

# Investor Psychology and the Dynamics of Security Prices

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Economics is a science, but it is a social science; the human factor—particularly beliefs that shape how humans interpret and act on information—plays a substantial role in the behavior of financial markets. Four attributes of beliefs are important to keep in mind: (1) Most concepts and frameworks are shared. (2) Beliefs differ greatly in sophistication. (3) Beliefs are often false. (4) Beliefs do not change easily. From a practical point of view, by emphasizing the importance of individuals' decisions, the behavioral approach reaffirms that good business judgment is critical in money management.

**W**hy should professional money managers, academicians, and other rational people spend their leisure time learning more about investor psychology? The answer is simple: Most of us would agree that the behavior of financial markets is often far from rational. Yet, despite extraordinary events here and overseas (e.g., the 1987 stock market crash), modern finance theory has almost completely ignored the complex motivational and cognitive factors that influence investor decision making. This presentation takes a different approach. First, I explain why psychology matters and why a behavioral approach is currently the most promising and exciting way to think about financial issues. Next, I briefly explore how the behavior of money managers, financial analysts, and individuals shapes the dynamics of stock prices—in particular, how investor sentiment sometimes causes price momentum and sometimes causes price reversals. The exploration requires a discussion of the links between stock price movements and economic fundamentals, trader perceptions of risk and return, and the “state of the market.”

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## The Practical Challenge

Investment managers care about the psychology of financial markets because they want to create wealth—for themselves and for their clients. To create wealth, they need to develop strategies that will be successful, and to develop strategies, they need to understand how markets operate. Logically, some positive theory of how the world works always

comes prior to the development of normative principles. Thus, the place to start is with descriptions of what investors do, whether their actions seem sensible or not. From these descriptions derives a theory of market behavior.

What are the exact links between security prices and news—that is, value-relevant information? Over the decades, researchers have thought about this question in various ways. The basic issue is whether prices react properly to new information. In the past, three responses to this issue have emerged. The first defines the efficient markets hypothesis: “The price is right.” That is, according to this centerpiece of modern finance theory, market prices adequately reflect all information at all times. The second response is that the relationship between prices and true intrinsic values does not exist; the market has a life of its own, and prices are driven by, in the words of John Maynard Keynes, “animal spirits.” The third response, and the one that receives the most support from the empirical work in behavioral finance, resembles Isaac Newton’s law of universal gravitation: What goes up must come down. Applied to the stock market, this law means that, over time, prices tend to revert to value. In the short term, however, big disparities may arise between the two.

These three perspectives on asset valuation have different implications for money management. The price-is-right answer suggests that “you can’t beat the market” and that indexing is the way to go. The animal-spirits view is fascinated by the study of investor sentiment, initial public offering and growth

stock fads, and technical analysis. Newton's law of gravity suggests pursuing fundamental analysis in the style of Benjamin Graham and David Dodd. Note that two of the three approaches recommend that investment professionals pay careful attention to human behavior.

## The Failures of Modern Finance

For 30 years, however, modern finance as taught in U.S. business schools has claimed the opposite—that human behavior is not important to the markets. Investors are invited to assume that markets and people are “perfect.” The conduct of the representative agent (an ordinary Joe Sixpack), which is reflected in security prices, is described as the ideal type of *homo economicus*. The theory says, pure and simple, that people behave the way we would want them to behave. Because *homo economicus* is utterly and completely rational, all behavior is reduced to a mathematical optimization problem. Math is in; psych is out. Deduction is in; induction is out. Strictly analytical, quantitative methods—logically deduced from first principles—are the way to create value. Nuclear physicists and engineers know how to optimize; so, even without reading the social science literature, they must be great social scientists—and even better money managers.

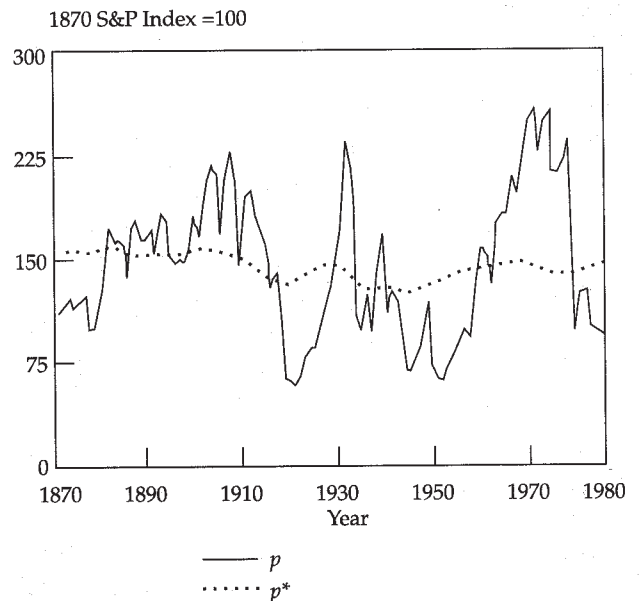
Of course, no one can argue with the use of Reason, but any theory is only as good as its foundations: Garbage in, garbage out. So, from a practical point of view, how successful is modern finance? We can judge the theory by listing some of its main insights and testing how well they stand up to the data. Or we can judge the whole framework by what it leaves out and does not even attempt to explain (e.g., trading volume).

Following the first method, consider briefly three major ideas familiar to every student of modern finance: (1) The price of any asset equals the sum of the appropriately discounted expected cash flows; (2) risky assets sell at lower prices than risk-free assets (and risk is best measured by beta, or covariability); and (3) markets are efficient.

The fallacy of the discounted cash flow model as a descriptive theory of market prices was first exposed by Robert Shiller (1981a). Shiller compared actual stock prices with *ex post* rational prices—that is, prices calculated using the dividend discount model (DDM). After the fact, the DDM tells analysts what—with perfect foresight—a company should have been worth in, say, 1900. Shiller studied the S&P 500 Index between 1870 and 1979, and his findings are reproduced in Figure 1.

Figure 1 compares the *ex post* index with the actual index. The figure teaches three things. First, it

**Figure 1. Real S&P Composite Stock Price Index versus *Ex Post* Rational Price**



Note: Both lines have been detrended through dividing by a long-run exponential growth factor. The variable  $p^*$  is the present value of actual subsequent real detrended dividends, subject to an assumption about the present value in 1979 of dividends thereafter.

Source: Shiller (1981a).

shows that actual prices ( $p$ ) are much more volatile than DDM-estimated prices ( $p^*$ ). For example, in the Great Depression, markets crashed, but DDM-estimated prices for that period exhibit only a slight dip. Of course, market participants may have worried about scenarios of history much worse than what actually occurred, but the puzzle is why price volatility was for so long not validated by subsequent movements in dividends. As Shiller proved, the logic of DDM requires that the volatility in  $p^*$  be larger than the volatility in  $p$ . The data, therefore, totally contradict the DDM theory.

The second implication of Figure 1 is that factors other than dividends (and the economic determinants of dividends) play a big role in price determination. This implication opens the door for investor psychology.

The third insight from Figure 1 (and perhaps the most troublesome for practitioners) is the implication it has for fundamental analysis. Even an analyst with perfect foresight, with a crystal ball, could deliver only DDM price estimates ( $p^*$ ). But wealth is created by buying low and selling high. The conclusion must be that rational money managers cannot ignore market sentiment.

Recent research has further demonstrated the embarrassing weakness of our theories of the risk-return trade-off and efficient markets. For instance, the academic literature is replete with evidence of seasonal-

ity—short- and long-term predictability in returns. Even Eugene Fama has withdrawn his support for the celebrated Sharpe–Lintner–Black capital asset pricing model and its notion of beta risk. Today, our best pricing models say that, in the cross-section of stocks, the required return on equity moves with market capitalization and with the ratio of market value to book value, a number constructed by accountants. No one has any good story, however, to explain why it does. Thus, the sad but honest truth is that, despite its many insights, modern finance offers only a set of asset-pricing theories for which no empirical support exists and a set of empirical facts for which no theory exists.<sup>1</sup>

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## The Theoretical Challenge

How should academicians react to this state of affairs? Familiar tunes often sung by theorists blame the data. “The data are noisy and cannot be trusted,” theorists lament. “Measurement error, survivorship bias, selection bias,” they sigh. If the data are numerous, “The data are mined.” If the data are few, “The theory cannot be properly tested.”

I do not like an approach that takes heart and derives its appeal from the fact that it cannot be falsified. Rather, I believe that the challenge is to develop new and better theories of asset pricing. Above all, the new theory should explain the joint puzzle of excess market volatility and excess trading. In my view, understanding of investor psychology is critical to this task.

Psychology influences prices so long as two conditions are fulfilled. Both are necessary. The first condition, that of “bounded rationality,” is that people are human; Joe Sixpack is fallible. The second condition is that rational arbitrage is imperfect.

That people try their best but make mistakes, that people often repeat their mistakes, and that many people make the same mistakes—these everyday observations are beyond question. Because asset valuation is about the future, and because the future is unknown and in the distance, asset valuation is really about quality of judgment. In some fundamental way, finance is a branch of the psychology of judgment. Contrary to what some theorists may say, expectations are not always rational.

Why is arbitrage imperfect? One reason is that arbitrage is costly and there is no free lunch in information gathering. The usual arbitrage arguments

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<sup>1</sup>Merton Miller seems to agree with this characterization. In a 1994 interview with *The Economist* (April 23), he said that “the blending of psychology and economics . . . is becoming popular simply because conventional economics has failed to explain how asset prices are set.” The reasoning may be simple, but at least to me, it is convincing. Miller added, however, that he believes the new mix of psychology and finance “will lead nowhere.”

also exclude true diversity of opinion. Consider, however: If an oil tanker in the Persian Gulf sinks, some traders will think that event is great news for Exxon Corporation while others will think it is terrible for Exxon. The price of Exxon will reflect how many dollars people are willing to put behind these two beliefs. Thus, false beliefs matter.

Another reason arbitrage is imperfect is that irrational traders create additional risk for themselves and everyone else. An analyst may find that some stock is undervalued and should be bought, but if other people do not come to the same belief within some reasonable period of time, arbitrage is not worthwhile and, in fact, the analyst may be hurt by unjustified price movements.

Finally, rational arbitrage may be destabilizing. If a rational person knew in advance that a television story rehashing old facts long known to sophisticated investors would be on the Thursday evening news and would cause the price of IBM to go up on Friday, what would that person do? Bet against the price rise because the news is old hat? Not at all. He or she would buy now, buy before the price increase. Thus, arbitrage can destabilize prices and make matters worse.

We have no choice but to take on the monumental job of modeling irrational “noise” traders. What people do affects prices and, therefore, affects everyone.

Clearly, this psychological approach is quite different from a perspective that emphasizes perfect markets and perfect people. It also contrasts with the neo-institutional paradigm. Modern institutionalists try to model market frictions, but they still regard the marginal trader to be fully rational. That is, to institutionalists, if information is asymmetrical—that is, if some people know more than others—the people who know less know that they know less and act in full recognition that they know less. The behaviorists, on the other hand, assume that the stupid (or less-informed people) are indeed stupid but do not know that they are stupid.

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## Mental Frames

The effect of judgment on asset prices is a product of the beliefs (or mental frames) that traders, rightly or wrongly, share. The effect also depends on how traders incorporate new information into the frame. Because perceptions play such an important role, four attributes of beliefs are important to keep in mind.

First, people do not create many frames that are uniquely their own. Concepts and frameworks are shared. That is why we can speak over dinner about the war in Bosnia without ever having been there. Second, beliefs differ greatly in sophistication. If a

passenger asks a taxi driver about the link between the budget deficit and interest rates, the likely response will be a confused look and a short, one-sentence answer. If the person were to ask a professional economist, her reply might take an hour—admittedly, perhaps with the same net effect as the taxi driver's answer. Third, beliefs are often false. Some years ago, I watched an afternoon television talk show about the savings and loan crisis. One of the people in the audience said, "The taxpayers shouldn't pay for this mess. The government should." Modern finance surely overestimates the sophistication of the public! In short, it is preposterous to assume, as rational expectations theorists do, that everyone has a superb understanding of how the macroeconomic and financial systems work. Finally, beliefs do not change easily. People have an enormous capacity to rationalize facts and fit them into a preexisting belief system. Inflationary expectations in the bond market demonstrate this point. One way to interpret the low returns on fixed-income instruments in the 1970s is that most investors never thought inflation would go up as much as it did. Similarly, the very high real returns experienced during the early 1980s may have resulted from the conviction that inflation was here to stay.

That shared beliefs affect market prices, often the wrong way, is evident from a careful study of business history. A good example is U.S. corporate restructuring. In retrospect, is it surprising that the merger and acquisition wave of the 1960s (when many firms diversified into new activities) was followed by the break-up wave of the 1980s and 1990s? A reasonable person might wonder if the initial M&A wave was largely in error. Profit data certainly suggest that it was. The management gurus of the 1960s loved diversification and saw it as a big plus for company value, whereas today, their buzzword is "focus." What is most striking, however, is that the stock market apparently took the gurus seriously, not once but twice: Event studies show that stock prices of bidder firms reacted favorably to acquisition news in the 1960s but unfavorably in the 1980s. It is rather perilous and bad practice to judge the value of a long-term investment decision by the whim of a short-term price reaction.

## Heuristics and the Dynamics of Security Prices

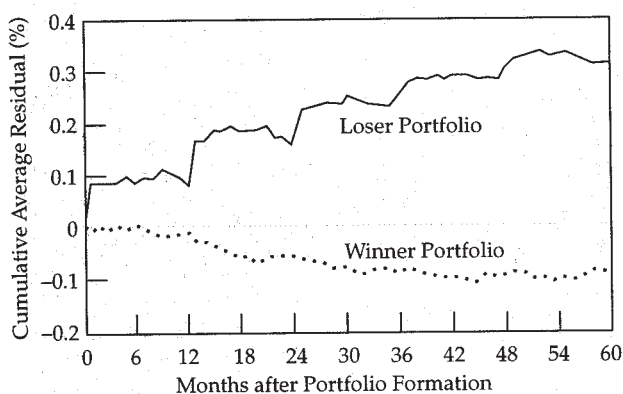
How do security prices respond to news? That depends in part on how investors' mental frames are influenced by new information. There are always two effects. The first has to do with the short-term impact of the surprising news in light of the information already impounded in prices. The second effect depends on how the news changes the frame itself. At times, seemingly minor pieces of news trigger a change in mental frame and lead to a big price reaction.

A major focus of my past research has been the quality of financial forecasts. How good are expert and amateur predictions of inflation, economic growth, company earnings, stock prices, etc.? In addition, how do people go about making these forecasts? A recurring theme is the tendency of most forecasters to extrapolate the immediate past. People seem to have a difficult time projecting anything greatly different from what is already happening. This tendency may be viewed as an "overreaction" to what is salient and obvious. Laboratory research indicates that non-Bayesian forecasting probably results from the use of mental heuristics, namely, representativeness, availability, and adjustment and anchoring (Tversky and Kahneman 1974).

Security analysts' earnings forecasts are a good example (De Bondt and Thaler 1990). The forecasts are persistently very wide of the mark. And notwithstanding their large errors, analysts keep offering extreme predictions. In addition, the data show optimism bias as well as serial correlation in forecast errors (Brown 1993). Somewhat similar phenomena are observed with stock price forecasts made by small individual investors. For several years, the American Association of Individual Investors has asked a random sample of its members for a stock market forecast every week. The data show that, just like subjects in controlled experiments, most individuals are optimistic in bull markets and pessimistic in bear markets. The forecasts, however, have little or no predictive power (De Bondt 1993).

A series of empirical tests supports the idea that overreaction bias affects stock prices (De Bondt and Thaler 1985). **Figure 2** summarizes the initial, and controversial, study of the winner/loser effect. Richard Thaler and I examined all companies listed on the NYSE since December 1925. As Figure 2 shows, the 50 NYSE stocks that did the worst during an initial

**Figure 2. The Returns to Buying Past Losers and Selling Past Winners Short**



Source: Werner F.M. De Bondt, based on data from De Bondt and Thaler (1985).

50 NYSE stocks that did the worst during an initial five-year period subsequently outperformed the 50 NYSE stocks that did the best. Stock prices apparently "have a memory," because the difference in performance when one has controlled for time-varying risk and other factors is, on average, about 8 percent a year. Despite many attempts to refute these findings, they still stand. In fact, the seeming profitability of contrarian strategies of this type has been established for many different countries and time periods. The winner/loser effect was the first asset-pricing anomaly predicted and discovered by a behavioral theory.

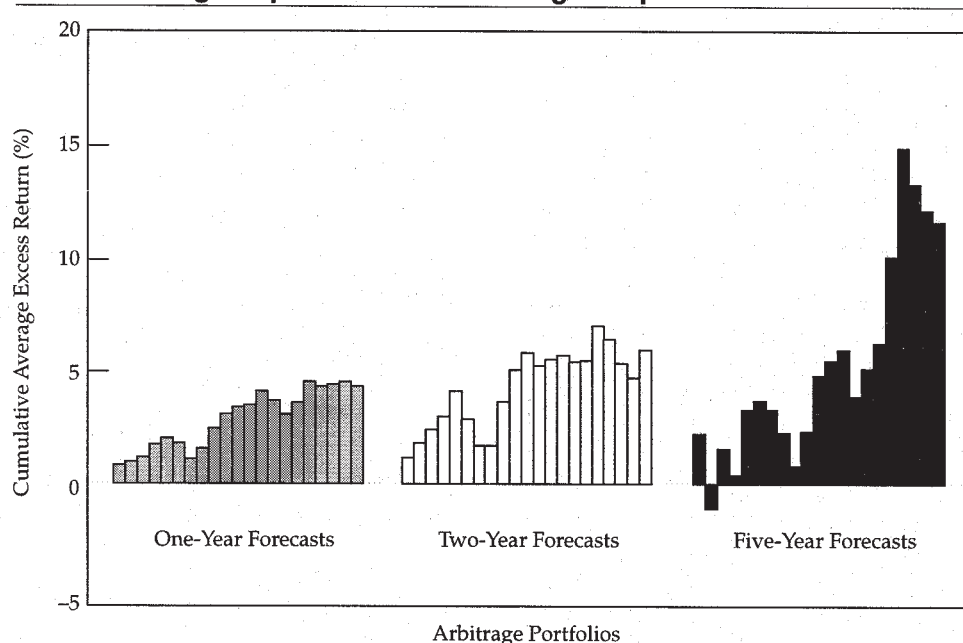
What causes the winner/loser effect? My favorite behavioral explanation is that traders naively extrapolate past earnings trends. In a 1992 study, I tested this overreaction-to-earnings hypothesis. I wondered whether analysts' earnings forecasts could be used to earn abnormal profits. The period was 1976 through 1984, and I used more than 100,000 forecasts. Firms were ranked on the basis of analyst predicted earnings growth for one-, two-, and five-year horizons. Apparently, an arbitrage strategy that buys the 20 percent of companies for which analysts are most pessimistic and finances the purchases by selling short the 20 percent of companies for which analysts are most optimistic earns substantial profits. **Figure 3** shows the risk-adjusted excess returns for the 21 months following initiation of the strategy. Note that the longer the forecast period, the greater the excess returns. These findings—echoes of Newton's law of universal gravitation—strongly support

the overreaction-to-earnings hypothesis and contrarian investment styles in general.

Plenty of mystery stories are left in the data. One puzzle is the empirical evidence documenting *underreaction*. **Figure 4** is taken from a survey on the topic by Victor Bernard (1993). If companies are ranked on the basis of standardized earnings surprises (surrounding the day of their earnings announcements), companies with positive earnings news are much better subsequent investments than are companies that report bad news. The effect lasts for many months and, surprisingly, the strategy has consistently paid off for more than a quarter of a century.

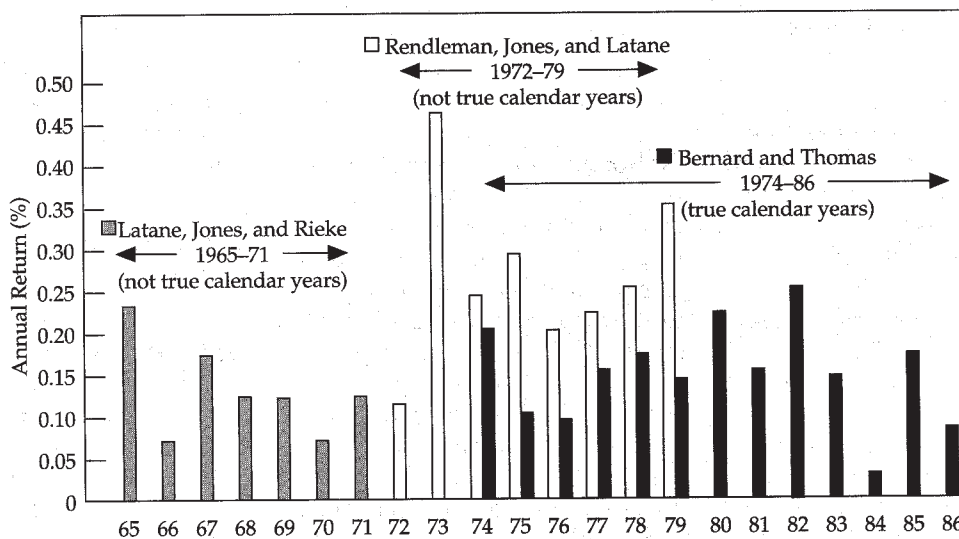
How do we square the overreaction results with the underreaction results? How do we square price momentum with price reversals? Logically, can both be true? The answer is a definite yes. Large disparities between price and value can result from the wrong mental frame. For example, we freely talk about "growth firms" and "declining industries" even though annual earnings changes provide little evidence of any reliable time-series patterns (except in the tails of the distribution). All too often, the life-cycle metaphor proves persuasive. No wonder, then, that when an earnings surprise hits, many investors refuse to believe it. Mental frames and prices take time to adjust, and this slow adjustment may be responsible for the underreaction evidence. Another finding consistent with this overall interpretation of the data is that past stock market losers are more likely than not to experience positive earnings surprises and past market winners to report negative

**Figure 3. The Returns to Buying Companies with Poor Earnings Prospects and Selling Companies with Good Earnings Prospects**



Source: De Bondt (1992).

**Figure 4. Returns to a Strategy Based on Standardized Unexpected Earnings: Results Reported in Three Studies**



Note: For specific study descriptions and test assumptions, see Latane, Jones, and Rieke (1974), Rendleman, Jones, and Latane (1982), and Bernard and Thomas (1989).

Source: Bernard (1993).

surprises.

## Conclusion

In many ways, modern neoclassical finance has been notably successful in the past 30 years. Consider, for instance, the impact of the Black-Scholes option-pricing formula. Yet, while we take pride in financial economics as a science, we should never forget that it is a social science. The human factor plays a substantial role in the behavior of financial markets.

U.S. economist John Maurice Clark understood this connection well. He stated in 1918 that

... the economist may attempt to ignore psychology, but it is sheer impossibility for him to ignore human nature. . . . If the economist borrows his conception of man from the psychologist, his constructive work may have some chance of remaining purely economic in character. But, if he does not, he will not thereby avoid psychology. Rather, he will force himself to make his own, and it will be bad psychology.

Unfortunately, modern finance involves a lot of bad psychology.

Fortunately, behavioral finance is a call for more

discipline in financial modeling. Before we make further arbitrary, *ad hoc* assumptions (such as rational expectations or Bayesian updating), perhaps we should check with our colleagues in the arts and sciences as to whether any evidence exists that people behave according to the assumptions.

From a practical point of view, the behavioral approach reaffirms that good business judgment is critical—in money management as in everything else. Something useful derives from the study of heuristics and biases and from understanding how people process data and solve problems. The financial arena contains no shortcuts, however, no simple ways to get rich quick (except, perhaps, with privileged inside information). Whether long-term fundamental analysis pays off is still somewhat unclear. In all likelihood, the best approach is to live by Newton's law. All the evidence that I know warns against buying glamour, against buying companies with astronomical P/Es or highfliers in the stock market. Similarly, all the evidence I know finds wealth (if not virtue) in contrarian investing, in going against the crowd.

# Question and Answer Session

Werner F.M. De Bondt

**Question:** If a good strategy is simply to buy the 20 stocks with the most pessimistic earnings forecasts and sell the 20 with the most optimistic forecasts, what of the role of financial analysts?

**De Bondt:** Analysts have a useful role, but their position is certainly paradoxical. On the one hand, believers in efficient markets must explain what tens of thousands of analysts around the world do that is worth that much money. Why do analysts get paid if their insights are worthless? So, the survival of analysts is a puzzle within the rational paradigm.

On the other hand, believers in the competing view that market prices are often irrational are also in an uncomfortable position. If prices are irrational, why don't more professional investors outperform the indexes?

In the end, the success of the security analysis industry may reflect more what people *think* analysts are worth than what value analysts can really add. We all know that investors chase the celebrities who appear on the covers of *Business Week*, *Money* magazine, and so on. Of the many reasons for this investor behavior, the main one is the difficulty in distinguishing luck from skill. Extrapolation bias and overconfidence also play a role, however. Overconfident investors firmly believe that they themselves can outperform the market, even if others can't, or that they can pick somebody who will beat the averages for them.

**Question:** In your 1992 analyst forecast study, where was the money made—on the short side

or the long side?

**De Bondt:** One aspect of the return data that we have not quite explained is that, in many overreaction studies, more of the profits seem to come from buying losers than from selling winners short. The ratio is about two to one. I am as much surprised at that finding today as I was ten years ago. When Thaler and I started this research, I thought picking a stock that is overpriced would be a lot easier than picking one that is underpriced. Much of the profit of contrarian strategies, however, comes from the loser side.

**Question:** Do noise traders become smarter over time? What can we do to improve our own judgment?

**De Bondt:** The efficient markets hypothesis implies not only that the smart cannot outperform the averages but that, as long as they are diversified, the stupid cannot underperform. Picking a portfolio that does worse than the S&P 500 is just as onerous as picking one that does better. So, uninformed investors can ride free on efficient market prices and be protected.

The evidence I have presented suggests a different model of financial markets, one in which wealth flows from the poorly informed to the well informed. Can this process last? I don't see why not. Foolishness characterizes all times and all places. Centuries ago, Erasmus of Rotterdam wrote a book called *In Praise of Folly*, and history shows that irrationality, prejudice, and superstition are pervasive. I have deep doubts about the rationalist

philosophy of the Enlightenment that lurks behind neoclassical economics.

**Question:** What can we do to improve our own judgment?

**De Bondt:** Overcoming our natural biases is not easy, but a better awareness of the intuitive ways in which people look at problems can help. People should learn as much as they can about decision making—by, for instance, making themselves familiar with the laboratory research of psychology professors Amos Tversky and Daniel Kahneman or by reading the memoirs of important political and business leaders.

**Question:** Technical analysis seems to take behavioral biases into account. Why don't more people use technical analysis?

**De Bondt:** Behavioral finance and technical analysis agree on the relevance of investor psychology for asset pricing. The two approaches differ, however, in that technical analysis is the arena of practitioners and has not really gone through the rigors of scientific testing. Behavioral finance is part of science. Its adherents start from fundamental behavioral axioms (such as loss aversion or overreaction to salient news) and ask whether the theory built on the axioms can explain the stylized facts around us. Finally, they perform empirical tests to check the theory's predictive power out of sample. Thus, behavioral finance is much more rigorous than technical analysis.