socioeconomic groups.

Another danger is that our current social climate of continuous technological advances creates the illusion that we humans are more advanced and sophisticated than we really are. It’s true that *Homo sapiens* are great at making new tools. But when it comes to decision-making, we’re relying on an old-model brain. Our brains were optimized to handle the challenges of life 10,000 years ago. Our brains are still evolving, but they can’t begin to keep pace with the societal, cultural, and economic changes of the last 100 centuries, let alone the last 100 years.

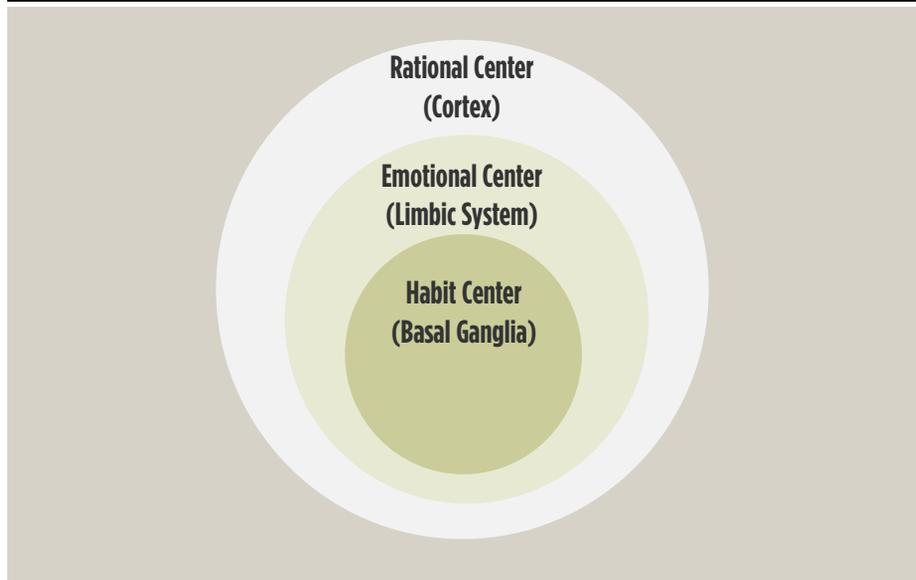
While the brain inside your head is only as old as you are, its structure and circuitry date back to prehistoric times. Scientists who study human evolution say that the human brain, which grew and changed dramatically over the course of millions of years, has not significantly changed in size, weight, or organization in the last 50,000 years. From that, we can suppose that our brains were ideally suited to dealing with the demands of the environment at least 50,000 years ago. If we knew what life was like for people who lived that long ago, we could understand what kinds of situations our brains are equipped to handle. Unfortunately, we don’t really know anything about people’s lives that far back in time.

But, thanks to the work of archeologists and paleontologists, we do have a picture of what humans faced 10 to 20 thousand years ago.

Around 10,000 BCE, humans were *hunter-gatherers*, that is, they found food either by hunting for wild animals or by gathering edible plants and flowers. It took about another thousand years or so for humans to figure out how to grow food by cultivating land and planting seeds. (And it took another 10,000 years to come up with supermarkets and Starbucks!) Humans who lived 10,000 years ago developed specialized stone tools (hence the term “Stone Age”) to help them build shelters and acquire food. They lived in small groups, often in dwellings constructed of stone and roofed with animal skins. They moved around a lot, most likely to find fresh sources of food. Stone Age humans’ major challenges happened in the physical world: How to avoid getting eaten by a woolly mammoth, how to figure out whether a plant was edible, or how to protect their families from the elements or from unfriendly tribes out to steal their supplies. Their brains were wired to help our species survive, not make complicated investment decisions. As Richard Peterson, noted psychiatrist, hedge fund manager, and author of *Inside the Investor’s Brain: The Power of Mind Over Money*, explains:

If you’re a tribesman in the Serengeti region of Tanzania, Africa, and you come across a mango tree, you want to get as many mangoes off that tree as you can before a lion shows up. In that scenario, greed and fear are good. Those emotions are essential to survival. Really extreme emotions keep you alive. The trouble is, when it comes to financial matters, there’s nothing like the mango tree. The stock market isn’t a mango tree full of mangoes. It’s a completely different and unpredictable entity. But we deal with it as though it was that mango tree.

While our neural programming is brilliantly organized to help us meet

Figure 1: A Simplified Model of the Brain

physical challenges, it's not built to handle contemporary challenges such as financial decision-making.¹

Brainology 101

To understand how we and our clients make financial decisions, or decisions of any kind, we first need to understand how our brains operate. The brain is divided into three major sections. In the outer layer is the brain's rational center, which handles complicated cognitive processes, such as objective thinking and rational decision-making. The brain's rational center is largely composed of an anatomical section of the brain called the cerebral cortex. In the middle layer of the brain is its emotional center, which processes emotions, motivations, and drives. The major anatomical component of the brain's emotional center is called the limbic system. Within the limbic system is the amygdala, which translates outside stimulation into specific emotions such as fear or excitement. The inner part of the brain, the habit center, processes everything we do automatically without thinking. It includes not only habits, but also basic body functions such as breathing, circulation, move-

ment, and sensation. The most significant anatomical part of the habit center related to financial decision-making is the basal ganglia, which automatically seek out anything we recognize as rewarding, thus leading to the formation of habits. These three parts of the brain—the rational center, the emotional center, and the habit center—work together. They are connected to one another by neural circuits, that is, pathways that use special chemicals to send information back and forth among different parts of the brain.²

Here's an example of how the three parts of the brain are connected: Imagine you hear a rumor that almost all the jobs in your department at work will be eliminated. Within 12 milliseconds, what you heard activates the part of your brain that processes emotions and you feel frightened and anxious. Your emotional brain immediately sends a chemical message to your inner brain, which cues your heart to start beating faster and your breathing to become shallower. Meanwhile, it takes a sluggish 40 milliseconds for your outer analytical brain to get the message about the possible job eliminations—not nearly as quickly as your emotional brain. You try to figure out whether a job loss is

likely, given that your company's profits are trending lower. You decide that the rumor is probably true, so your anxiety level rises and your heart continues to beat rapidly. All of this has happened in a matter of seconds.

Now, suppose you heard about the rumor from someone who seems always to know what's going to happen. And suppose you've just made an offer on a new home. You start to panic. You're sure that you will lose your job. So you call your real estate agent and tell her that you must withdraw your offer. Three weeks later, instead of losing your job, you are offered a promotion. You now will earn several thousand dollars more per year than you had before. You call back your real estate agent and discover the home you dreamed of having has been sold to another buyer.

What happened to those connections between the three parts of your brain? Your emotions of fear and anxiety were so strong that they disabled the rational center of your brain. It's not that you *weren't* thinking at all, but that your strong feelings affected the *quality* of your thinking. The message that your brain's rational center received had already been "spun" by your brain's emotional center. What seems like a logical decision (I should withdraw my offer because I'm about to lose my job) is really pseudo-logic that justifies doing what you emotionally feel driven to do. Imagine what would have happened if you had made one call to someone in authority at your company, expressing your concern about a possible job loss. It's likely you would have been assured that not only were you in no danger of losing your job, but also that good news was on its way. The one phone call you *did* make—withdrawing your offer to buy a new home—turned out to be the wrong call.

Why did hearing the rumor about a possible layoff cause such a lapse in judgment? Because the triggering event—the rumor—was *emotionally stimulating*. While the potential of a layoff was no doubt disturbing, when paired with a decision to buy a new home, the potential job loss became

even more frightening. When we're in such an emotionally charged situation, our brains act *reflexively*: We do things automatically, without thinking clearly.

If our emotions are highly negative, they activate the brain's *loss avoidance* or *danger system*, a complex set of neural circuits that communicate across all three anatomical sections of the brain whenever we perceive threats or dangers in our environment.³ If our emotions are highly positive, they activate the brain's *reward system*, a collection of neural circuits running across the three divisions of the brain that scans our environment in search of things we want.⁴ When our reward system is activated (in the presence of highly positive emotions), it turns off our danger system. When our danger system is activated, it neutralizes our reward system. As far as our brains are concerned, there are no shades of gray: We are either excited and pursuing rewards, or we are fearful and trying to avoid danger. Perhaps you've had the experience of feeling so worried about something that it was impossible to enjoy a normally pleasurable event. That's because in the presence of either highly exciting or anxiety-producing financial situations, our rational brains are MIA. In the case of the layoff rumor, for instance, our anxiety and fear blocked our ability to make a rational decision to check out the accuracy of the rumor.

The Danger System

The danger system is the circuitry in the brain that gets activated when we feel threats to our survival. Neuroscientists have not yet definitively mapped the brain anatomy of the danger system. However, it is believed to largely involve structures in the limbic system, including the insula, which registers pain or disgust, the amygdala, which processes emotions, and the hippocampus, which processes long-term memory. The danger system also is thought to include the hypothalamus, which secretes hormones that send messages to other systems in our body, including the endocrine system. When our danger

system is activated, the whole body is involved. Our adrenal gland produces two chemicals: cortisol (often referred to as the stress hormone), and epinephrine (also known as adrenaline), which are secreted into the bloodstream, preparing our body to fight or flee the danger we are facing. Cortisol gives us the energy to deal with physical threat by increasing our blood pressure and blood sugar. Epinephrine prepares the body for action in emergency situations. It boosts the supply of oxygen and glucose to the brain and muscles, while suppressing non-emergency bodily processes. Some signs that your danger system is in charge: shaking, sweating, breathing quickly, or feeling panicky. But just because you don't feel any of those symptoms doesn't mean that your danger system isn't active.

The Reward System

The reward system is the set of circuits in the brain that helps us identify and acquire things we want. It is made up of a bundle of neurons in the midbrain that send projections throughout the prefrontal cortex, affecting the rational processing ability of the brain. The neurons in the reward system communicate primarily by releasing a chemical called dopamine. When we see something potentially desirable (chocolate, an attractive person, a higher-paying job) our reward system turns on, motivating us to want this thing that has come to our attention.⁵ What's interesting is how dopamine helps motivate us to go after what we want, by making us feel good. That's why dopamine is typically referred to as the pleasure chemical. Thanks to dopamine, we feel good when we anticipate getting what we want, and we feel good when we've gotten what we wanted.

Both reward and danger systems can be operating without our knowing it. That means we can be under the sway of emotions we're not consciously aware of, making decisions that we mistakenly think are objective. And, importantly, so can our clients.

Patterns in the Brain

When it comes to making decisions, there's a lot more to the brain than its reward and danger systems. Our brains also are wired to instantaneously detect patterns. This pattern-spotting skill has great value for our physical survival and well-being: A screech of brakes is often followed by a vehicle crash; overeating is often followed by indigestion; running a few miles may result in feeling calm and happy. Such patterns are real, and they help us predict the future. If A happens, then B will soon follow. Therefore, I can make a decision to seek out something that will probably result in a positive outcome, or I can decide to avoid something that usually would result in harm. Recognizing those patterns can thus help us more efficiently avoid danger or secure rewards. When I hear the screech of brakes, I immediately scope out the best way to avoid the source of the noise. Because I want to feel good, I lace up my running shoes every morning and head out for a jog, usually without even consciously thinking about why I am doing so. But, as neuroeconomist Scott Huettel points out, "... in our modern world, many events don't follow the natural physical laws that our brains evolved to interpret. The patterns our modern brains identify are often illusory, as when a gambler bets on 'hot' dice or an investor bets on a 'hot stock.'"⁶

This predisposition to see patterns works against us when we are looking at situations that are, in fact, random and unpredictable. Most financial phenomena are not governed by predictable patterns. If the stock market goes up, we think it will keep going up. If the housing market is hot, we assume that will continue. If we've gotten a raise every year, we expect to see an increase next year. When we read about a mutual fund that has outperformed the stock market three years in a row, we buy into the pattern and sign up—even though a purely logical assessment of the situation would tell us that there is no reason to believe that something will keep happening just because it has been happening. In fact, if the past is a predictor of the future, then what it really tells us is

that what goes up must come down, and vice versa. As Hersh Shefrin, behavioral finance pioneer and author of *Beyond Greed and Fear* points out, “Past performance is a great predictor of future expectations, not future performance.”⁷

The Neuroscience of Financial Decision-Making

John Sanders, whom we met at the beginning of this article, shows us how our brains’ wiring reacts when we’re in the throes of a highly charged financial situation. Given what was at stake for the Sanders—their post-retirement comfort and security—the quality of John’s decision-making was critical. Looking objectively at his situation, we realize that he had more than five minutes to make a significant decision about his retirement savings. But, because John is human, he was at the mercy of his brain’s default wiring. His brain, like ours, is programmed on one end to detect and avoid danger, and on the other end to perceive and pursue opportunity. To ensure our physical survival, our brains are hypersensitive to perceived threats. When sensing danger, the brain’s danger system activates. It immediately sets off a whole host of physiological changes that help us get away from the source of danger. Our danger system turns our analytical centers off, as if to say, “You don’t have time to figure out the nuances of this situation. Just get out of here!” It also turns off all nonessential bodily functions, including limiting blood flow to the hands and feet to minimize damage in case of injury. But even when we’re not in physical danger, such as during a stock market crisis, our automatic danger response still kicks in with a flood of emotions that are better suited for escaping from a bear than dealing with a bear market. When we really are in a dangerous, life-threatening situation, we need a quick response. It saves us. But stock market volatility, while often emotionally painful, is not life threatening. So sacrificing the accuracy of our rational brains for the speed of our emotional brains begins to work against us.

A historical point drop in the Dow Jones

Industrial Average will always get the attention of our brains’ danger system. And once our brains are triggered by a scary external event, our emotional brains take over. That was the case for John Sanders. John was hostage to his emotional brain. He experienced all the physiological symptoms of a life and death crisis. John jumped the gun. Within a few minutes he had taken an action to deal with his perceived emergency. Except he wasn’t in any immediate danger. He didn’t need to do anything on the night of October 9, 2008. He had hours. In fact, he had weeks, even months, to plan a thoughtful response to the realities of a challenging financial environment.

If John had possessed full access to his rational brain, he would have recognized that, logically, there was no reason why he couldn’t have enjoyed a tasty dinner and a restful night’s sleep after that difficult October day. It made no logical sense to bail out on a big market downturn and jump in on a big upswing. But, as financial planners, we recognize that John was stuck on emotional auto-pilot. His brain’s danger system was in charge one day, and his reward system was in charge a few days later. And when one system—either the danger system or the reward system—is operational, the other is disabled. In both cases, his brain’s limbic system (home of the emotional center) hijacked his prefrontal cortex (home of the rational center). What wasn’t affected was the part of his brain that houses automatic responses.⁸ So John’s default mechanism under pressure was to respond to highly charged situations as he had always dealt with them in the past, whether that made financial sense or not.

Can We Change Our Brains?

Given the way our ancient brains are wired, how can we possibly make smart financial decisions under duress or in the thrall of an exciting opportunity? Fortunately, we can change the way our brains respond to financial situations. Though we’re wired to behave in ways that can get

us into financial trouble, our brains also have the capacity to create response patterns and new habits. Recent neuroscience research has revealed that the brain is “plastic.” Neuroplasticity means that the brain can change. We can help our clients create new habits, so that when faced with challenging financial situations, they can respond in ways that are in their best long-term financial interest. With practice, we can undo their typical reactions to financial situations and establish new responses that activate the logical parts of their brains. And the first step to reprogramming their brains is to get in touch with the values they would like their financial decisions to reflect.



Endnotes

1. Richard Peterson, personal communication with Doug Lennick, April 28, 2008.
2. Adapted from Peterson, Richard L. 2007. *Inside the Investor’s Brain: The Power of Mind Over Money*. Hoboken, NJ: John Wiley & Sons. 23–25; and Zweig, Jason. 2007. *Your Money & Your Brain: How the New Science of Neuroeconomics Can Help Make You Rich*. New York: Simon & Schuster. 14–18.
3. Peterson, Richard L. 2007. *Inside the Investor’s Brain: The Power of Mind Over Money*. Hoboken, NJ: John Wiley & Sons. 25–26.
4. Ibid.
5. Antoine Bechara, quoted in Zweig, Jason. 2007. *Your Money and Your Brain*. New York: Simon & Schuster. 64.
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7. Shefrin, Hersh. 2002. *Beyond Greed and Fear: Understanding Behavioral Finance and the Psychology of Investing*. New York: Oxford University Press.
8. Jeffrey Schwartz, author of *The Mind and the Brain*, personal communication with Doug Lennick, March 9, 2009.