Inside the Investor's Brain

The Power of Mind Over Money

RICHARD L. PETERSON

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To Sarah.

Your grace, warmth, and ease light up my world.
You made this book possible.

Contents

Preface

This book isn't written for you. At least, it's not intended for the rational, *thinking* you who was thrown off by that last sentence. This book is for the parts of you that were perturbed, the feelings that you can't quite access. Those feelings arise from deep in your brain, and they're largely subconscious. To get to them, I have to go through you—you the reader.

And there's the catch. If thinking could make everyone a great investor, then there wouldn't be market bubbles and panics, poverty, addiction, or criminal greed. But we do have those problems—in part because the thinking brain evolved about 100,000 years ago, while the feeling brain is one of our most primitive endowments (something we share with our pets), and the two brains don't always get along. How to manage them both in the wild world of the financial markets is the subject of this book.

In the financial industry, most investment decision making follows a rational process until, often at crucial times, that process breaks down. Whether you're an individual investor, portfolio manager, financial adviser, trader, analyst, or member of an investment committee, odds are you've experienced the powerful effects of the psychological forces that move the markets. This book answers two questions for investors: What are the deep "irrational" forces driving investment behavior, and what can be done to better manage them?

GOOD INVESTING IS MORE THAN BOOK SMARTS

Good investing requires a basic financial education. That's the straightforward part. However, to really *excel* in investing, you've got to learn the skills to manage *yourself*. Book smarts aren't enough. You've got to understand both the terrain of the markets *and* the topography of your mind.

This book is intended for educated investors (individuals, portfolio managers, venture capitalists, and bankers), financial analysts (security research, fundamental and technical analysts), and traders. Readers of this

book will learn to identify subconscious mistakes (biases) in their financial decision making. Readers will develop an understanding of the brain origins of psychological biases, learn to recognize when they arise, and gain techniques for improving their financial judgment.

However, just because you *know* when you're likely to make a mistake doesn't mean you can stop yourself from doing it. Two methods are effective for learning to manage biases: personal experience and studying the examples of others. Gaining personal experience in the markets is costly. To enhance the study of others, this book contains examples of investors who have succumbed to biases, people who have overcome such mistakes, the decision-making tactics of great investors, and tips for creating an investment environment that supports effective decision making.

Much of the research on investor biases presented here is imported from the academic field of behavioral finance. Investigators in behavioral finance, in pioneering studies, have identified numerous systematic investing biases. Due to their origination in deep brain circuits, most biases influence investment decisions automatically and beneath awareness. When evidence from neuroscience, behavioral finance, and real-world practitioners is integrated, then a clearer picture of the fundamental issues and remedies is revealed.

ORGANIZATION OF THIS BOOK

Most chapters open with vignettes. Some are tragic, some uplifting, and some unusual. All are selected for the lessons they teach. The investors depicted in these stories are fabricated from my collective experiences with numerous individuals and through anecdotes I have heard from others. Any resemblance to real persons is completely coincidental.

In individual chapters, readers will learn to: (1) identify specific subconscious biases, (2) know when thinking and analysis will improve their investment process (and when it won't), (3) improve their emotional awareness, and (4) enhance the decision process.

One caveat: There is an emphasis on the neural origins of biases, yet few direct links between the brain and investment behavior have been proven. Nonetheless, this book attempts to simplify concepts and relationships as accurately as possible to make the discussion relevant to practitioners. In the introduction, the investment fallibility of Long-Term Capital Management, Sir Isaac Newton, and Samuel Clemens (Mark Twain) are used to illustrate some of the most basic and prevalent investor biases. Chapter 1 explains the challenges investors face in finding opportunities in a competitive marketplace, and it argues that the best remaining source of profits lies in understanding how other investors think. Chapter 2 educates the reader

about basic brain structure and briefly reviews the research tools used in experiments. Chapter 3 describes the roles of belief and expectation in shaping one's experience. Chapter 4 is a discussion of neurochemistry including the common medications and substances that alter neurochemical balance and influence financial decision making.

Part II describes how various emotions impact judgment. Chapter 5 demonstrates the tremendous value of intuition and "gut feel" in investment decisions. Chapter 6 explains how overt emotions such as fear, excitement, anger, and sadness bias financial judgment. Chapter 7 looks at the brain origins and pathological investment effects of excessive greed and excitement. Chapter 8 examines the dangers presented by overconfidence and the hubris that results from a series of successes. Chapter 9 describes how anxiety and fear affect investor decision making, while Chapter 10 is specifically about stress and burnout. Chapter 11 describes pathological gambling, which affects some day traders and institutional "rogue traders." Chapter 12 investigates the personality traits that contribute to investing excellence.

Part III is a review of the cognitive (thinking and perception) biases. While these biases are influenced by emotion, research has primarily focused on the mental mechanisms that underlie them. Chapter 13 briefly explains modern decision-making theory, and illustrates how information about outcome size, probability, and ambiguity biases choice. Chapter 14 investigates how the framing of a decision biases judgment. Chapter 15 explains loss aversion – which results in "holding losers too long" – both in amateur and professional investors. Chapter 16 is a discussion of how time perception, such as time discounting, generates investment biases. Chapter 17 is about the process of social influence and herding, and how it impacts investment decision making and investment committees. Chapter 18 explains the perceptual pitfalls that arise during chart reading and data mining. Chapter 19 is a discussion of biases in attention and memory that affect investors. Chapter 20 looks at investment risk taking from the perspective of the differing biology of women versus men and the aged versus the young. It also examines the (very limited) cultural differences between Eastern and Western investors.

Part IV presents techniques for managing biases. Chapter 21 summarizes the book's major conclusions and offers self-help exercises for reducing biases. Chapter 22 provides a more in-depth approach to emotion management in the markets. Chapter 23 teaches the reader how to incorporate "neural" insights into their investing strategy and explains how to identify and take advantage of collective biases in market prices.

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I wrote this book over several years. So many people influenced its production that I cannot possibly do justice to their contributions here. I am very appreciative of my family and friends, who provided their love and encouragement. Thanks especially to Sarah, my amazing wife, for her unflagging optimism and patience during the writing of the book. My gratitude is profound.

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Investing psychologists Frank Murtha, Doug Hirschhorn, Denise Shull, Flavia Cymbalista, Alden Cass, and Janice Dorn shared fascinating stories and insights from their practices. Performance psychologist and coach, Howard Fleischman, provided valuable advice during the preparation of the self-help chapters.

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And a final thank you to the investors who have shared their personal stories with me. They must remain nameless. Whether through their tragic disappointments or spectacular successes, they inspired my search for a road-map to the investor's mind. I hope that by sharing their stories, those who follow can avoid their dangerous financial wrong turns and model their high-performance secrets.

R.L.P.

About the Author

Richard L. Peterson is founder of Market Psychology Consulting, where he trains financial professionals for improved performance. Dr. Peterson has developed five psychological testing products including the "Money and Investing Personality Test." He is currently developing analytical market software and novel investment strategies for use in portfolio management.

Dr. Peterson received a BS in electrical engineering and a BA in Plan II Arts at the University of Texas in 1995. In 2000 he received a doctor of medicine degree from the University of Texas Medical Branch, with honors. He completed psychiatry residency training at San Mateo Medical Center in 2004, during which he was engaged in postdoctoral neuroscience research at Stanford University.

After completing his undergraduate studies, Dr. Peterson designed stock forecasting software and traded futures for an investment partnership. Thereafter, he investigated the role of emotions in financial decision making both during medical school and neuroimaging research at Stanford.

Dr. Peterson has published scientific papers in economics, finance, psychology, and neuroscience journals. He is an associate editor of the *Journal of Behavioral Finance* and is on the board of advisers of the Social Science Research Network (SSRN) in the experimental and behavioral finance area. He is a member of the Society for Neuroeconomics, the Institute of Psychology and Markets, and the American Psychiatric Association.

His primary professional interest is the role of emotion in investment decision making, and specifically, the arbitrage of neural-based anomalies in the financial markets. His long-term fascination with the markets grew out of his early investing (since age 12) and futures trading activities, and it continues with the application of psychological principles to investment strategy development. He plans to launch a quantitative psychology-based hedge fund in early 2008.

Dr. Peterson lives in the Los Angeles area with his wife and daughter.

Introduction

This introduction contains three vignettes about famous financial mishaps: the late 1990s hedge fund Long-Term Capital, Sir Isaac Newton and the South Seas bubble, and Samuel Clemens (a.k.a. Mark Twain) and the 1860s silver fever. There is a lot to be learned from such financial failures—both in the accounting facts and historical circumstances, but also in the psychology underlying the protagonists' faulty decision making. Reading the stories that follow, take note of the investment choices of the main players as their success, and confidence, grow.

BRAINS OF STEEL . . . ARE NOT ENOUGH

In February 1994 the most esteemed hedge fund in history, up to that time, opened for business. Long-Term Capital Management (LTCM) was extremely secretive, though it was widely known that the fund's partners included brilliant academics and extraordinarily successful traders. LTCM's partners included Myron S. Scholes and Robert C. Merton, two Nobel Prize winning economists (one awarded in 1997) who were renowned both on Wall Street and in academia.

The founder of Long-Term Capital was John Meriwether. According to Michael Lewis, author of *Liar's Poker* and a colleague of Meriwether's on the bond desk at Salomon Brothers during the late 1980s, "[John] had, I think, a profound ability to control the two emotions that commonly destroy traders—fear and greed—and it made him as noble as a man who pursues his self-interest so fiercely can be."[1] Meriwether not only kept his emotions under wraps, but he was also roundly acknowledged as intellectually brilliant.

Furthermore, Meriwether had proven to have high confidence in his market opinions. If he believed that an opportunity in the markets would go in his direction, and instead it moved against him, he might increase the size of his bet. He used mathematics to determine fair values of securities

and spreads. If his models identified a mispricing, he had confidence that it would return to fair value over time.

LTCM's launch was the largest in history at that time: $1.25 billion was raised. While LTCM's fees were above the industry average (taking 25 percent of net returns), the profits over the fund's first four years were large, seeming to justify the high fees. By April 1998, $1 invested in the fund at its inception in 1994 was worth $2.85 (after fees).

Unfortunately for LTCM, mathematical genius was insufficient to reap consistent profits. Other traders figured out many of LTCM's strategies, piggybacking on their trades, and LTCMs profitability began to erode. The mathematicians at LTCM looked for new markets in which to apply their basic models. They made assumptions that those new markets operated similarly to the old. Gradually, they grew greedier, took increasing risk, and spread their positions too widely. The founding partners bought out a large proportion of the original investors' capital so they could increase their own stakes in the fund.

After April 1998, LTCM's performance began an accelerating slide. Within a period of five months, from April 1998 to September 1998, LTCM lost 90 percent of its assets and could not meet its margin calls on the $1.3 trillion in outstanding positions it held. Many large Wall Street banks had loaned securities to LTCM on thin margin, and now some of those banks were threatened with catastrophic losses if they liquidated the fund's heavily in-the-red positions and triggered a "run on the bank."

Five months after the fund's peak, the original dollar invested in LTCM in 1994 was worth $0.23, and the fund's collapse had nearly caused the meltdown of the global financial system.[2] Financially, LTCM's collapse was caused by excessive leverage in illiquid positions. But how did these conditions come to be?

In the media reports about the fund, the root causes of its rapid demise were identified as psychological. After several years of success, greed, hubris, and arrogance infected the partners' decision making and impaired their communication. In investment management, mathematical genius may perform well in the short term, but it is no substitute for *emotional* intelligence.

CALCULATING THE MADNESS OF MEN

Sir Isaac Newton was one of the most influential scientists in history. He laid the groundwork for classical ("Newtonian") physics. He was the first to demonstrate that the motions of objects on Earth and the movements of the celestial bodies are governed by the same set of mathematical laws. His investigations into optics and sound formed the basis for centuries of

research. Unfortunately, Newton's scientific acumen did not improve his investing decisions. On the contrary, he lost much of his wealth in the largest stock bubble of his age.

Like many members of the British aristocracy in the early 1700s, Newton owned shares of the South Seas Trading Company in 1720. The South Seas Company was organized with two missions: (1) as a monopoly over British trade with the Spanish colonies in America and (2) as a converter of British government annuities into long-term debt. The South Seas Company initially had a legitimate and profitable business monopoly courtesy of the British government. Furthermore, the Company was repeatedly successful in raising money on the British stock market for proposed expansions of its operations. As a result of their success, a series of corporate competitors arose and the Company's monopoly was placed in jeopardy.

Following the lead of the South Seas Company, joint-stock companies proposing a wide range of speculative ventures formed and began to raise money through share sales. Public enthusiasm for stock trading grew, and a price bubble formed among the traded shares. When the sometimes fraudulent promotions of new joint-stock companies became apparent to legislators, a law was passed by the British parliament in June 1720 (the "Bubble Act") to prevent non-royal-endorsed joint stock companies from issuing shares to the public. Even after the "Bubble Act" was passed, companies continued selling shares for absurd enterprises. One such offering advertised its business as follows: "For carrying on an undertaking of great advantage; but nobody to know what it is."[3]

In the midsummer of 1720, Newton foretold a coming stock market crash, and he sold his shares of the South Seas Company for a profit of 7,000 pounds. Subsequently, however, Newton watched the Company's stock price continue to rise, and he decided to reinvest at a higher price. Newton then remained invested as prices started a precipitous decline. Soon panic ensued, and the bubble collapsed. After the dust had settled from the stock market crash of August 1720, Newton had lost over 20,000 pounds of his fortune. As a result of these losses, he famously stated, "I can calculate the motions of heavenly bodies, but not the madness of people." Newton's fear of missing out on further gains drove him to buy shares as the price soared higher. His inertia during the panic led to the loss of most of his assets.

MARK TWAIN AND THE "SILVER FEVER"

The celebrated author and humorist Samuel Clemens (pen name Mark Twain) was the most widely recognized American in the last decade of the nineteenth century, both nationally and internationally.[4] Clemens's

documentation of his experiences in the Nevada mining stock bubble are one of the earliest (and certainly the most humorous) firsthand accounts of involvement in a speculative mania.

After a brief stint as a Confederate militiaman during the beginning of the U.S. Civil War, Clemens purchased stagecoach passage west, to Nevada, where his brother had been appointed Secretary of the Territory. In Nevada, Clemens began working as a reporter in Virginia City, in one of Nevada's most productive silver- and gold-mining regions. He enviously watched prospecting parties departing into the wilderness, and he quickly became "smitten with the silver fever."[5]

Clemens and two friends soon went out in search of silver veins in the mountains. As Clemens tells it, they rapidly discovered and laid claim to a rich vein of silver called the "Wide West" mine. The night after they established their ownership, they were restless and unable to sleep, visited by fantasies of extravagant wealth: "No one can be so thoughtless as to suppose that we slept, that night. Higbie and I went to bed at midnight, but it was only to lie broad awake and think, dream, scheme."[6]

Clemens reported that in the excitement and confusion of the days following their discovery, he and his two partners failed to begin mining their claim. Under Nevada state law, a claim could be usurped if not worked within 10 days. Clemens lost his claim to the mine due to inattention, and his dreams of sudden wealth were momentarily set back.

But Clemens had a keen ear for rumors and new opportunities. Some prospectors who found rich ore veins were selling stock in New York City to raise capital for mining operations. In 1863, Clemens accumulated stocks in several such silver mines, sometimes as payment for working as a journalist. In order to lock in his anticipated gains from the stocks, he made a plan to sell his silver shares either when they reached $100,000 in total value or when Nevada voters approved a state constitution (which he thought would erode their long-term value).

In 1863, funded by his substantial (paper) stock wealth, Clemens retired from journalism. He traveled west to San Francisco to live the high life. He watched his silver mine stock price quotes in the newspaper, and he felt rich: "I lived at the best hotel, exhibited my clothes in the most conspicuous places, infested the opera. . . . I had longed to be a butterfly, and I was one at last."[7]

Yet after Nevada became a state, Clemens continued to hold on to his stocks, contrary to his plan. Suddenly, the gambling mania on silver stocks ended, and without warning, Clemens found himself virtually broke.

> *I, the cheerful idiot that had been squandering money like water, and thought myself beyond the reach of misfortune, had not now as much as fifty dollars when I gathered together my various debts and paid them.*[8]

Clemens was forced to return to journalism to pay his expenses. He lived on meager pay over the next several years. Even after his great literary and lecture-circuit success in the late nineteenth century, he continued to have difficulty investing wisely. In later life he had very public and large debts, and he was forced to work, often much harder than he wanted, to make ends meet for his family.

Clemens had made a plan to sell his silver stock shares when Nevada became a state. His rapid and large gains stoked a sense of invincibility. Soon he deviated from his stock sales plan, stopped paying attention to the market fundamentals, and found himself virtually broke.

Clemens was by no means the first or last American to succumb to mining stock excitement. *The World's Work*, an investment periodical published decades later, in the early 1900s, was beset by letters from investors asking for advice on mining stocks. The magazine's response to these letters was straightforward:

> *Emotion plays too large a part in the business of mining stocks. Enthusiasm, lust for gain, gullibility are the real bases of this trading. The sober common sense of the intelligent businessman has no part in such investment. [1907a, pp. 8383–8384]*[9]

While the focus of market manias changes, the psychology of speculators remains remarkably similar over the centuries.

Mathematical brilliance and Nobel Prizes (in the case of LTCM), scientific genius (in the case of Newton), and creativity (in the case of Clemens) do not insulate against investment failure. As we'll see in this book, accolades and success can actually impede investing success. In all three cases, as warning signs became apparent, the investors remained in an overconfident worldview, dismissing risks and turning their attention away from prudent money management. Then, as their wealth evaporated, they remained passive in the face of losses.

Regardless of their professional standing, the vast majority of investors underperform the markets, often for the same reasons as the three cases above. Emotions easily overwhelmed reasoning when money is at stake. When times are good, investors take them for granted and do not prepare for risks. When markets turn sour, they are not paying attention, often holding on to their positions too long while hoping for a comeback or denying that there is a problem.

WHAT'S THE USE OF NEUROFINANCE?

In neuroscience laboratories, revolutionary new tools are available for investigating investor behavior. These technologies enable researchers

to watch changes in brain function in real time, allowing the precise characterization of the decision-making process. As researchers have come to better understand the brain, some fascinating and important findings have come to light regarding how people make good, and bad, decisions with money.

"Neurofinance" is the name for the interdisciplinary study and application of neuroscience to investment activity. Finance, psychology, economics, and neuroscience collaborators are exploring common questions, such as why and how people make nonoptimal financial decisions. Furthermore, with the contributions of clinical psychologists, psychiatrists, and neurologists to recent research, it has become apparent that some "neural" biases can be corrected by implementing therapeutic techniques.