

The Psychology of Financial Decision-Making: Applications to Trading, Dealing, and Investment Analysis

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This paper offers a whole range of areas in which the latest work on psychology, social psychology and behavioral finance could offer competitive advantage both to financial markets as well as individual firms. The aim is to identify potential applications of experimental and organizational psychology to improve the efficiency of financial institutions. The focus is on two major areas of application: trading and dealing in currencies, and investment decision-making.

The paper reviews the seven deadly sins in individual decision-making showing how the financial decision-maker may fall prey to them. It also suggests how this knowledge can be put to use in improving efficiency in financial strategy, marketing, and human resource management (selection, training, decision-aiding, and control). The paper concludes by identifying important questions for the financial markets to consider if they are serious about improving managerial practices.

“Everyone complains about his memory, and no-one complains about his judgment”

—La Rochefoucauld

Background and Aims: From Behavioral Finance to Applied Psychology

The financial markets operate in a fast-changing and increasingly competitive environment, with activity that is being revolutionized in at least two ways. The first development is technological. Screen-based trading has replaced floor trading, and institutions such as LIFFE in London that did not adapt fast enough lost business to foreign competitors. A new wave of market restructuring is being driven by Internet trading.

The second development is geopolitical. Globalization has affected financial centers in many ways, leading to the creation of three major time zones for trading (U.S., Europe, and Asia), which has resulted in specialization. For example, the City of London has become Europe's leading financial center. Such positions of preeminence are continually under threat, and major financial centers need to justify their preeminence by

continually providing better services than their regional and international competitors.

There is currently another revolution taking place, which is intellectual in nature. This is the new field of behavioral finance (Lifson and Geist [1999]; Shefrin [1999]; Statman [1995]; and Thaler [1993]), which argues that people and markets have inherent tendencies toward irrationality. Unlike traditional economics, this new discipline does not assume that people are perfectly rational, nor does it assume that market irrationality is due to imperfections in market mechanisms. It assumes that markets are composed of imperfectly rational players in imperfect markets (de Bondt [1998]).

Behavioral finance is the most visible application of recent work in experimental psychology on irrationality in human decision-making to the financial markets (Bazerman [1998]; Hogarth [1987]; Russo and Schoemaker [1991]). Experimental psychologists have built a substantial body of knowledge demonstrating biases and shortcomings in expert decision-making in general (Camerer [1981]), and economic decision-making in particular (Lopes [1994]). The implication for the financial markets of relevant research in psychology has recently begun to be diffused in the financial markets through books (e.g., Bernstein [1996]), articles in the financial press, and professional conferences on behavioral finance.

However, I believe the potential implications go beyond behavioral finance, which, with its focus on predicting and understanding market behavior, does not focus directly on the individual's decision processes. Behavioral finance tends to have more of an impact on financial strategy, e.g., in the choice of a contrarian or a momentum strategy in investing.

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I argue that psychology can also be applied to decision-training and decision-aiding, as well as financial product marketing and the traditional human resource management concerns of recruitment, training, compensation, and control. My aim here is to identify potential applications of experimental and organizational psychology to improve the efficiency of financial institutions. I focus on two major areas of application: trading and dealing in currencies, and investment decision-making. What empirical work that does exist on these activities encourages the belief that market participants are not impervious to the kinds of judgmental biases (e.g., confirmation bias, loss aversion) demonstrated in other domains, such as managerial and medical decision-making (e.g., Bazerman [1998] and Hilton [1997b]).

I focus on the unit of decision-making—the individual and the decision-making team—and describe research on the processes that drive financial decision-making. In the first section I review the seven deadly sins in individual decision-making (there are actually quite a few more), and then I show how the financial decision-maker may fall prey to them. Next I briefly consider the sources of collective irrationality that may further plague financial decision-making. I then suggest how this knowledge can be put to use in improving efficiency in financial strategy, marketing, and human resource management (selection, training, decision-aiding, and control). I distinguish the psychology of financial decision-making from behavioral finance, and conclude by identifying important questions for the financial markets to consider if they are serious about improving managerial practices.

The Seven Deadly Sins in Financial Decision-Making

I review seven well-known biases in human judgment and decision-making that collectively explain why financial markets are likely to be less than rational. They also offer a basis for understanding the behavior of professionals (investment fund managers, traders, and dealers) and individuals (whether private investors or fund clients), which I then use to make suggestions about the potential applications of psychology to financial markets.

Confirmation Bias in Hypothesis Testing and an Experimental Market

A well-known bias in human decision-making is to seek confirmation, rather than disconfirmation, for hypotheses. The danger of selectively searching for and interpreting information in financial markets is real. As the director of a U.K. investment fund pointed out to

me, “There is a lot of data out there. The data will support almost anything. You have to watch out for confirmation bias in your thinking.”

One simple way of demonstrating the prevalence of confirmation bias is through a simple card problem (Wason and Johnson-Laird [1972]). You are told that a pack of cards has letters on one side and numbers on the other. Imagine that someone makes the following statement: *If there is a vowel on one side then there is an even number on the other*. There are four cards drawn on the table in front of you, on which an E, a K, a 4, and a 7 are facing up. Which cards would you need to turn over to decide whether the statement is true or false?

Most people would turn over the E and the 4. In fact, the correct cards to turn over are the E and the 7, because you can only disprove the rule by turning over the E and the 7. However, most people more naturally look for confirmations, so they turn over the cards with the vowel (E) and the even number (4). The only exceptions I know of are French Grande Ecole students from the ESSEC business school, who are highly trained in mathematics. On the whole, people are not natural Popperians, even when nothing appears to be at stake as in this abstract card problem.

Work in experimental markets, such as Forsythe et al. [1992], suggests that those best able to resist confirmation bias are the most likely to make money. In Forsythe’s study, a team of economists and political scientists created and tracked a political stock market in which traders dealt in shares in Bush and Dukakis through a computerized system prior to the 1988 U.S. presidential election. Most profits went to a small minority of “marginal traders” who succeeded in buying low and selling high. These traders seemed to be able to resist confirmation bias by interpreting “news” dispassionately. For example, after each of the three televised debates, marginal traders adjusted their holdings in the candidates appropriately, regardless of whether they personally supported Bush or Dukakis. Other traders were more likely to interpret these debates as favoring their own candidate. In addition, the successful marginal traders were free of the false consensus bias, a tendency to overestimate the number of other people who share your preferences.

A final point is that this experimental market was remarkably efficient, in that the prices of shares in Bush and Dukakis predicted vote share on election day better (through a simple conversion formula) than all the major public opinion polls. This result was replicated in the 1992 U.S. election (Lopes [1994]), as well as in seven out of eight other political stock markets. It substantiates the Hayek hypothesis that a market can be efficient even if most of its participants are not fully rational. What this study adds, of course, is that the profits of arbitrage go to those who are free of judgmental biases. It seems to illustrate Soros’s [1998, p.

25] claim that a Popperian “disconfirmation bias” is 1) rational, 2) rare, and 3) profitable.

Optimism Bias and the Illusion of Control

Optimism bias refers to people’s tendency to believe that they are better than average, and that misfortunes are more likely to befall other people than themselves. 95% of British drivers believe that they are better than average (Sutherland [1992]). American students believe that a wide range of illnesses is more likely to happen to other students than themselves (Weber and Hilton [1990]). Buyers and sellers in zero-sum markets presumably believe that they have the edge over the other party in the transaction; otherwise the market would not exist.

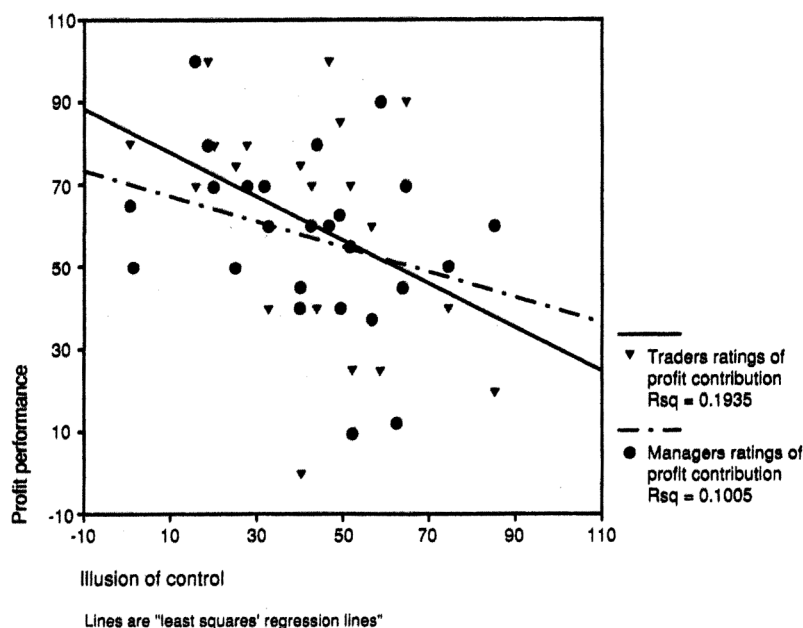
The closely related illusion of control refers to individuals’ tendency to overestimate the control they have over outcomes. It can be induced by cues suggesting that the individual’s skill and ability can make a difference to the outcome, even when they are actually irrelevant. A classic demonstration of this is provided by Langer [1975]. Participants received lottery tickets either through drawing them themselves (illusion of control) or through being given them by the lottery proprietor (no illusion of control). When asked for selling prices, those who had drawn the tickets themselves

wanted approximately twice as much, presumably reflecting their greater belief in the probability of winning.

In some domains, optimism bias can lead to superior performance. Seligman reports that door-to-door salesmen who attribute refusals to external factors (bad luck, unsuitable client) rather than internal factors (poor product, inaptitude for sales) are more likely to be successful. This is presumably due to their greater motivation to continue enthusiastically after repeated failures and the need to exude confidence in order to convince clients. However, this phenomenon does not seem to generalize to the impersonal financial markets conducted through screens in dealing rooms. Fenton O’Creevy et al. [1998] find that overoptimistic traders (by measuring the illusion of control via a series of computer-based tasks) are less likely to show successful performance, based on both self-report and supervisor assessments of contribution to overall desk profits (see Figure 1).

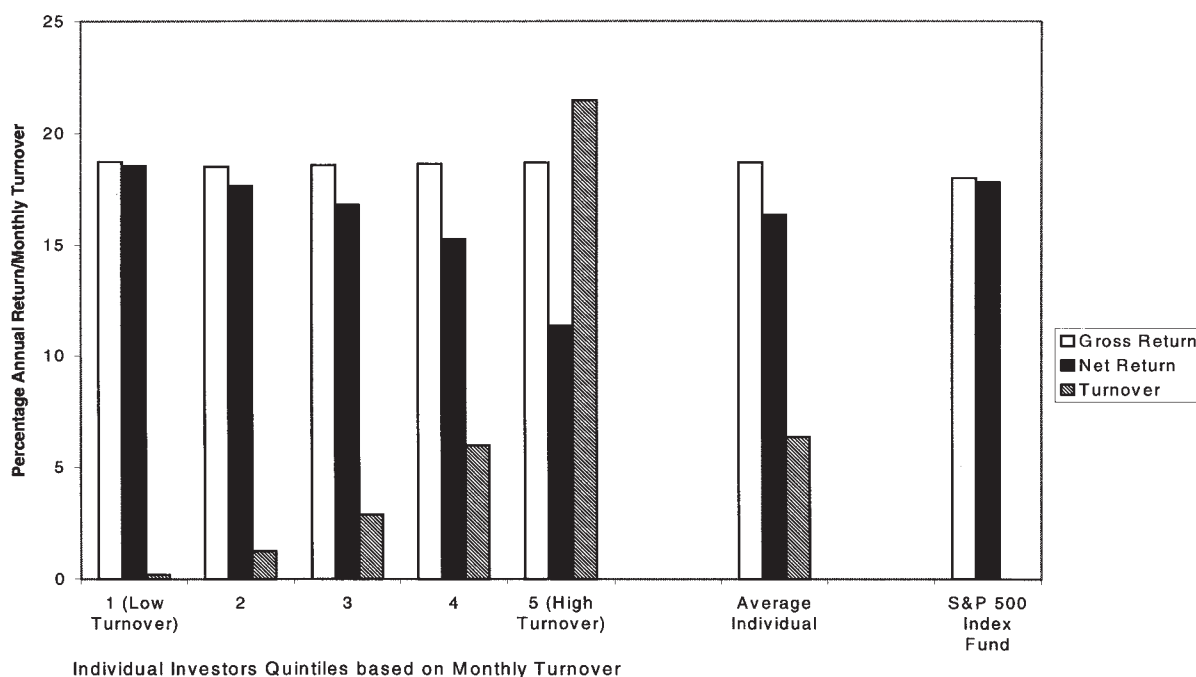
Further evidence that optimism bias hurts trading performance comes from studies of individual investors. A corollary of optimism bias is that it will incite people to trade more often because they believe they have higher chances of success, perhaps because they are reading the market better than other players. Consistent with this, Barber and Odean [2000a] find an average of 75% turnover per year in portfolios held at a discount brokerage, which is highly suggestive of ex-

FIGURE 1
Relations Between Measured Illusion of Control and Perceived Earnings of Traders
(Rated by the Traders Themselves and Their Supervisors)



Note: Adapted from Fenton O’Creevy et al. [1998].

FIGURE 2
Monthly Turnover and Annual Performance of Individual Investors



Note: Monthly turnover and annual performance of individual investors. The white bar (black bar) represents the gross (net) annualized geometric return from February 1991 to January 1997 for individual investor quintiles based on monthly turnover, the average individual investor, and the S&P 500. The net return on the S&P 500 Index Fund is that earned by the Vanguard Index 500. The striped bar represents the monthly turnover. Adapted from Barber and Odean [2000a]; published by Blackwell Publishers and © American Finance Association.

cessive optimism in trading. However, the problem with this kind of self-belief is that it can lead people to trade more often without a compensating increase in earnings. Barber and Odean compared high- and low-frequency traders in their sample, and found that high-frequency traders did not make higher gross profits (see Figure 2), but incurred greater trading costs (the average round-trip transaction costs of a trade due to commission and bid-ask spread is about 6%).

Barber and Odean's findings clearly run counter to the predictions of a rational analysis of trading behavior, which would expect trades only to occur when expected profits outweigh transaction costs. But they fit a model of trading behavior where traders are unrealistically overconfident about their abilities. The male investor seems particularly likely to be overconfident in this way. Survey research indicates that, compared to women, men spend more time and money on security analysis, rely less on their brokers, trade more actively, believe that returns are more highly predictable, and anticipate higher returns than women. Consistent with this argument, Barber and Odean's [2000b] analysis of discount brokerage accounts finds that men take riskier positions than women. They also find that men trade more often than women, and as a consequence incur less net returns. This difference between the sexes is

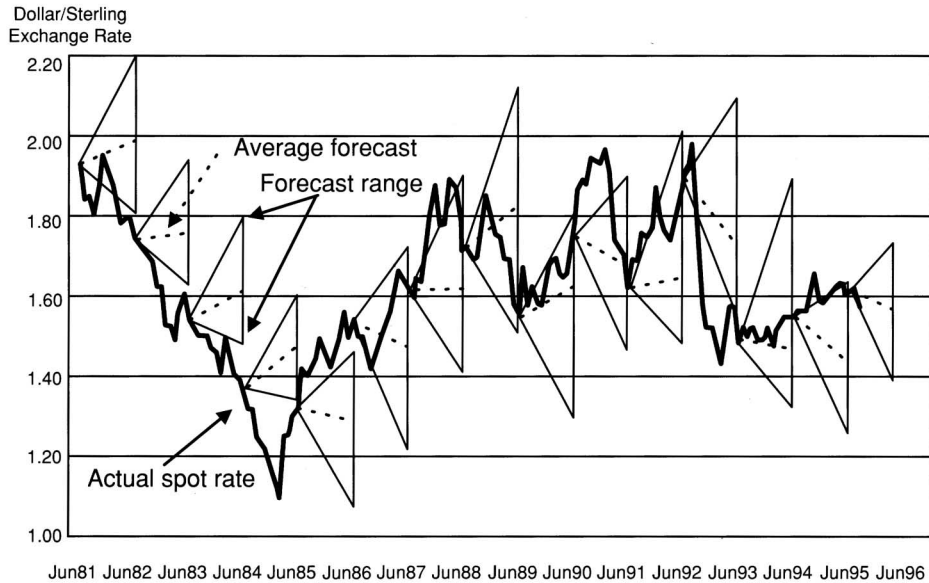
especially marked when single men are contrasted with single women!

Overconfidence in Predictions

Expert predictions about the behavior of financial markets are generally quite inaccurate. An amusing demonstration of this was given by *The Economist* ("Garbage In: Garbage Out," April 23, 1994, p. 86). In 1984, *The Economist* asked four groups of professionals to make ten-year predictions about economic prospects (four ex-finance ministers in OECD economies, four chairmen of multinational firms, four Oxford University economics students, and four London dustmen). Four indices were used: the average growth rate in the OECD during this period; average inflation; the price of oil in 1994; and when Singapore's GDP would overtake Australia's GDP. Joint winners were the businessmen and the dustmen; the finance ministers came last.

Further illustration of the pervasive inaccuracy of expert prediction comes from data collected by *Euromoney* and the Record Treasury Management on financial experts' and corporate treasurers' predictions about £/U.S.\$ and £/DM rates over the last two decades (see Figures 3 and 4). Finally, Wilkie-Thompson et al.

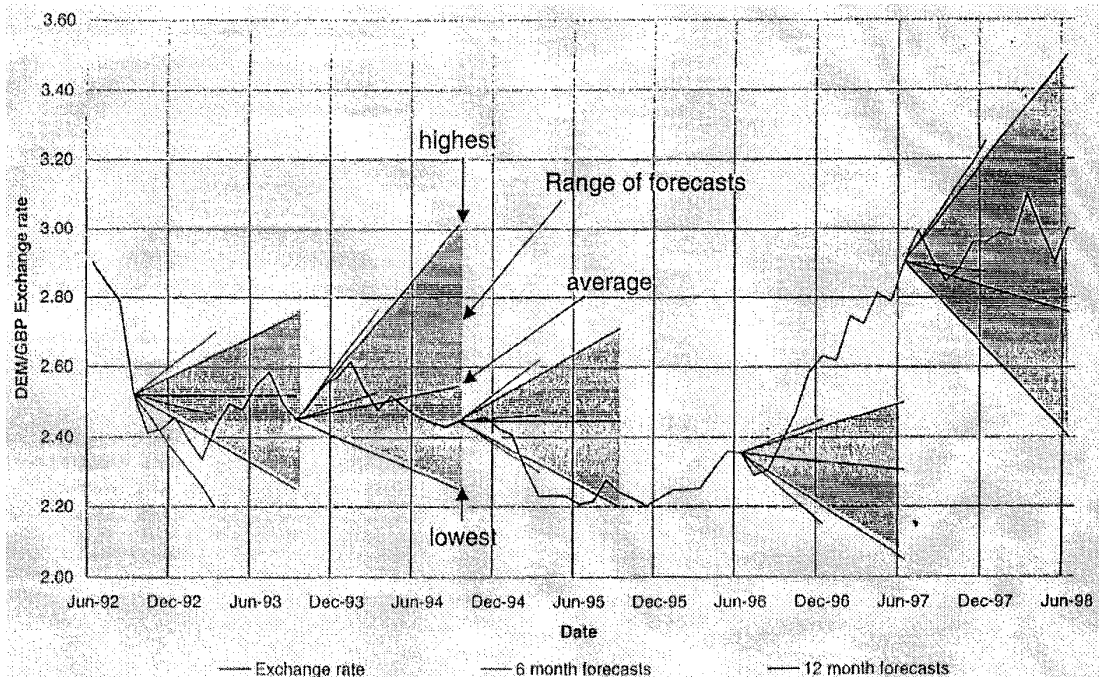
FIGURE 3
Forecasts of the U.S./£ Spot Rate at a Twelve-Month Horizon From Forty Top Foreign Exchange Forecasters Between 1981 and 1996



Every June Euromoney magazine surveys the top 40 professional foreign exchange forecasters for their forecasts of the \$/£ spot rate at a twelve month horizon. The triangles on the chart illustrate the range of forecasts, the dotted line the resulting average forecast and the thick black line the spot rate.

Note: Courtesy of Record Treasury Management and Euromoney.

FIGURE 4
Six-Month and One-Year Forecasts of U.S./£ Rates by U.K. Corporate Treasurers Between 1990 and 1998



Note: Courtesy of Record Treasury Management and Euromoney.

[1998] find that a panel of financial experts actually did worse than fourth-year students of mathematical finance at making predictions from a simulated series.

The overconfidence effect in expert predictions is well known to psychologists (Russo and Schoemaker [1991]), and can be assessed and corrected. A common way of assessing faulty calibration of predictions is to ask people to make a range prediction, so they are 90% sure that the actual value will fall within the range specified. For example, a money manager asked to make a prediction about the £/Euro exchange rate in six months could say that he is 90% sure that the exchange rate will be between 0.64 and 0.74 pounds. This procedure can of course be repeated with any number of other currency predictions, and if the manager is well calibrated, nine out of ten currency values should fall within the predicted range ("hits"). He should thus expect only one out of ten "misses" due to predictions falling outside the predicted range.

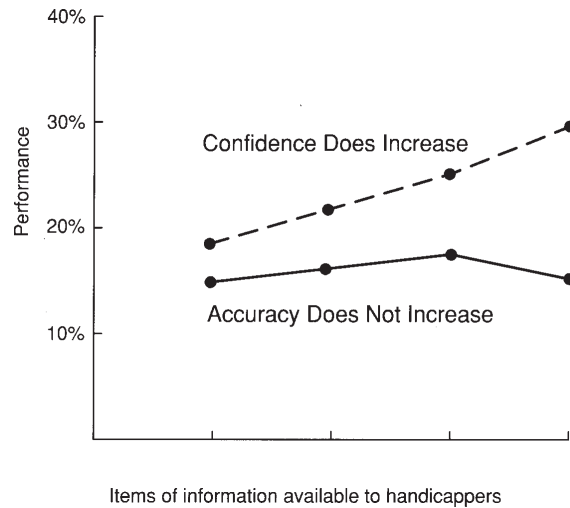
Using this procedure with thirty-six foreign exchange traders in a globally operating bank, Stephan [2000] finds strong evidence of faulty calibration, with high miss rates not only on exchange rate predictions (71.1%) but also on stock price questions (83.3%) and general knowledge questions (78.6%). Such overconfidence may be costly. In a simulated experimental market, Biais et al. [2000] finds that overconfident subjects are less likely to learn correct prices quickly and more likely to lose money in trading.

In today's markets, information is a double-edged sword—its presence should help us make accurate predictions and rational decisions, but it can also make us unduly overconfident in our predictions and decisions. This is especially likely today because the human decision-maker may have more information than he can effectively handle.

This point is illustrated by an unpublished study on horse race handicapping by Slovic and Corrigan, reported by Russo and Schoemaker [1991]. The eight handicappers who participated in this study were allowed to select five, ten, twenty, and forty pieces of information from "past performance charts" that gave nearly 100 pieces of information on each horse and its history. At each point they were asked to make a prediction. Overall, accuracy did not increase (see Figure 5). This flat curve is due to three handicappers decreasing in accuracy, two improving, and three staying about the same. However, the handicappers' confidence in their predictions did increase with further information, so that they became even more overconfident with forty items of information than they were with five.

Finally, note that in any sample of market traders some will inevitably appear to be better than average (for a while) simply through chance (the "star performer" phenomenon). However, if they are genuinely skillful, they will show consistently superior perfor-

FIGURE 5
Relationship Between Number of Items of Information Available to Horse-Race Handicappers, Confidence in and Accuracy of Odds Given



Note: From Slovic and Corrigan [1974]; figure adapted from Russo and Schoemaker [1991].

mance. Hartzmark [1991] tested this hypothesis through an analysis of traders' positions in U.S. futures markets in commodities, T-bonds, and T-bills from 1977 to 1981. He found strong support for the view that predictions in these markets were randomly generated. "Stars" from the first two-year period showed regression to the mean in the second period, and initial underperformers also showed a tendency to "improve." Hartzmark concluded that luck, rather than forecast performance, is the best explanation for superior forecast performance.

The failure of financial decision-makers to learn from feedback and calibrate predictions accurately is especially intriguing given that markets are supposed to correct inaccurate expectations. One would expect people playing the market every day to get corrective (and expensive) feedback—for "experience is a dear teacher" (Benjamin Franklin).

But there seem to be several plausible reasons for this. Humans have a horror of accepting randomness and seek causal explanations even where behavior is random (Heider and Simmel [1944]; Oatley and Yuill [1984]). Hindsight bias (Fischhoff [1982]) means that post-hoc explanations are always easy to invent after the fact. Events such as the allied victory in the Gulf War in 1991, the pound's departure from the ERM in 1992, and LIFFE's collapse in 1998 seem inevitable with retrospect, thus making the world seem more predictable than it is. Financial markets seem especially prone to rewriting history. As Fischhoff [1982b] puts it when discussing examples of hindsight bias: "One of

my favorite contrasts is that when the market rises following good economic news, it is said to be responding to the news; if it falls, that is explained by saying that the good news had already been discounted.”

Feedback in financial markets may be inherently difficult to recognize due to the high level of noise in markets. Failure to learn action outcome relations may be accentuated by self-serving attributions for success and failure (taking credit for successes and laying blame on external factors). Feedback may be asymmetrical, in that corporate treasurers and pension fund managers may invoke procedures to limit losses but not gains. Hedge fund managers may be symmetrical in terms of feedback, leading to a short half-life due to the greater probability of having to leave one’s position if the fund underperforms. However, those that survive three years in a row and get good “reputations” for persistently performing “above average” may do so only through chance. As we see below, Westerners in particular tend to commit the fundamental attribution error of underestimating the role of situational factors (such as chance) as causes of performance.

Mistaken Beliefs: Illusory and Invisible Correlations

For the rational expectations theory to work as a model of market behavior, market participants must be able to form accurate beliefs about the correlations between characteristics: that higher price does indeed correlate with better quality, spending money on advertising will increase market share, and so on. Otherwise, rational agents pay unnecessarily high prices for products, or waste time and money on pointless advertising campaigns. Likewise, a rational agent should not fail to notice relationships that are predictive of product quality, market share, and so on.

However, research suggests that the business world is rife with illusory correlations—beliefs that inaccurately suppose a relationship between a certain type of action and an effect, such as the belief that unstructured interviews enable accurate assessments of people’s personalities (Dawes [1994]). The world of finance is no exception. In a recent article in the *Journal of Applied Corporate Finance*, Alberic Braas and Charles N. Bralver argue that managers typically overattribute trader profits to speculative positioning and fail to take into account “the value of the turn”—that is, profits that accrue from being able to keep the bid–offer spread. Their analysis suggests that players with a stronger market-making capacity get to keep the lion’s share of the spread, and these firms generate the majority of their profits this way. They cite a fixed-income trader for a New York powerhouse who told them, “Any trader I put in the five- to seven-year chair makes a lot of money for us; each of them thinks he is making

the money with his smart calls. But it’s really the chair that makes the money.” Failure to recognize this reality is a classic example of a particular kind of illusory correlation known as the fundamental attribution error—overattributing performance to the person and under-attributing it to the situation.

Conversely, an invisible correlation may be said to exist if a correlation that is “out there” is not spotted by a relevant community of experts. An example is the correlation between smoking and cancer, which was not spotted by doctors for three centuries. Recent research at the Max Planck Institute’s Center for Adaptive Behavior and Cognition suggests that the finance community may have also failed to spot some interesting correlations. As part of their research program on “simple but smart” heuristics, researchers at the MPI used the fame of German companies to predict share performance. They asked German laypeople whether they recognized a list of firms, and invested only in firms that were recognized by over 90% of the respondents.

A similar procedure was used in the U.S. with U.S. firms and American laypeople. Over six months, the portfolios constructed this way had an overall better performance than the market, and outperformed both the Dax30 and Dow30 indices as well as the German Hypobank and Fidelity Growth funds that were used as benchmarks. It seems that economics journals are reticent about publishing these results, however. Perhaps they are awaiting more evidence? Nevertheless, one of the Max Planck team (Gerd Gigerenzer) was still smiling: He invested his own money in these portfolios, which latest reports confirm are still performing above average.

Risk Aversion, the “Disposition Effect,” and the Framing of Investment Choices

Imagine the following problem: Which choice would you prefer?

- a) a 25% chance of winning \$30,000, with a 75% chance of winning nothing; or
- b) a 20% chance of winning \$40,000

Most people choose (b) (Kahneman and Tversky [1979]). Now imagine the following problem: You are in a game with four players. Only one will move on to the next round (the others will win nothing). Imagine that you reach the second stage and you face the following choice:

- a) a sure win of \$30,000; or
- b) an 80% chance of winning \$40,000

Most people choose (a) (Kahneman and Tversky [1979]). This reflects a bias called risk aversion, and reflects a tendency to value certainty. However, the fact that people show preference reversals when the same problem is framed differently delivers a fatal blow to expected utility theory as a descriptive model of human decision-making. If people use expected utility theory, they should have picked (b) in both cases.

Do financial decision-makers show irrational and/or systematic risk aversion? Some recent research indicates that this may be the case. One does not have to look far to see the importance of this principle for financial markets. It predicts the “disposition effect” (Shefrin and Statman [1985])—the tendency to sell winners too early and ride losers too long due to loss aversion. For example, Odean’s [1998] study of individual investors’ accounts with a discount brokerage in the U.S. shows that investors tend to buy the same number of winners and losers but to sell more winners than losers, except in December when there are tax incentives to sell losers. Investors also sell both winners and losers too early—the securities they buy underperform the ones they sell over a one-year time period, although losers tend to recover in the second year.

The disposition effect is also liable to affect professional traders and investors. Shapira and Venezia [2000] report market data suggesting that Israeli fund managers show the disposition effect. Although the fund managers show a less strong disposition effect than private investors, this effect could not be explained by tax incentives, because profits are not taxed in Israel. In a study on corporate investors, Steil [1993] finds that corporate treasurers show clear risk aversion in their responses to a survey with problems involving foreign exchange risk. He concludes that their behavior on these realistic problems could not be explained by rational (Bayesian) models.

Finally, Kahneman and Tversky’s [1979] research shows that people’s tendency to risk aversion can change radically when they are faced with losses. Consider the following options:

- a) a sure loss of \$30,000; or
- b) a 20% chance of losing nothing, and an 80% chance of losing \$40,000

Here, research indicates that most people would choose (b), while they would choose (a) in the previous problem concerning gains. Generally speaking, people become extremely risk seeking when confronted with losses.

In another in-depth study conducted on ten traders at one of Wall Street’s ten largest investment banking firms, Shapira [1999] found ample evidence that professional traders’ behavior is affected by framing, specifically whether they are showing a profit or a loss for the day’s trading. As Kahneman and Tversky’s model

would predict, even for professional traders, losses loom larger than gains, and they are more likely to take risks if they are losing with respect to their reference point. Shapira tracked the trades of twenty government bond traders, and was able to show that the greater the profit or loss (P&L) account from the previous day, the more traders bought and sold the following day. In addition, losses loomed larger than gains; this tendency to previous activity was especially strong if the previous day had ended in a loss. Traders also took riskier positions on the day after a loss. Finally, this tendency to risk-seeking after losses also manifested itself within the day’s trading: Traders showed a tendency to take “long shots” in the last hour or two of trading at the end of the day if they were down at 3:00pm. None of this behavior can be predicted by rational models of choice, and seems unlikely to contribute to the overall efficiency of a trading desk’s performance.

Thus, professional traders, like private investors, need to guard against the disposition effect through appropriate “mental accounting.” A recurring theme in Patel’s [1997] series of interviews with leading professional traders is the importance of self-discipline, and the ability to cut one’s losses. He posits that traders should “reframe” their positions by asking themselves whether they would buy the stock they are now holding at its present price. If not, they should sell.

Others stress the importance of “wiping the slate clean” every day, and forgetting about previous losses (see insert below). Otherwise, traders may find themselves taking long shots to try to eradicate losses. This is an all too real temptation, as the case of Barings Bank and Nick Leeson shows, and it may be generalizable. Partnoy [1998] reports other cases, and suggests that there may be more that have been covered up by banks who were big enough to take the losses.

Mental Rigidity: The Psychology of Under- and Overreaction in Financial Markets

If most players in a market are conservative, owing to such factors as status quo bias (Samuelson and Zeckhauser [1987]) and confirmation bias, they will react insufficiently to information that disconfirms prevailing market opinion (e.g., information about a particular stock, sector, or market). This is the underreaction phase. Eventually, so much negative information will accumulate that the market will collectively revise its opinion and start selling. This tendency is reinforced by the self-fulfilling nature of market prophecies (Orléan [1998]) and will result in herding behavior and a race to sell. This is the overreaction phase. As a director of a U.K. investment fund put it to me: “Markets are a form of groupthink. Part of what the markets do is self-reinforcing.”

These phases of market underreaction and overreaction can present attractive opportunities for investors (de Bondt [1998]; Vriesen and Tempelaar [1998]). Specifically, momentum strategies (going with the trend) are likely to be successful over short time periods (six to twelve months), while contrarian strategies are likely to be successful over long time periods (three to five years). This is because market participants who share a positive sentiment about an asset will continue to buy even when negative information is beginning to accumulate. However, this negative information will eventually result in an overenthusiastic price revision, which does not take into account factors such as the probability that firms with bad results will turn themselves around, and that very few actually go out of business.

Even for those who are aware of these findings (and who believe that the markets will continue to behave in this slow seesaw fashion), there are still psychological barriers to capitalizing on them. First, the contrarian strategy almost inevitably leads to initial losses as an undervalued stock continues to go down. People are very averse to losses (Kahneman and Tversky [1979]), and may be panicked by short-term losses into selling. Second, those buying losers run the risk that some will go through the floor and go out of business. Ahead of time, people tend to find even very small probabilities of losses to be highly aversive. Third, when such a loss occurs, people may find this very aversive even if the other “losers” in a portfolio are doing well enough to compensate for the loss, an example of a mental accounting fallacy (Thaler [1992]). This may well be sufficient to deter fund managers from implementing such strategies. Even if a fund manager believes in the worth of such contrarian strategies, he may have problems explaining to clients his philosophy of investing in firms that go out of business.

Mental Accounting Biases: The Construction of Values and Preferences

Mental accounting fallacies occur due to the effect of context on people's evaluation of the same items. For example, one group of spectators was asked to estimate the number of fouls committed during a football match they were watching, and another group was asked to estimate the number of fouls committed 1) in the first half, and 2) in the second half. Spectators' estimates of the total number of fouls committed in the two halves regularly exceeded that of the single whole. People's memories are, in an important sense, constructed on the spot rather than retrieved intact from a stable long-term memory, and are thus susceptible to influence by irrelevant contextual factors at the time of judgment.

Just as memories for events are not retrieved wholesale from memory, so it seems that we do not have “intrinsic values” that we retrieve from our deepest “real” selves that determine our choices. This fact has considerable implications for marketing in general (Hilton [1997a]) and for financial marketing in particular (Shefrin and Statman [1993]). In one experiment, Benartzi and Thaler [1998] conducted a survey of employees of the University of California about how they would like to allocate their funds between two funds, A and B. Both funds offered the option of diversifying between stocks and bonds (up to 100% in stocks and 0% in bonds, or vice versa), but varied the way in which they presented the options.

The kinds of options presented had substantial effects on participants' preferences (Benartzi and Thaler [1998]). Thus, in the first experimental condition, Fund A invested in stocks and Fund B invested in bonds. In the second condition, Fund A was again a stock fund, but Fund B was a “balanced fund” investing half its assets in stocks and half in bonds. In the third condition, Fund A was the balanced fund and Fund B was a bond fund. Participants allocated a total of 54% of their wealth to stocks in condition 1 (stocks versus bonds), 46% to condition 2 (stocks versus a balanced fund), and 61% to condition 3 (bonds versus a balanced fund). Benartzi and Thaler found evidence for two strong behavioral tendencies: dividing the assets fifty-fifty between the two options proposed, and putting everything into the “balanced” (fifty-fifty) fund.

The Social Context of Decision-Making

The Aggregate Mind and Market Confidence: Bears, Bulls, and Overreaction

Keynes compared markets to beauty contests, in which judges not only had to take into account their own preferences about the prettiest face but also the preferences of other judges. Finance professionals may see it as part of their job to talk to other players in there. But they may be less aware of the potential influence of other people's opinions on their own mood and behavior.

Consider the difference in the likely state of mind of an investor in stable and unstable markets. Investors in a long-term stable bull market, such as the U.S. stock market between 1949 and 1960, which rose almost continually by over 600%, are likely to feel self-confident. They will feel that their investment strategies are working because they are making money. Investors in a long-term unstable market, such as the U.S. stock market between 1966 and 1982, which went down an overall 9% after wild fluctuations, are likely to feel unsure of them. So-

cial psychological research shows that people who feel sure of themselves and their judgments are likely to pay little attention to the opinions of others in forming their judgments, unlike people who are unsure of them.

Following this reasoning, Schachter [1985] reasoned that investors in the stable bull market of 1949 to 1960 would be more independently minded than those of the unstable market of 1966 to 1982. Independently minded investors should be less likely to be shaken from their strategies by “news” of external events impinging on the market.

Schachter and his colleagues obtained corroboration of this reasoning. For example, markets reacted rather less to the results of U.S. presidential elections during 1949–1960 than over 1966–1982. The volume of post-election day trading went up an average of only 9.2% in 1949–1960, but by 47.3% in 1966–1982. In another analysis, they showed that the 1949–1960 market reacted less than the 1966–1982 one to airline disasters: Trading in the shares of the airline and/or manufacturer affected went up 29.6% during 1949–1960 but 166.7% during 1966–1982. More focused analysis of bull and bear runs within these time periods paint the same picture: Investors react more to external news and tips during bear runs than bull runs.

Schachter’s results are consistent with laboratory research that shows individuals with low self-esteem and confidence are more susceptible to influence by others. It also throws light on the kinds of social processes that are likely to result in financial bubbles (Mackay [1841/1932]). As we see next, such social influence processes can also explain irrational behavior in organizations and work groups.

Groupthink and Risky Shift

The organizational theorist Henry Mintzberg estimated that the average manager spends over two-thirds of his time talking to colleagues, workers, and anybody else he chances to come across during the day. These meetings and conversations, whether formal or informal, enable a manager to get an enormous number of decisions made. Consequently, it behooves us to understand how decision-making is affected by our interaction with others.

One well-known phenomenon in group decision-making is groupthink—a process whereby a group of individuals mutually reinforce each other into believing that their collective point of view is right. Research on groupthink grew out of identification of the group polarization phenomenon, which began with the discovery of the risky shift in group decision-making by Stoner [1968]. When presented with risky choices to make, students at the School of Industrial Management at the Massachusetts Institute of Technology were often likely to prefer riskier options after group discussion. Stoner found that twelve of the thirteen groups he studied

showed a significant collective shift toward greater risk after discussion compared to the average of each individual’s position before discussion. Indeed, subjects recorded their own opinion before and after the discussion, and appeared to have genuinely changed their minds as a result of the discussion. The risky shift effect has proven very robust, having been replicated in 100 studies conducted in over a dozen countries.

With certain kinds of topics, group discussion tends to lead to greater caution, an effect known as cautious shift. Cautious shift typically occurs, for example, after discussion of risky decisions involving health or human life. Social psychologists prefer to talk about group polarization—the intensification of shared attitude positions (to anything ranging from risky decisions to politicians) through group discussion. Explanations for this include information sharing (through discussion each individual may hear of new reasons to support his initial position, leading him or her to become more confident), and diffusion of responsibility (the individual’s neck is no longer on the line if the group takes a risky decision and it goes wrong).

In general, research shows that groups make better decisions than individuals. The traditional explanations for this are that more information is likely to be shared, different points of view examined, and so on. However, research also shows that group discussion is more likely to improve decision quality if it is conducted in ways that facilitate information pooling and objective and complete analysis of options, and that there are circumstances in which group discussion actually worsens decision-making performance, as in the groupthink phenomenon. These cases may be more frequent than people think. For example, research on brainstorming suggests that it is a less productive method of generating ideas than having the same people work individually on generating ideas. Given that most management decisions are made in consultation with others, there seems to be considerable scope for research on whether certain kinds of group discussion styles are likely to lead to better financial decisions (as measured by some objective criterion).

Effects of Accountability on Decision-Making

Another perspective on social processes in decision-making is obtained through examining how the effect of having to explain or justify one’s position to others affects people’s judgment and decision processes. Pilkington and Parker-Jones [1996] find that trainee doctors who were asked to explain their reasoning to a non-expert showed evidence of better learning and diagnostic performance. Similar improvement was not observed when the medical students had to explain their reasoning to another medical student. Giving explanations to others may force decision-makers to ar-

ticulate assumptions and explore options more fully, especially when their interlocutors are not familiar with the domain.

People appear to make choices through weighing the pros and cons of options and choosing the one with the most reasons in its favor. For example, Simonson [1989] found that when people are asked to explain their preferences, they are more likely to make certain choices than others. One part of Simonson's research concerned consumer decisions about six-packs of beer, as shown below:

- | | |
|-----------------------|--------------|
| A. Quality rating: 50 | Cost: \$1.80 |
| B. Quality rating: 70 | Cost: \$2.60 |
| C. Quality rating: 40 | Cost: \$1.80 |

When presented with options A and B, people were split 50/50 between the two. However, when presented with options A, B, and C, people were more likely to choose A. This effect can be predicted if one assumes that when asked to justify their choice, people look for reasons to prefer one option over the other. Option A offers the most possible reasons, since it is better than option B on price, better than C on quality, and worse than B on quality, leading to two reasons for and one against. Option B offers two reasons for (better than A and C on quality) and two against (worse than both on price). This effect goes against expected utility theory, because the existence of the unattractive alternative C should not alter the decision-maker's relative preferences for A or B. Moreover, when asked to justify their choice, people were even more likely to choose A than when they were asked to choose without giving a justification. This is presumably because making people accountable puts them under pressure to come up with a good reason to justify their choice.

This last finding illustrates the point that making decision-makers accountable may make them less (not more) rational. In social life, we are often required to explain and justify our decisions to others. Indeed, the very aim of decision-making is often to produce a decision that one can justify to others—for example, to one's desk manager in a trading room. This consideration has been shown to affect risky choice. Thus, when people know they will have to justify their decision, they may be less concerned about maximizing expected utility in their decision-making than about constructing the decision that is the most easily defended in public.

Tetlock and Boettger [1994] demonstrate this kind of effect using a simulation of a healthcare policy problem in which they asked students whether they were for or against the introduction of a new anticoagulant drug. This drug was expected to save a certain number of lives (300, 600, or 900) according to the experimental condition, but with a cost due to deaths from hemorrhaging (0, 100, or 300, respectively). Accountable decision-makers, who expected to have to justify their de-

cisions, were much less likely to choose the drug if an identifiable number of people would be killed. They were also more likely to seek further research before approving the drug, even if this meant the deaths of many people in the meantime. This effect was even stronger when judging a drug that was not already on the market, presumably because the accountable decision-maker would feel even more responsible for the consequences if his decision also allowed introduction of the drug to the market.

Accountability pressures of this kind may make the individual trader unduly risk averse and more likely to forego attractive (but risky) opportunities, even though their desk managers may prefer their traders to take attractive risks and thus maximize the desk's overall profits. Experimental research has shown that if people know they will have to justify their decision before analyzing information about a defendant's guilt in a mock trial, they will use more information and be less subject to confirmation bias. If they are made accountable only after they have analyzed the information, they will become more dogmatic and selectively find reasons to defend a decision based on an incomplete analysis of the initial information. Given that many financial market managers are currently pondering what kind of control to exert over people working in teams under them to encourage maximum performance, research on the effects of accountability on financial decision-making would be very timely.

Potential Applications of Psychology for Finance

I next review some potential applications of psychology to finance. There are three main areas: financial strategy, marketing of financial products, and human resource management. Of these three, I say the most about the last, with specific reference to selection and training of traders and dealers and to investment decision-making.

The Psychology of Markets and Financial Strategy

The identification of successful investment strategies is one of the major applications of behavioral finance. Behavioral finance seeks to identify and explain anomalies in economic behavior, such as underreaction, overreaction, and calendar effects in security prices (Thaler [1992]). These in turn suggest investment strategies of various kinds (de Bondt [1998]; Vriesen and Tempelaar [1998]), such as momentum strategies (going with the trend) for short-term investments (six to twelve months) and contrarian strategies (going against the trend) for longer-term investments (three to five years).

The potential role of psychology. Psychologists have little to contribute directly to applications here. Their main influence is indirect, through providing insights and findings that researchers in economics and finance can build on to construct their own theories in behavioral finance, which can then be diffused to practitioners through the financial press, seminars, and consulting. For the continuing stimulation of economics by psychology to continue, however, it is important for the financial community that fundamental research in the psychology of decision-making is adequately supported.

The Psychology of the Client and Marketing of Financial Products

Psychology has a contribution to make in three main areas:

The design of financial products. Portfolio managers must satisfy their clients, which means having to take the client's "psychology" into account. For most investors, risk means the chance of a loss rather than the swings in the value of an investment, although the latter definition of risk corresponds to that found in classical economics (Fortuna [1998]). Because clients think about risk in this way, and are highly averse to losses, financial products such as "click funds" that reduce downside risk are likely to prove very attractive (Smid and Tempelaar [1997]).

The presentation of financial products. Benartzi and Thaler's [1998] research shows that very minor changes in the presentations of portfolios can lead to substantial changes in client preferences. Their findings are consistent with a wide range of research on the construction of preferences in psychology and marketing that has yet to be applied to financial products (Hilton [1997a]). This seems an obvious area for further research.

Communication, client satisfaction, and loyalty. Psychology has long contributed theories and methods to marketing research, and can therefore be used in financial marketing. Psychological research can be used to develop theories about how best to present and explain complex financial products to clients, thereby better matching the clients' needs. Mental framing strategies can be used to "teach" clients how to think appropriately about risk, and to avoid nasty surprises later on. Measures such as these should ensure greater client satisfaction and fidelity. At the present stage of knowledge, more research on communication and framing strategies for financial products is needed.

The Psychology of Financial Decision-Makers: Human Resource Management

Trading and dealing. Initial research into this area suggests that London-based traders and dealers do show evidence of decision biases that affect their profitability. As noted earlier, Fenton O'Creevy et al. [1998] find that the dealer tendency to suffer from the illusion of control has led to worse earnings performance. The data currently available are based on small samples, however, and the findings need to be replicated. But they are highly suggestive, as people who believe themselves to be "in control" may project the very personality characteristics that clients seek at the recruitment stage.

Apart from the above research, there appears to have been little done to establish which characteristics predict good performance. Anecdotal evidence suggests that poor traders may differ from good traders because they have "long loss tails" due to letting losses run (see the interviews with successful traders in Patel [1997]). These conjectures, however, although well informed, remain just that for the moment.

Profiles of successful traders and dealers. Research needs to be done to identify the psychological characteristics of successful traders and dealers. The relevant psychological characteristics can be divided into four types: cognitive, personality, ability and knowledge, and sociometric. Establishment of these profiles could be used to aid selection and training through the establishment of standardized measures to answer questions such as: Do cognitive biases such as overconfidence and illusion of control lead to suboptimal trading performance? Should traders have aggressive Type A personalities or calmer Type B personalities? Which of the "Big Five" personality characteristics (extraversion, agreeableness, conscientiousness, emotional stability, and intellect) correlate with optimal performance? Is success simply predicted by IQ, or is verbal and/or spatial/numerical ability most important? Is the possession of rich, non-redundant social networks that get traders vital information before others the key to success? These and other questions (Hilton [1999]) seem eminently researchable, and have clear implications for the bottom line.

Policy capturing of successful decision-makers. Another research strategy would be to study successful and less successful decision-makers to attempt to "capture" their judgmental policies. Slovic [1969] reports a policy capturing study in which two stockbrokers were presented with 128 hypothetical companies that varied systematically in terms of eleven investment indices such as yield, near-term prospects, earnings quarterly trend, and so on. The results yield some surprises.

Although the first judge had aided in the creation of the investment scenarios and the definition of the eleven dimensions of evaluation for stocks, an analysis of his judgment patterns revealed that he was only influenced by eight of them. The second judge used seven of these factors. Overall, only five of the eleven factors were used by both judges, and even these five were often weighted quite differently. This latter finding helps explain why there was only a 32% agreement between the two experts, although it is interesting to note that the second stockbroker was recruited because it was believed he had a similar investment policy to the first.

Finally, the two stockbrokers were asked to estimate how much importance they accorded each factor. The first judge had considerable insight into his own judgment policy, but the second judge had very little such insight. A follow-up study on thirteen stockbrokers found that the longer an investment broker has been in the business, the less insight he has into his weighting policy (Slovic [1972]).

Other financial decisions are also likely to be captured by simple decision policies. Cornelli and Goldreich [2000] report that an investment bank's "decision policy" for pricing initial public offerings can be modeled by two cues alone (average limit price of bids and oversubscription).

Other studies suggest that one reason decision-makers may have little insight into the true causes of their financial choices is that they are unduly influenced by feelings. For example, MacGregor et al. [2000] show that business students are strongly influenced by positive and negative associations of financial products that are not based on relevant market information. They may have a positive "image" of a market sector such as "major pharmaceuticals" because this sector is associated with "healing," "beauty products," "cleanness," and so on, while another sector like "railroads" may be associated with negative features such as "dirty," "old," "used by poor people," and so on. Their judgments of how well these industry groupings had done in the past year and would do in the next year, as well as their willingness to buy, were predicted by how positive their images were of these sectors. However, their judgments and willingness to buy were only weakly related to indicators of actual performance.

Thus the policy capturing technique needs to be used more widely to understand financial analysis. Is successful decision-making correlated with the use of a wide range of features, or the high weighting of a few critical features? Is it correlated with insight into one's own decision policy? Is it influenced by subconscious "feelings"? In addition, this technique could have considerable potential as a training device to help stockbrokers and investment analysts gain insight into their own decision processes.

Decision training and debiasing. Research shows that it is difficult to debias decision-makers (Fischhoff [1982a]). Nevertheless, it can be successful. Russo and Schoemaker report that Shell has used calibration techniques to debias its geologists' forecasts of where to drill for oil, with corresponding savings for the corporation. And Bolger and Onkal-Atay [1998] report that calibration and feedback led to substantial improvement of management students' predictions of equity prices.

As one junior trader on the London markets put it: "Overconfidence is the big problem—you get carried away with success. You then have to go back over your behavioral attitude." Research should therefore be conducted to see what techniques are most effective in reducing biases in decision-making. Calibration and feedback techniques should be the first to be considered.

Decision-aiding. The technological revolution has made the problem of information overload ever more pressing for financial decision-makers. Current research on screen design has tried to use psychological research on perception and information processing to present information in the most "user-friendly" way. Nevertheless, it is not difficult to envisage how decision-making research could lead to the development of screens that provide an active role in decision aiding. This could be done through the development of "smart screens" that offer decision-aiding facilities. For example, screens could be programmed to solicit explicit probability judgments for predictions, to store them, and then to retrieve them for calibration exercises. These "automatic auditing" functions should aid financial decision-making performance.

Screens could also be "tailored" to offer decision aiding where it is most needed. For example, prior testing may identify individuals who are more subject than others to "availability bias" (overweighting of recent information). Others may be more subject to pseudodiagnosticity effects (failure to recognize the redundancy of information). Screens could therefore be designed to either remind individuals of "old" information, or to point out redundancy between incoming items of information (or even suppress redundant information). These decision aids could be tailored to address an individual's known weak points.

The development of such "smart screens" would presuppose the completion of research programs on how cognitive biases influence financial decision-making. For example, if the kind of profit and loss (P&L) account on traders' screens does indeed affect their risk-taking behavior, then desk managers should choose to show P&L information that is the most likely to influence a trader's behavior in the desired way (e.g., indexed to the last day versus the whole year). Smart

screens may also require some expert system inference engines to endow them with the capacity to recognize which information is relevant to which decision. Nevertheless, such systems could play an important role in ensuring that decision-makers have the relevant information in mind (and only that information) when making a decision. These kinds of systems have been shown to have considerable success in improving medical decision-making.

Financial expert systems. Research has shown that experts are regularly outperformed by simple regression equations based on the experts' own "theories" about the relationships between variables (Camerer [1981]). This phenomenon—known as bootstrapping—explains why computers can even outperform super-experts whose knowledge was used to create them. For example, Christine Downton, chief investment officer of fund manager Pareto partners in London, contributed her knowledge of investment decision-making to the creation of an expert system that manages bond portfolios in twelve major markets. The program uses rules that relate investment decisions to fundamental economic indicators. Backtesting suggests that the model has "a potential to outperform the index by 4%–5%." Although Downton checks the model's predictions, she never alters its recommendations. She explains that "we implement exactly what it says, we don't second-guess it. Usually, if I second-guess it, I'm wrong. And that's probably because I got out of bed on the wrong side." Her philosophy of the market is that the winners are those with consistent long-term views, while the losers are those who have no views and change their minds on the basis of recent data. "Most research into cognitive bias" says Downton "suggests that investors tend to overweight recent information."

Management control systems and trading desks. The introduction of screen-based trading has made management control and record-keeping much easier. Desk managers may use their own screens to examine what their traders and dealers are doing at any moment. The new technology has made new forms of management control and compensation possible.

However, there seems to be little consensus (and, again, less research) on what the best control and compensation systems would be. For example, would the knowledge used to justify one's decisions to a superior, or even to one's colleagues, lead to different decision-making patterns? Research on the effects of accountability on decision-making indicates that this is often the case. For example, it is easy to imagine that accountability will lead each member of a team of individuals to take less risky decisions in order to avoid the

opprobrium associated with a loss, although the team manager's preference would be for each individual to take the risky choices, thus maximizing the probability of collective gains. Accountability could thus, depending on the context, lead to better or to worse decisions from the collective point of view. Research should be done to ascertain the conditions under which accountability is likely to improve or worsen financial decision-making. These findings should give managers insights on when and how to make their subordinates accountable for their decisions.

More generally, there is considerable theory and research in organizational behavior on methods of team management and compensation practices. Again, there seems to be plenty of scope for applying this research to the analysis of financial institutions. Should desk managers be directive or democratic in managing their teams? Should they give regular feedback to traders and dealers on their performance? A harder question is: Should compensation be individual, collective, or a mixture of the two?

Investment decision-making and fund management. The kinds of skills required by investment decision-makers (fund managers, corporate treasurers, etc.) may be substantially different from those required by traders and dealers. While traders and dealers continually monitor market prices, investment decision-makers may be expected to take longer-term views and to be more interested in fundamentals. The thought processes involved may be qualitatively different, in that more weight is given to scenario construction and testing using causal theories about market behavior.

The fact that a few fund managers have persistently outperformed market indices over many years suggests that some investment styles are winners. Nevertheless, the persistent failure of many managed funds to outperform the stock index (Bernstein [1996]) suggests that there is scope to improve investment decision-making. This view is reinforced by the frequent failure of financial experts (reviewed above) to make accurate forecasts. It would therefore seem worthwhile to investigate investment decision-making in more detail.

For example, overconfidence in the accuracy of one's predictions seems to be such a robust and widespread phenomenon that it is probably multiply determined. Contributing causes probably include information overload, confirmation bias, failure to recognize informational redundancy, poor cue-outcome weighting, belief in illusory correlations between outcomes and cues, and failure to learn from feedback (Hilton [1998]). Research could be conducted on investment decision-makers with the aim of identifying the most common sources of bias. Does increasing the amount of information available to a decision-maker increase

his confidence without a corresponding increase in accuracy? If we limit the information available to a decision-maker, what kind of information is most likely to improve his accuracy?

In addition, policy capturing research may help differentiate the strategies used by successful and less successful managers. Teaching managers about the sources of their decision errors may help them overcome them.

Psychology and the Financial Markets: Research Perspectives

From Behavioral Economics to the Psychology of Financial Decision-Making

In reviewing this area I was struck by how little empirical work has actually been done on the psychological processes underlying trading, dealing, and investment decision-making. This observation is made all the more striking when one reads Slovic's [1972] review of the field, which makes innumerable suggestions for studies that remain to be carried out, such as policy capturing, how information acquisition may lead to overconfidence, and how market players may learn illusory correlations.

What has happened since Slovic's [1972] review is that economics has rediscovered psychology (Lewin [1996]), and this has spawned the new discipline of behavioral economics (Thaler [1992]). Although inspired by laboratory experiments in psychology (usually done on psychology students), the typical level of analysis of behavioral economics remains that of market behavior. Behavioral economists typically use psychological findings on judgmental heuristics such as availability, or overconfidence in judgments, to infer explanations for observed market behavior as indexed by price movements or volume of trading. The continuing stream of publications in behavioral economics attests to the success of this strategy in explaining market irrationalities that conventional economic models have difficulty explaining.

There has, however, been very little in-depth study of the decision processes of finance professionals themselves. Psychology here has much to offer, for in better understanding the psychological causes of irrationality, managers are better placed to remedy them. This is something that behavioral economics, with its focus on understanding and predicting market behavior, is less well placed to do. Elsewhere, I detail the kinds of specific studies based on the research reviewed in this article that could yield important policy recommendations for financial managers and decision-makers (Hilton [1999]).

What Does the Psychology of Finance Have to Offer the Markets?

Why fund psychological research on financial decision-making? I conclude this article with a simple thought, and for those for whom that is not enough, a simple calculation. The simple thought is that the efficiency of a "knowledge society" depends on the effectiveness with which that knowledge is used. For the past forty years, experimental psychological research has been making considerable advances in uncovering the "cognitive unconscious," which explains why smart, healthy, and sane people systematically make errors of judgment. Ingrained judgment strategies that may have been very adaptive in evolutionary history may be very inadaptable when confronted with complex problems in domains such as finance, law, and medicine. But people are generally unaware of their deficiencies, partly because almost everyone else shares them. All this illustrates the acuity of La Rochefoucauld's observation that "Everyone complains about his memory, and no-one complains about his judgment."

The simple calculation is the following: A conservative estimate of net revenues from the London money markets is \$15,000 billion per year. If better use of psychology contributed only an 0.1% increase in efficiency to revenue earnings in the City of London, this alone would amount to a revenue increase of \$15 billion a year. At the level of an individual firm we might imagine a typical trading desk that trades government securities and reports a trading profit of \$50 million per year. If a targeted psychological intervention led to a 1% increase in trading profits, this would increase trading profits for this company alone by \$500,000 per year. Assuming that the effect of the intervention lasted ten years, this would amount to a net gain of \$5 million.

I hope this helps the reader to decide the value of investing in psychology for the financial markets.

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References

- Barber, B., and T. Odean. "Trading is Hazardous to Your Wealth: The Common Stock Performance of Individual Investors." *Journal of Finance*, 54, (2000a), pp. 773–806.

- Barber, B., and T. Odean. "Boys Will Be Boys: Gender, Overconfidence and Common Stocks Investments." *Quarterly Journal of Economics*, (2000b).
- Bazerman, M. Judgment in Managerial Decision-Making. London: Wiley, 1998.
- Benartzi, S., and R.H. Thaler. "Naive Diversification Strategies in Defined Contribution Saving Plans." Unpublished paper, UCLA, 1998.
- Bernstein, P. Against the Gods: The Remarkable Story of Risk. Chichester: Wiley, 1996.
- Biais, B., D.J. Hilton, K. Mazurier, and S. Pouget. "Psychological Traits and Trading Strategies." Paper presented at the conference on Economics and Psychology, Brussels, June 2000.
- Bolger, F., and D. Onkal-Atay. "The Effects of Feedback on Judgmental Probability Forecasts From Time Series." Conference on Judgmental Inputs to the Forecasting Process, University College, London, November 1998.
- Camerer, C.F. "General Conditions For the Success of Bootstrapping Models." *Organizational Behavior and Human Performance*, 27, (1981), pp. 411–422.
- Cornelli, F., and D. Goldreich. "Bookbuilding: How Informative is the Order Book?" Paper presented at European Summer Symposium in Financial Markets, Studienzentrum Gerzensee, Switzerland, July 2000.
- de Bondt, W. "The Psychology of Under- and Overreaction in World Equity Markets." IIR Seminar on Behavioral Finance: The psychology of investment decision-making, London, November 1998.
- Fenton O'Creevy, M., N. Nicholson, E. Soane, and P. Willman. "Individual and Contextual Influences on the Market Behavior of Finance Professionals." ESRC Conference Paper, 1998.
- Fischhoff, B. "Debiasing." In D.E. Kahneman, P. Slovic, and A. Tversky, Judgment Under Uncertainty: Heuristics and Biases. Cambridge: Cambridge University Press, 1982a.
- Fischhoff, B. "For Those Condemned to Study the Past: Heuristics and Biases in Hindsight." In D.E. Kahneman, P. Slovic, and A. Tversky, Judgment Under Uncertainty: Heuristics and Biases. Cambridge: Cambridge University Press, 1982a.
- Forsythe, R., F. Nelson, G.R. Neumann, and J. Wright. "Anatomy of an Experimental Stock Market." *American Economic Review*, 82, (1992), pp. 1142–1161.
- Fortuna, P. "The Downside of Alternative Risk Measures – An Implementation Case Study." IIR Seminar on Behavioral Finance: The Psychology of Investment Decision-Making, London, November 1998.
- Hartzmark, M.L. "Luck versus Forecast Ability: Determinants of Trader Performance in Futures Markets." *Journal of Business*, 64, (1991), pp. 49–74.
- Hilton, D.J. "Constructive Processes in Attitudes, Judgment and Decision-Making: Implications for Psychology and Marketing." *Swiss Journal of Psychology*, 56, (1997), pp. 112–126 (special issue on Context and Biases, edited by F. Butera, P. Legrenzi, and M. Oswald).
- Hilton, D.J. "Medici e Decision-Making: Paraocchi, Errori e Rimedi." *KOS*, 147, (1997), pp. 14–21.
- Hilton, D.J. "The Psychology of Financial Markets: Applications to Trading, Dealing and Investment Analysis." IIR Seminar on Behavioral Finance: The Psychology of Investment Decision-Making, London, November 1998.
- Hilton, D.J. "Psychology and the City: Applications to Trading, Dealing and Investment Analysis." Publication no. 38 of the Centre for the Study of Financial Innovation, 1999.
- Hogarth, R.M. Judgment and Choice. Chichester: Wiley, 1987.
- Kahneman, D.E., P. Slovic, and A. Tversky. Judgment Under Uncertainty: Heuristics and Biases. Cambridge: Cambridge University Press, 1982.
- Kahneman, D.E., and A. Tversky. "Prospect Theory: An Analysis of Decision Under Risk." *Econometrica*, 47, (1979), pp. 263–291.
- Langer, E. The Illusion of Control. *Journal of Personality and Social Psychology*, 32, (1975), pp. 311–328.
- Lewin, S.B. "Economics and Psychology: Lessons for Our Own Day From the Early Twentieth Century." *Journal of Economic Literature*, 34, (1996), pp. 1293–1323.
- Lifson, L.E., and R.A. Geist. *The Psychology of Investing*. New York: Wiley, 1999.
- Lopes, L.L. "Psychology and Economics: Perspectives on Risk, Co-operation and the Marketplace." *Annual Review of Psychology*, 45, (1994), pp. 197–227.
- MacGregor, D.G., P. Slovic, D. Dreman, and M. Berry. "Imagery, Affect, and Financial Judgment." *Journal of Psychology and the Financial Markets*, 1, (2000), pp. 104–110.
- Mackay, C. Extraordinary Popular Delusions and the Madness Of Crowds. London: Office of the National Illustrated Library, (1841) (reprinted by L.C. Page and Co., Boston, 1932).
- Odean, T. "Volume, Volatility and Profit When All Traders Are Above Average." *Journal of Finance*, (1998), pp. 1887–1934.
- Orléan, A. "Le Poids Des Croyances." *Sciences Humaines* (hors série No. 22), (1998), pp. 24–26.
- Partnoy, F. F.I.A.S.C.O. London: Profile Books, 1998.
- Patel, A.B. The Mind of a Trader: Lessons In Trading Strategy From The World's Leading Traders. London: Pitman Publishing, 1997.
- Russo, J., and P.J.H. Schoemaker. Confident Decision-Making: How To Make The Right Decision Every Time. London: Piatkus, 1991.
- Samuelson, W., and R. Zeckhauser. "Status Quo Bias In Decision-Making." *Journal of Risk and Uncertainty*, 1, (1987), pp. 7–59.
- Schachter, S., D.C. Hood, W. Gerin, P. Andreassen, and M. Rennett III. "Some Causes and Consequences of Dependence and Independence In The Stock Market." *Journal of Economic Behavior and Organization*, 6, (1985), pp. 339–357.
- Shapira, Z. "Aspiration Levels and Risk Taking: A Theoretical Model and Empirical Study On the Behavior of Government Bond Traders." Unpublished manuscript, New York University, 1999.
- Shapira, Z., and I. Venezia. "Patterns of Behavior in Professionally Managed and Independent Investors." (2000).
- Shefrin, H. Beyond Greed and Fear: Understanding Behavioral Finance and The Psychology of Investing. Boston: Harvard University Press, 1999.
- Shefrin, H., and M. Statman. "The Disposition to Sell Winners Too Early and Ride Losers Too Long: Theory And Evidence." *Journal of Finance*, 40, (1985), pp. 777–790.
- Shefrin, H., and M. Statman. "Behavioral Aspects of the Design and Marketing of Financial Products." *Financial Management*, (1993), pp. 123–134.
- Simonson, I. "Choice Based on Reasons: The Case of Attraction and Compromise Effects." *Journal of Consumer Research*, 16, (1989), pp. 158–174.
- Slovic, P. "Analyzing the Expert Judge: A Descriptive Study of a Stockbroker's Decision Processes." *Journal of Applied Psychology*, 53, (1969), pp. 253–263.
- Slovic, P. "Psychological Study of Human Judgment: Implications for Investment Decision Making." *Journal of Finance*, 27, (1972), pp. 779–799.
- Smid, P.P.M., and F.M. Tempelaar. "Click Funds in the Netherlands: The How and Why of an Index-Linked Financial Innovation." University of Groningen, Faculty of Economics, Research Report 98C14, SOM, 1997.
- Soane, E., M. Fenton O'Creevy, N. Nicholson, and P. Willman. "Individual and Organizational Influences on Decision-Making and Behavior." London Business School: Centre for Organizational Research Working Paper 98–06, 1998.
- Soros, G. The crisis of global capitalism: Open society endangered. London: Little Brown, 1998.

- Statman, M. "Behavioral Finance Versus Standard Finance." In A. Wood, ed., *Behavioral finance and decision theory in investment management*. Association for Investment Management and Research, Charlottesville, Virginia, 1995.
- Steil, B. "Corporate Foreign Exchange Risk Management: A Study in Decision Making Under Uncertainty." *Journal of Behavioral Decision Making*, 6, (1993), pp. 1–31.
- Stephan, E. "Anchoring and Adjustment in Economic Forecasts: The Role of Incentives, Ability and Expertise." Conference on Judgmental Inputs to the Forecasting Process, University College, London, November 1998.
- Stoner, J.A.F. "Risky and Cautious Shifts in Group Decisions: The Influence of Widely Held Values." *Journal of Experimental Social Psychology*, 4, (1968), pp. 442–459.
- Sutherland, N.S. *Irrationality: The Enemy Within*. Harmondsworth: Penguin, 1992.
- Tetlock, P.E. "The Impact of Accountability on Judgment and Choice: Toward a Social Contingency Model." *Advances in Experimental Social Psychology*, 25, (1992), pp. 331–376.
- Tetlock, P.E., and R. Boettger. "Accountability Amplifies the Status Quo Effect: When Change Creates Victims." *Journal of Behavioral Decision Making*, 7, (1994), pp. 1–23.
- Thaler, R.H. *The Winner's Curse: Paradoxes and Anomalies of Economic Life*. New York: Free Press, 1992.
- Thaler, R.H., ed. *Advances in Behavioural Finance*. New York: Russell Sage Foundation, 1993.
- Tversky, A., and D.E. Kahneman. "Judgment Under Uncertainty: Heuristics and Biases." *Science*, 185, (1974), pp. 1124–1131.
- Vriesen, M. "Case Study: The Practical Implementation of Behavioral Strategies." IIR Seminar on Behavioral Finance: The Psychology of Investment Decision-Making, London, November 1998.
- Wason, P.C., and P.N. Johnson-Laird. *The Psychology of Reasoning: Structure and Content*. London: Batsford, 1972.
- Weber, E.U., and D.J. Hilton. "Contextual Effects in the Interpretation of Probability Words: Perceived Base-Rate and Severity of Events." *Journal of Experimental Psychology: Human Perception and Performance*, 16, (1990), pp. 781–789.
- Wilkie-Thompson, M.E., D. Onkal-Atay, A.C. Pollock, and A. Macaulay. "The Influence of Trend Strength on Directional Probabilistic Currency Predictions." Conference on Judgmental Inputs to the Forecasting Process, University College, London, November 1998.

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