

PART I

Foundations

*The Intersection of Mind
and Money*

CHAPTER 1

Markets on the Mind

The Challenge of Finding an Edge

"I'd be a bum on the street with a tin cup if the markets were always efficient."

—Warren Buffett

Even though trillions of dollars change hands in the financial markets every day, most active investors cannot find an edge over their competition. They are vulnerable to psychological biases that impair their investment decisions, and their profitability is eroded. Consider the fate of Internet-era day traders.

Day traders typically aim to earn money from small intraday price movements and trends. Most are not financial professionals by training or experience. Often, they enter day trading from other occupations, encouraged by the independence and high expected financial returns of trading.

A 1998 study sponsored by the North American Securities Administrators Association (NASAA) analyzed 26 randomly selected day-trading accounts. The year 1998 should have been an excellent year for day trading, with the S&P 500 up over 26 percent that year. However, the report's conclusions were pessimistic. "Eighteen (18) of the twenty-six accounts (70 percent) lost money. More importantly, all 18 accounts were traded in a manner that realized a Risk of Ruin of 100 percent." The "risk of ruin" is the statistical likelihood, based on swings in value, that the account will go bankrupt over the next year. The report noted that "Only three (3) of twenty-six (26) accounts (11.5 percent of the sample) evidenced the ability to conduct profitable short-term trading."¹ The report observed that most traders were limiting their profits and letting their losses ride, and "that's a surefire way of going broke."²

It wasn't only American day traders who lost money in the late 1990s. In an analysis of Taiwanese day traders on the Taipei Stock Exchange, most traders' profits were not sufficient to cover their transaction costs. "In the typical six month period, more than eight out of ten day traders lose money."

Short-term currency traders lose with similar consistency to day traders. One of the largest retail foreign exchange dealers in the United States is Foreign Exchange Capital Markets (FXCM). In 2005, Drew Niv, chief executive of FXCM, remarked to the *Wall Street Journal* "If 15 percent of [currency] day traders are profitable, I'd be surprised."³

While short-term trading looks like a losing proposition on average, in both the United States and Taiwan a small percentage of day traders were consistently profitable. Among the Taiwanese, "Traders with strong past performance continue to earn strong returns. The stocks they buy outperform those they sell by 62 basis points [0.62 percent] *per day*."⁴ Most day traders aspire to be as successful as this small minority, but they find themselves held back by poor decision making.

What are the underlying reasons for the poor performance of most day traders? Researchers analyzed the daily trading records and monthly positions of investors at a large discount brokerage. They examined 10 years of trading records for 66,465 households, including over two million common stock trades. They divided the accounts into five groups based on the level of turnover in the stock portfolios. The 20 percent of investors who traded most actively earned an average net annual return 7.7 percent *lower* than the average household.⁵ Based on this study, it appears that excessive stock turnover and the attendant transaction costs contribute to poor performance.

It is not simply overtrading, but choosing the wrong stocks to buy and sell, that reduces profitability. Individual investors underperform because psychological biases interfere with their investment decision making. In a different study, researchers analyzed the trading records of 10,000 brokerage accounts over six years, including 162,000 common stock trades.^{6,7} They compared the performance of losing stocks held to that of the winning stocks sold. One year after the sale, the losing stocks investors clung to had underperformed the winners they sold by an average of 3.2 percent.⁸ Most investors sold winning stocks too early and held losing stocks too long.

In a broad study of mutual fund returns, Vanguard founder John Bogle calculated that while the stock market rose 13 percent annually from 1983 through 2003, the average mutual fund returned 10 percent and the average mutual fund investor gained only 6.3 percent.⁹ Other researchers have found that the average mutual fund investor underperforms inflation.¹⁰

Mutual fund managers' decisions are impaired by psychological biases. In a study of mutual fund performance from 1975 to 1994, on a net-return level, the studied funds underperformed broad market indexes by one percent per year.¹¹ Mutual fund underperformance is due, in part, to fund manager overtrading.¹² Furthermore, the higher a mutual fund's management fee, the lower its performance. Mutual funds look like a lose-lose proposition. Even if you can control your own overtrading, your mutual fund manager may not be able to manage himself.

While the vast majority of mutual funds underperform their benchmarks over time, about 3 to 4 percent earn consistently high returns, year after year.¹³ The persistent success of these star funds suggests that a small minority of portfolio managers have "the right stuff." Chapter 12 discusses the psychological characteristics of such star performers.

On average, both mutual fund managers and individual investors significantly underperform the markets due to psychological biases. Overtrading and its high associated transaction costs are one cause of poor performance. Other mistakes, such as holding losers too long and failing to stick to a prearranged risk management plan, are behind the "celebrity" mishaps of LTCM, Newton, and Clemens described in the introduction. Yet biases are not fated for most investors. With experience, bias severity declines (or the nonbiased preferentially survive) and as a result, returns increase.¹⁴ Furthermore, biases are less prevalent if nothing of value is at stake in the decision. Some of the best-performing financial professionals are those who don't have to make actual trading decisions: stock analysts.

ANALYSTS AND DART BOARDS

While most mutual fund managers and individual investors struggle to keep up with the market, stock analysts' buy and sell recommendations are generally quite accurate. In 1967, Nobel Prize winning economist Paul Samuelson declared to a U.S. Senate committee: "A typical mutual fund is providing nothing for the mutual fund owner that they could not get by throwing a dart at a dartboard." Samuelson's assertion prompted a series of competitions between stocks selected randomly by throwing darts at the stock tables of a newspaper and stocks selected by professional stock analysts. Several major business news publications featured these contests, including a Swedish newspaper that trained a chimpanzee to throw the darts. The most highly regarded contest was that of the *Wall Street Journal* (WSJ), which ran from 1982 to 2002.

In the WSJ results from 142 six-month contests, professionals came out significantly ahead of the darts with a six-month average return of

10.2 percent. The darts averaged a 3.5 percent semiannual return, while the Dow Jones average climbed 5.6 percent.^{15,16} It appeared that stock analysts' recommendations contained a great deal of value to investors. However, the pros' recommendations could *not* be acted on by individual investors to beat the markets. The stocks recommended by the analysts opened up an average of 4 percent from the prior day's close.¹⁷ The advantage of analysts' expertise was eliminated by dissemination.

In general, professional stock analysts' strong buy recommendations outperform their strong sell recommendations by almost 9 percent annually.¹⁸ However, because of frequent turnover and high transaction costs when investing based on analysts' advice, the excess return of such a strategy is not significantly above the market return. Analysts' forecasts are quickly priced into stocks, and the transaction costs accrued by following their frequent changes in opinion prevent excess returns for the general public.

Many funds employ analysts in-house so they can have instant access to their insights, and some hedge funds pay high trading commissions, which entitle them to "first-mover" insights from the best analysts at major brokerages. Due to much higher compensation, many excellent analysts work at hedge funds where their opinions are kept a closely guarded secret.

What does this mean for the individual investor? In the end, if you want an advantage, you've got to learn to be your own stock analyst. The first step toward that goal is to learn how analysts think.

DEVELOPING BETTER EXPECTATIONS

Analysts have better forecasts than others because they have superior expectations of likely stock price moves. Russ Fuller is a portfolio manager for the mutual fund group Fuller and Thaler Asset Management, based in San Mateo, California. Fuller has written that "having better expectations than the market is the mother of all alphas."¹⁹ *Alpha* is the amount by which a portfolio manager outperforms his benchmark. The benchmark is usually a stock index of similar size, growth, or value characteristics to the stocks the fund is buying.

So how can investors develop better expectations to increase their alpha? According to Fuller, they can develop one of three advantages. First, they can have superior private information about company fundamentals or markets. Superior private information is often obtained through a better research process, such as through an in-depth examination of a company's growth prospects, earnings quality, product viability, or management team.

The second method for generating superior expectations, according to Fuller, is by processing information better. It is possible to find mathematically predictive relationships within fundamental and financial data based on quantitative, computerized information processing. Additionally, some expert human analysts can perceive predictive relationships in corporate data.

The third technique for developing better expectations is to understand investors' behavioral biases. Behavioral biases are caused both by (1) investors who are not wealth maximizing and (2) investors who make systematic mental mistakes.²⁰ Finding the impact of behavioral biases on stock prices requires psychological savvy, but it can be quite profitable. Fuller and Thaler's portfolios have returned average alphas of almost 4 percent since their inception,²¹ a track record that has prompted the creation of many copycat "behavioral finance" funds.

This book will address each technique for developing superior expectations. In particular, it will help readers to identify and eliminate errors in analysis and modeling. The discussion of corporate management biases, particularly overconfidence in Chapter 8, should be useful for readers who are fundamental analysts. The description of data-interpretation errors (self-deception) in Chapter 20 is helpful for quantitative and technical analysts. The majority of the book is devoted to behavioral biases. To use behavioral biases in investment strategy, one should find where such biases affect the majority of investors and show up in characteristic market price patterns.

"THE WISDOM OF THE COLLECTIVE"

"Markets can still be rational when investors are individually irrational. Sufficient diversity is the essential feature in efficient price formation. Provided the decision rules of investors are diverse—even if they are suboptimal—errors tend to cancel out and markets arrive at appropriate prices."

—Michael Mauboussin, *More Than You Know*²²

Michael Mauboussin is chief investment strategist at Legg-Mason Capital Management and a professor of finance at the Columbia Business School. He is also a polymath who has integrated elements of complex adaptive systems theory and behavioral finance into his investment philosophy. One aspect of his philosophy he calls "The Wisdom of the

Collective.” Mauboussin has found abundant literature indicating that individuals (even experts) can estimate “correct” stock valuations no better than the consensus market price.

When people are asked to guess answers to problems as diverse as the number of jelly beans in a jar, the precise weight of an ox, or the location of a bomb, individual guesses (even guesses by experts) are relatively poor. Averaging the participants’ guesses often produces a consensus average estimate that is the most reliable and accurate solution to the problem. In many ways, the stock market is a collective estimation about the future of the economy.

Mauboussin explains that humans are not rational agents in the markets, there is no steady-state market price equilibrium, and price changes are not normally distributed, thus the markets are a complex adaptive system. Using the assumption of complexity, one can account for real-world considerations: the markets are composed of boundedly rational agents (individuals driven somewhat by psychology), they have states of disequilibrium (prices are unstable even without new information), and they exhibit “fat-tailed” price change distributions (large price changes occur much more frequently than expected by chance).

As Mauboussin points out, the stock market has no defined outcome and no defined time horizon. Prices in the financial markets both *inform* and *influence* participants about the future. Diversity (or efficiency) is lost in the markets when investors imitate one another or when they rely on the same “information cascades.” Information cascades induce market participants to make the same decisions based on the same signals from the environment, without consideration that others are doing likewise.

From Mauboussin’s work one can draw several conclusions. In order to find advantages in the markets, one must search for “diversity breakdowns.” Diversity breakdowns represent collective overreactions or underreactions to new information, often leading to mispricings that ultimately correct themselves. Investment profits can be made both as the mispricings form and as they break down.

When researchers find brain activation patterns leading to uniform buying or selling during market experiments, then they may have located a plausible brain mechanism for diversity breakdowns. As Mauboussin puts it, “So the issue is not whether individuals are irrational (they are) but whether they are irrational in *the same way at the same time*.” He goes on, “While understanding individual behavioral pitfalls may improve your own decision making, appreciation of the dynamics of the collective is the key to outperforming the market.”²³

Diversity breakdowns may sound like a rare event, but in fact they occur every day in the financial markets. Because we are biological beings with common biological hardware, we are susceptible to common

influences from the environment. Environmental factors that sway collective thinking can be overt (such as news releases) or beneath awareness. Natural cycles (such as variations in daylight) and meteorological events (such as cloud cover and geomagnetic storms) alter collective mood and behavior. These group-level shifts in emotion and thought have been shown to affect market price movements.

METEOROLOGICAL ANOMALIES AND OTHER ANIMAL SPIRITS

Calendar and meteorological effects are surprising both for the size of their impact on market prices and for the fact that they operate entirely beneath awareness. Short-term natural influences on investing behavior arise from six areas: Daily sunshine versus cloud cover, disruptions in sleep patterns, temperature extremes, lunar cycles, electromagnetic storms, and wind strength. A long-term biological influence on investor behavior is the gradual waxing and waning of daylight as seasons change.

Professor Hirshleifer at Ohio State University found that morning sunshine correlates with stock returns.²⁴ He examined 26 stock market indices around the globe for the period of 1982 to 1997. He looked at sunshine versus some cloud cover in the city of a nation's largest stock exchange. "In New York City, the annualized nominal market return on perfectly sunny days is approximately 24.8 percent per year versus 8.7 percent per year on perfectly cloudy days." He cites evidence that sunshine improves investors' moods. When their moods are elevated, investors are less risk averse and are more likely to buy.

Kamstra, Kramer, and Levi (2003) find that stock returns are significantly related to season. They examined stock market performance during the six months between the fall equinox (September 21) and the spring equinox (March 21) for the northern hemisphere and the opposite six-month period for the southern hemisphere. The authors found that overall, stock markets underperformed in the seasonal summer and outperformed in the winter. As an example, the authors cite the returns of a portfolio invested 50 percent in each of Sydney, Australia (the most southerly major market with the most daylight during the northern winter) and Stockholm, Sweden (the most northerly major market with the most daylight during the summer). From 1982 to 2001 this equal-weighted portfolio earned 13.1 percent annually. If the entire investment followed the darkness across hemispheres, investing in Stockholm from September to March and Sydney from March to September, the annual returns were 21.1 percent (versus 5.2 percent if doing the opposite strategy). The researchers hypothesized that

emotional shifts, related to the biology underlying seasonal affective disorder (SAD), alter risk preferences and subsequent investment behavior on a collective level.²⁵

Goetzmann and Zhu (2002) analyzed trading accounts of 79,995 investors from 1991 to 1996, and they found that *individual investors* do not trade differently on sunny days versus cloudy days. However, the authors found that *market-maker* behavior was significantly impacted by the degree of cloud cover: Wider bid/ask spreads on cloudy days were hypothesized to represent risk aversion among market makers. Other researchers discovered that morning cloud cover and wind speed in Chicago correlate with wider bid-ask spreads in the afternoon.²⁶ The weather in the exchange's home city affects market-maker behavior, but investors in other cities who place orders on the exchange are probably unaffected.

While it seems plausible that sunlight affects investor moods and trading behavior, some much more extraordinary correlations have been found. Researchers found that severe geomagnetic storms (a result of solar flares) caused world stock market underperformance over the six days following the event.²⁷ Interestingly, the psychology literature demonstrates a correlation between geomagnetic storms and signs of depression in the general population during the two weeks following. Depression is an emotional disorder characterized, in part, by risk aversion.

In addition to sunshine and geomagnetic storms, researchers found that poor sleep quality leads to subpar market returns. Daylight savings time serves as a proxy for sleep disruption (desynchronosis). Kamstra, Kramer, and Levi (2002) found that on the time-change weekends of daylight savings time there are below normal stock returns from the Friday market close to the Monday open (two to five times larger than normal). The authors hypothesize that this underperformance is due to impaired judgment secondary to sleep disruption. Expanding this hypothesis, the average weekend desynchronosis may explain the "Monday effect," where prices rise less on average on Mondays than on other days of the week.

Other environmental variables affect investors as well. Cao and Wei (2002) found that abnormal local temperatures affect stock prices in the city of a country's major stock exchange. The authors draw on psychology studies showing increased physical activity in unusually low-temperature environments and increased apathy and aggression during period of abnormally high temperatures.

Yuan, Zheng, and Zhu (2001) find a lunar effect on stock prices worldwide. The authors report that stock market returns in 48 countries are lower during the days surrounding a full moon than during the days around a new moon. The superior returns around the new moon amount to 6.6 percent annually.²⁸ In fact, the light of the full moon may contribute to more

frequent nocturnal awakenings, sleep disruption, and subsequent next-day risk aversion.

These natural market anomalies tell a compelling story about the impact of the natural world on collective investor behavior and market prices. Seasonal and meteorological factors may contribute to market price anomalies via collective changes in emotional states (and thus risk preferences). These findings indicate that investors' mood states are the basis of some of the predictable volatility in the markets. Importantly, such market patterns are predictable and significant, and result from unconscious changes in collective behavior.

SENTIMENT

If investors' emotional states can predict market price movements, is there a way of measuring investors' average emotion in advance to predict market prices? Of course, the above authors measured environmental stimuli such as sunlight and magnetism, which are known to influence mood and behavior. In the finance literature, surveys that ask investors how "bullish" or "bearish" they feel are available.

Researchers found that both newsletter writers²⁹ and individual investors³⁰ show increased optimism about future stock market gains (bullishness) following high recent returns. Additionally, as the S&P 500 declined over a 12-month period, investor optimism about the stock market's future declined in tandem with prices.³¹ Investors' projections of future market action reflect their feelings about recent price trends.

Perhaps paradoxically, Fisher and Statman (2000) noted that the percentage of investors who believed the market was overvalued was correlated with expectations of future returns from 1998 to 2001.³² That is, even though investors knew that the market was "overvalued," their expectations of future gains actually increased the more they thought it was overpriced. Based on this surprising finding, it appears that investors' intellectual assessment ("overvalued") is decoupled from their underlying feeling of optimism ("it's going up!"). In general, sentiment levels do appear to be negatively correlated with (and somewhat predictive of) future market price changes.³³

Across individuals, biological commonalities in information processing, such as those generated by emotion, lead to diversity breakdowns in market prices. The large and repeating effects of meteorological and calendar events on market prices indicates that subtle biological forces influence group investment activity. The dissociation between intellectual

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INSIDE THE INVESTOR'S BRAIN

assessments of market value and sentiment suggests that different brain systems are mediating decision making. Understanding both the neural origins and provocateurs of diversity breakdowns may lead to novel investment strategy development and training programs to eliminate those biases.

The next chapter introduces the brain circuits responsible for biased investment behavior.