

Behavioral Corporate Finance

by Hersh Shefrin,
Santa Clara University*

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Behavioral finance holds important implications for the practice of corporate finance. The traditional approach to corporate finance, embodied by the practice of value-based management, is based on three concepts: (1) rational behavior, (2) the capital asset pricing model (CAPM), and (3) efficient markets. Proponents of behavioral finance argue that psychological forces interfere with all three components of the traditional paradigm. They maintain that psychological phenomena prevent decision makers from acting in a rational manner, that security risk premiums are not fully determined by security betas, and that market prices are regularly at odds with fundamental values.

There are two key behavioral impediments to the process of value maximization, one internal to the firm and the other external. I call the first impediment behavioral costs. Behavioral costs tend to undermine value creation. They are the costs—or, alternatively, the loss in value—associated with errors that managers make because of cognitive imperfections and emotional influences. The second impediment stems from behavioral errors by analysts and investors. These errors can create a wedge between fundamental values and market prices. Managers may then find themselves unsure of how to factor the errors of analysts and investors into their own decision-making.¹

Consider first the behavioral obstacles to value creation that are internal to the firm. At present, academics and practitioners involved in issues of value-based management tend to focus exclusively on agency costs, which arise when the interests of agents (in this case, managers) are in conflict with the interests of the principals they have been engaged to serve (the owners or stockholders). Mechanisms that encourage agents to act in accordance with principals' interests are said to be *incentive compatible*.

Proponents of value-based management emphasize that with properly designed incentives, managers will maximize the value of the firms for which they work. But behavioral costs can be quite large, and cannot be addressed though incentives alone. This is not to say that incentives are immaterial—on the contrary, incentives are of critical importance. The point, however, is that there are limits to what incentives can achieve. If employees have a distorted view of what is in their own self-interest, or if they have a mistaken view of what actions they need to take in order to maximize their self-interest, then incentive compatibility, although necessary for value maximization, will not be sufficient.

Now consider the behavioral obstacles to value creation that are external to the firm. Proponents of behavioral finance argue that risk is not priced in accordance with the CAPM and that market prices often deviate from fundamental values. There is ample evidence that market prices and fundamental values often part company. Indeed, some of this evidence is documented in the literature on value-based management.²

These issues can be germane to corporate decision-making. Practitioners who follow a value-based management approach often assume that fundamental values and market values coincide. However, when these values differ, managers who seek to maximize fundamental value may find that their actions lower the market value of their firm, at least temporarily. What are managers to do in these circumstances? For example, what

¹ For a discussion of behaviorally oriented models of corporate financial decision making, see J. Heaton, "Managerial Optimism and Corporate Finance," Working Paper, University of Chicago, 1998; and S. Gervais, J. Heaton, and T. Odean, "Capital Budgeting in the Presence of Managerial Overconfidence and Optimism," Working Paper, Wharton School, University of Pennsylvania, 2001.

² For a review of this evidence, see J. Martin and J. Petty, *Value Based Management: The Corporate Response to the Shareholder Revolution* (Boston: Harvard Business School Press, 2000, Ch. 9); and S. Young and S. O'Byrne, *EVA® and Value-Based Management* (New York: Irwin/McGraw-Hill, 2000).

types of adjustments might managers make to the EVA®-based approach developed by Stern Stewart and Co., where fundamental value is computed using the present value of a future stream of cash flows? In traditional economic value added or EVA analysis, the discount rate applied to the EVA stream is usually derived using a CAPM-based methodology. However, when the errors of analysts and investors cause mispricing, managers might consider adjusting the discount rate in order to reflect the mispricing.

The next section presents some of the more prominent behavioral characteristics of decision-making. In subsequent sections, I describe how these characteristics create internal and external obstacles to value maximization in the context of real-world examples.

BEHAVIORAL FOUNDATIONS

Below are four decision problems that have been used by psychologists in controlled experiments to study various aspects of human behavior and how they are manifested in decision-making. I present the four problems, ask that readers consider them in turn, and review the general findings about each.

Problem 1: Suppose you face a situation where there is a 75 percent chance that you will lose \$7,600 and a 25 percent chance that you will win \$2,400. Imagine that before you learn the outcome of this gamble, you are offered \$100. If you accept the \$100 and lose the gamble, your net loss will be \$7,500, and if you accept the \$100 and win the gamble your net gain will be \$2,500. Would you accept the \$100 or decline it?

Problem 2: Relative to all the people you work with, how would you rate yourself as a driver? (1) Above average? (2) Average? (3) Below average? Here average is defined as the median.

Problem 3: Imagine that you face the following pair of *concurrent* decisions. First examine both decisions, and then indicate the option you prefer.

First decision: Choose between

- A. a sure gain of \$2,400
- B. a 25 percent chance of gaining \$10,000 and a 75 percent chance of gaining nothing.

Second decision: Choose between

- C. a sure loss of \$7,500
- D. a 75 percent chance of losing \$10,000 and a 25 percent chance of losing nothing.

Problem 4: Imagine that you are presented with four cards placed flat on a table in front of you. There is a letter appearing on one side of the card and a number on the other side of the card. You see the following on the four cards: **a, b, 2, and 3.**

a b 2 3

Suppose you are asked to test the following hypothesis about *these* four cards: *All cards with a vowel on one side have an even number on the other side*. Imagine that you are asked to select those cards, *and only those cards*, that will determine whether the hypothesis is true. Which of the four cards would you turn over to verify the hypothesis?

What do these four problems tell us? Consider each in turn. Virtually everyone answers Problem 1 by accepting the \$100. Hence, Problem 1 tells us that people systematically prefer more to less; they prefer financially superior gambles to inferior alternatives.³ Although that should come as no surprise, it does provide a rational baseline.

When Problem 2 is presented to groups of people who actually work together, between 65 and 80 percent tend to rate themselves as being above average.⁴ Because no more than 50 percent of any group can be above the median, Problem 2 tells us that people are generally *overconfident* about their own driving abilities. This turns out to be a general phenomenon. When it comes to difficult and challenging tasks, most people are overconfident about their own abilities and their own knowledge.

Problem 3 is more complicated than Problems 1 and 2. Most people choose A in the first decision and D in the second. Notice that A is the risk-averse choice. Most people find a sure \$2,400 difficult to pass up. Although \$10,000 is a lot more than \$2,400, the odds of collecting it are only one in four. Hence, the expected value of B is \$2,500, considerably less than \$10,000. In fact, \$2,500 is just a little more than the guaranteed \$2,400 offered in A.

In contrast, D is not the risk-averse choice. Yet most people take a chance instead of a guaranteed loss. Why? Because they hate to lose! And the uncertain choice holds out the hope that they won't have to lose. The psychologists who first posed Problem 3 call the phenomenon *loss aversion*.⁵ They find that a loss has about *two and a half times* the impact of a gain of the same magnitude. This is one of the key features of *prospect theory*.⁶ When faced with either a sure loss or a gamble that holds open the prospect of breaking even, most people opt for the gamble, even when its expected payoff is less than the sure loss. Moreover, people seem to be willing to throw good money after bad.

As noted in the description of Problem 3, the first and second decision problems constitute a concurrent "package." But most people do not see the package. They separate the choices into *mental accounts*, one account for the first decision and one account for the second. And that brings us to what the behaviorists call *frame dependence*.

People who choose A and D end up facing a 25 percent chance of winning \$2,400 and a 75 percent chance of losing \$7,600. However, they could do better. They could choose the B and C combination. This *would* lead them to face a 25 percent chance of winning \$2,500 and a 75 percent chance of losing \$7,500. But

³ Technically, they reject stochastically dominated gambles.

⁴ In my experience, about 15 percent of respondents ask about the criterion to be used in arriving at this judgment. I have found that providing a definition does not alter the general finding. Far fewer than half of respondents are willing to rate themselves below average.

⁵ A. Tversky and D. Kahneman, "Rational Choice and the Framing of Decisions," *Journal of Business*, Vol. 59 (1986).

⁶ D. Kahneman and A. Tversky, "Prospect Theory: An Analysis of Decision Making Under Risk," *Econometrica*, Vol. 47 (1979).

the manner in which these cash flows are packaged or *framed* is opaque. Therefore, people act as if they preferred to give up \$100, since they choose to win \$2,400 instead of \$2,500, and lose \$7,600 instead of \$7,500. That is, they act as if they reject the \$100 offer in Problem 1. The difference is that in Problem 1, the cash flows are transparent, whereas in Problem 3 they are opaque. Framing matters.

Consider Problem 4. Most people turn over the card with the **a**, and some turn over the card with the **2** as well. Yet the correct answer to the problem is to turn over only the **a** and the **3**. Why? Because the efficient way of testing the validity of the hypothesis is to turn over the cards that might falsify the hypothesis.

Consider in turn the falsification potential of each card. Suppose we turn over the card featuring the **a**. We will find either an even number or an odd number. If we find an even number, we have evidence supporting the hypothesis. However, if we find an odd number we know that the hypothesis is false. Next, suppose we turn over the card with the **b**. This card provides us with no evidence to judge the validity of the hypothesis, since the hypothesis says nothing about cards featuring consonants. Now consider the card with a **2** on it. If we turn it over, we might find a vowel. This would be consistent with the hypothesis. Alternatively, we might find a consonant. That would be irrelevant to the hypothesis. Hence, this card offers no potential for falsification. Last, suppose that we turn over the card with the **3** on it. If we find a vowel, we know that the hypothesis is false. A consonant provides no information to support or falsify the hypothesis. Thus, the only two cards that offer the potential for falsification are the **a** and the **3**. However, most people chose **a** and **2**, or **a** alone. Notice that while **a** allows for both support and falsification, **2** allows for support only.

Why do people turn over the **a** and the **2**? Because they use a rule of thumb or *heuristic* that leads them to search for evidence that confirms the hypothesis in question. The literature in behavioral decision-making indicates that people suffer from *confirmation bias*, the tendency to ascribe too much weight to evidence that confirms their views and too little weight to evidence that invalidates their views.

As we move to discuss applications of these concepts, keep the following in mind. The literature in behavioral decision-making suggests that people tend to be:

- loss averse;
- susceptible to framing or packaging that leads them to select inferior options;
- overconfident; and
- prone to confirmation bias.

BEHAVIOR-RELATED OBSTACLES THAT ARE INTERNAL TO THE FIRM

The Case of Sony Corporation⁷

Sony was founded in 1946 by Masaru Ibuka and Akio Morita. In 1957, Sony introduced the first pocket-sized transistor radio. A few years later, Ibuka and Morita were working to develop a color television set. In March 1961, Ibuka and Morita attended a trade show in New York, sponsored by the Institute of Electronics and Electrical Engineers. While there, they viewed a television screen that featured the sharpest and brightest image they had ever seen. The color tube was called the Chromatron (developed for the U.S. military by the

⁷ John Nathan traces the history of Sony Corporation in his book *Sony: The Private Life* (Boston: Houghton Mifflin Company, 1999).

Nobel Prize-winning physicist E. O. Lawrence). It was owned by Autometric Laboratory, a small subsidiary of Paramount Pictures.

Morita negotiated a technical license from Paramount to produce a color television receiver designed around the Chromatron tube. Ibuka led a two-year effort to develop a commercial prototype and process technology. By September 1964, Ibuka's team had succeeded in developing a prototype. However, they had not developed a commercially viable manufacturing process.

Ibuka was both *optimistic* and *confident*. He had the product announced and displayed in Sony's showroom. Consumer reaction was enthusiastic. Sony even invested in a new facility to house the Chromatron assembly. Ibuka announced that the Chromatron would be Sony's top priority. He placed 150 people on its assembly line. Yet the production process yielded only two or three usable picture tubes per thousand produced.

The retail price of a Chromatron color television set was \$550, but the cost of production was more than double that amount. There was a sharp difference of opinion within the Sony leadership about the appropriate course of action. Morita wanted to terminate the Chromatron project. However, Ibuka refused. Sony continued to produce and sell Chromatron sets, eventually selling 13,000 sets, each one with a negative unit gross margin.

In November 1966, Sony's financial managers announced that Sony was "close to ruin." Only then did Ibuka agree to terminate the Chromatron project. Were there behavioral elements at work in the Chromatron story? Yes, at least two—overconfidence and loss aversion. Overconfidence figures prominently because Ibuka committed Sony to mass-produce Chromatron sets before his engineers had developed a cost-effective mass production process.⁸ Loss aversion figures prominently because once losses began to mount, Ibuka continued to invest in the project and would not accept a sure loss, preferring to gamble that a solution could be worked out.⁹

Most of Sony's initial losses from the Chromatron stemmed from its investment in a new dedicated production facility—a sunk cost. Of course, sunk costs are exactly that, sunk, and most textbooks in corporate finance warn readers to ignore them. For example, in their well-known corporate finance text, Richard Brealey and Stewart Myers state: "Forget sunk costs. Sunk costs are like spilled milk: They are past and irreversible outflows. Because sunk costs are bygones, they cannot be affected by the decision to accept or reject the project, and so they should be ignored."¹⁰

By ignoring the \$7,500 sunk cost in the second decision in Problem 3 earlier, people would frame the second decision as whether or not to take a gamble involving a 25 percent probability of winning \$7,500, but a 75 percent probability of losing \$2,500. Most people act as if they are risk averse and reject the gamble. Yet they react to the original version of the third problem by acting as if they are risk seeking. Once again, framing matters.

Despite the advice offered by Brealey and Myers, corporate decision-makers often treat sunk costs as relevant. Even in professional basketball, coaches tend to take salaries into account when deciding whom to play, whether or not highly paid players have been performing well and despite the fact that their salaries are a sunk cost. Researchers state: "The higher a player was taken in the college draft, the more time he was given on

⁸ Nathan (1999, p. 44), cited above, states, "Ibuka alone was confident."

⁹ See H. Shefrin and M. Statman, "The Disposition to Sell Winners Too Early and Ride Losers Too Long: Theory and Evidence," *Journal of Finance*, Vol. 40 (1985); and T. Odean, "Are Investors Reluctant to Realize Their Losses?," *Journal of Finance*, Vol. 53 (1998).

¹⁰ R. Brealey and S. Myers, *Principles of Corporate Finance* (New York: Irwin/McGraw-Hill, 2000), p. 123.

the court, even after controlling for other logical predictors of playing time, such as performance, injury and trade status.”¹¹

Management scholar Edward Conlon observes that “some of the research has shown that people will put more money into a failure they feel responsible for than into a success— that’s known as the escalation factor.”¹² Conlon builds on previous research which suggests that decision-makers who are responsible for a failure would be more retrospectively oriented than those who were not responsible for a failure,¹³ meaning that they search for evidence to confirm the reasonableness of their prior decision. This can be viewed as a form of confirmation bias, the issue discussed in connection with Problem 4 above (the card problem).

One very important finding by Conlon is that the size of the sunk cost does not alter the tendency of managers to be retrospective or to escalate the level of expenditure. However, the “visibility” of the decision that resulted in failure affects both. In this respect, Conlon states, “It’s not so much how much money was involved but how visible the decision was—visibility is a big threat. If you’re seen as the primary mover and shaker in a highly visible failure you’re more prone to be retrospective and/or irrational in decisions on courses of action.”¹⁴

One of the major issues in agency theory is that managers make suboptimal corporate decisions because incentive systems fail to align their interests with those of shareholders. In this respect, behavioral influences are akin to agency costs. The behavioral influences driving Ibuka’s actions represented a threat to the wealth of Sony’s other shareholders:

[T]ension between Ibuka and Morita was manifestly in the air. Morita angrily accused the ...engineers of taking advantage of Ibuka’s commitment to technology to indulge their curiosity in the problem-solving process, costing the company money it couldn’t afford... [T]he worst moments occurred when people from ‘Morita’s camp,’ planners and accountants, began showing up at the brainstorming sessions at which the ... engineers were grappling with Chromatron.¹⁵

In the Sony case, manager Ibuka was also a founder and major shareholder. But even being rewarded as a major shareholder did not prevent him from succumbing to overconfidence or loss aversion in his actions as a manager. These are very strong effects that can be amplified by other phenomena such as visibility. There is no doubt that incentives are important as well. However, the Sony case illustrates that incentive effects by themselves will not necessarily overcome the impact of behavioral elements.

¹¹ B. Staw and H. Hoang, “Sunk Costs in the NBA: Why Draft Order Affects Playing Time and Survival in Professional Basketball,” *Administrative Science Quarterly*, Vol. 40 (1995), p. 487. See also C. Camerer and R. Weber, “The Econometrics and Behavioral Economics of Escalation to Commitment in NBA Draft Choices,” *Journal of Economic Behavior and Organization*, Vol. 39 (1999), which confirms Staw and Hoang’s general findings but questions the strength of the effect.

¹² L. May, “Sunk Costs Are Not So Fully Drowned After All,” *Australian Financial Review*, July 8, 1988.

¹³ B. Staw, “Knee-Deep in the Big Muddy: A Study of Escalating Commitment Toward a Chosen Course of Action,” *Organizational Behavior and Human Performance*, Vol. 20 (1976).

¹⁴ May (1988), cited earlier.

¹⁵ Nathan (1999, p. 45), cited earlier.

The Case of Syntex Corporation¹⁶

Consider a second example. Syntex, Inc. was a pharmaceutical corporation registered in Panama in 1944 and headquartered in Palo Alto, California until 1995, when it was taken over by Roche Holdings Ltd. In 1977, Gabriel Garay, a senior Syntex researcher with a Ph.D. in pharmacology, led a team that created a new drug, enprostil. The drug was designed to turn off stomach acid and thereby heal stomach ulcers. Syntex won a patent on the compound in 1978 and named Garay and two colleagues as co-inventors.

The potential market for enprostil was immense. At the time, approximately 23 million people worldwide had ulcer problems, and treatment products like Smith-Kline Beecham's Tagamet and Glaxo Holdings PLC's Zantac had yielded billions in sales. Enprostil was conservatively forecast to generate sales of \$50-100 million a year. Moreover, for Syntex, the timing was perfect, in that sales of the new drug would help offset the expiration of the patent on its major product, Naprosyn, an anti-inflammatory drug. The patent for Naprosyn was due to expire in December 1993. At the time, Naprosyn accounted for half of sales and more than half of operating profits. This made enprostil highly *visible*.¹⁷

In the 1980s, bringing a new drug from a chemist's bench to a pharmacist's shelf took an average of eight years and approximately \$90-100 million. After Syntex invested in the research and development phase of enprostil, evidence began to emerge of a negative side-effect profile. Researchers in Garay's laboratory found that enprostil tended to make blood platelets clot in the test tube, posing a possible risk of stroke or heart attack. Moreover, although enprostil appeared to heal existing stomach ulcers, it also seemed to cause new ones. An internal Syntex memo warned that in intravenous form, enprostil could provoke a "possibly fatal or crippling thromboembolism." Independent researchers found that enprostil significantly increased damage caused from ingesting alcohol.

As former executives of Syntex have stated, the eventual outcome was that the company "failed to pull the plug early enough on weak products. For instance, it poured more than \$100 million into the anti-ulcer drug enprostil in the late 1980s before shelving it."¹⁸ It would be reasonable to speculate that loss aversion on the part of Gabriel Garay made it difficult to terminate the enprostil project. However, this would not be correct. In fact, the California courts ordered Syntex to pay \$3.6 million to Garay, who sued Syntex for wrongful termination in 1987 after he had brought the negative side-effect profile of enprostil to light.

The decision-maker responsible for refusing to terminate the enprostil project was John Fried, who was not only president of Syntex's research division but also the vice chairman of the corporation. Fried had ordered that the initial memo from Garay's laboratory (identifying the potential problems with enprostil) be rewritten.¹⁹ In court, Fried testified that Garay's memo was "inflammatory" and "speculative."

¹⁶ I have firsthand knowledge about Syntex Inc., having served as a consultant to the company between 1983 and 1990. In particular, I was the lead consultant involved in designing a training program called "Finance at Syntex" which was provided to Syntex finance personnel worldwide. Nonetheless, all of the details reported about Syntex in this section are taken from publicly available documents.

¹⁷ "Syntex Tries to Kick a One-Drug Habit: To End its Overdependence on Arthritis Medication, It's Spending Heavily on New Pharmaceuticals," *Business Week*, Dec. 9, 1985.

¹⁸ "Has Syntex Run Out of Steam? Wall Street Is Impatient with Sluggish Sales and Few New Products," *Business Week*, July 12, 1993.

¹⁹ "A Matter of Candor: Did Syntex Withhold Data on Side Effect Of a Promising Drug? Scientist Says He Was Fired After Sounding Warnings About New Ulcer Remedy: Company Defends Procedures," *The Wall Street Journal*, January 8, 1991.

By 1985, Syntex had a new drug application for enprostil pending with the Food and Drug Administration (FDA). It had invested heavily in enprostil, and was continuing to do so. In 1986, researchers reported that several dogs involved in some of the animal studies had died. John Fried “testified that the dog deaths were ‘unsurprising’ because the drug was given rapidly, and because other chemicals were used in the test.”²⁰ In 1987, researchers reported having discovered the mechanism underlying enprostil, and that this mechanism was known to cause clotting and spasms in veins and arteries, thereby further raising the danger of possible strokes or heart attacks in patients. In court, Fried admitted concern that the team was “going around in circles rather than going forward in a meaningful manner” and was potentially wasting the FDA’s time.

Court records show that Fried repeatedly attacked or dismissed unfavorable study reports on enprostil as “preliminary,” “speculative,” “inflammatory,” and “irrelevant.” Was his behavior evidence of confirmation bias? In February 1988, the FDA met with Syntex and said that the side effects made it unlikely that enprostil could win broad market approval as a treatment for common ulcers. Shortly afterward, Syntex withdrew its application.

Like Ibuka of Sony, Fried was a major shareholder in his firm. In addition, he was vice chairman. His financial interests were aligned with those of the shareholders. Yet he acted as if he suffered severely from overconfidence, loss aversion, and confirmation bias. As in the Sony case, the message here is that behavioral biases can dominate financial incentives.²¹

To be sure, firms also suffer from traditional agency problems, such as the consumption of perquisites. *Business Week* discussed the role of Syntex CEO Paul Freiman prior to the firm being taken over by Roche Holdings:

Several current and former executives also cite Freiman’s separation, then divorce, from his wife of 36 years, all about the time he began appearing in public with a woman from Brazil, whom Syntex says he recently wed. The executives say Freiman made frequent trips to Brazil on the corporate jet, which according to the company’s bylaws may be used by executives and directors for personal trips. In fiscal 1992, ended July 13, Freiman’s personal use of the jet and other perks amounted to \$98,304 in benefits, according to Syntex’ latest proxy. That amounted to about 10% of Freiman’s total compensation for 1992 and was triple his use of perks the previous year.²²

But if the actions of both Paul Freiman and John Fried caused the wealth of Syntex shareholders to decline, there is nonetheless a significant difference between the two situations. The appropriate way to reduce agency costs of the sort associated with the actions of Paul Freiman is to *correct* the distortions in his compensation package. However, there are no compelling reasons to think that John Fried’s actions were the result of distorted incentives.

²⁰ Ibid.

²¹ There are many other cases involving the reluctance to terminate losing projects, similar to the Sony and Syntex cases. These include Shugart, a disk-drive maker, Lockheed Corp., manufacturer of the unprofitable L-1011 airplane, Apple Computer, manufacturer of the failed Newton project, and the 1999 bankruptcy filing by Iridium in connection with its satellite-phone project.

²² *Business Week*, July 12, 1993, cited earlier.

The Effect of Group Behavior on Decision-Making

One key question is whether group behavior mitigates or amplifies the cognitive errors to which individuals are prone. Researchers have found that groups often amplify individual errors.²³ This is an especially important finding for corporate managers, in that most major corporate decisions are made in group settings. In this respect, research suggests that senior managers working in committees are even more prone to escalate their commitment to projects whose outcomes may have become questionable.²⁴

A study of the group amplification impact on project termination decisions provided two descriptions of a particular project both to individual decision makers and to groups.²⁵ Although the future prospects for the project were not attractive, one description of the project featured a sunk cost, while the second did not. Only 29 percent of the individual decision makers who received the description without the sunk cost recommended that the project be funded. However, when the description included information about a sunk cost, 69 percent of individual decision makers recommended that the project be funded. The interesting finding is what happens in groups. Only 26 percent of groups recommended funding when no sunk cost was described. However, 86 percent of groups recommended funding when the description included a sunk cost. In other words, the behavioral error is actually amplified when the decision is made by a group rather than by an individual.

There are other behavioral applications to corporate finance besides project termination. For instance, overconfident executives may underestimate the probability of default, and as a result choose an overly debt-heavy capital structure. This was an issue in the case of the firm PSINet.²⁶ And *Fortune* magazine raised behavioral issues similar to project termination but in the context of CEOs who invest in protégés and successors:

[F]ailed CEOs are often unable to deal with a few key subordinates whose sustained poor performance deeply harms the company...If the protégé then fails to deliver, the CEO can't come to terms with it, especially if the protégé is a succession candidate...Mention this to people who were around General Motors in the early '90s and they tend to nod vigorously and say, 'Lloyd Reuss!' He became president when Robert Stempel became CEO.²⁷

BEHAVIORAL OBSTACLES THAT ARE EXTERNAL TO THE FIRM

When it comes to behavioral phenomena that are external to the firm, corporate managers face a different set of challenges. Traditional textbooks in corporate finance teach managers how to make rational decisions about capital budgeting and capital structure under the premise that investors and analysts also behave rationally. However, there is strong evidence that investors and analysts are not always rational. For example,

²³ E. Russo and P. Schoemaker, *Decision Traps: The Ten Barriers to Brilliant Decision-Making and How to Overcome Them* (New York: Simon & Schuster, 1989).

²⁴ Escalation of commitment is defined as "escalation situations...where losses have been suffered, where there is an opportunity to persist or withdraw, and where the consequence of these actions are uncertain." See B. Staw, "The Escalation of Commitment: An Update and Appraisal," in *Organizational Decision Making*, edited by Z. Shapira (Cambridge University Press, 1997).

²⁵ G. White, "Escalating Commitment in Individuals and Group Decision Making: A Prospect Theory Approach," *Organizational Behavior and Human Decision Processes*, Vol. 54 (1993).

²⁶ "Digital Hubris PSINet Could Become the Biggest High-Tech Bankruptcy in a Decade: The Story behind the Fall," *Forbes*, May 28, 2001.

²⁷ "Why CEOs Fail," *Fortune*, June 21, 1999, pp. 70-71.

Brealey and Myers warn readers not to mistake earnings growth for value creation, pointing out that a firm that grows its earnings can also be destroying value.²⁸ They also discuss one of several dubious reasons for mergers—the goal of increasing earnings per share by playing what they call the “bootstrap game.”²⁹ How might the lessons that Brealey and Myers seek to teach managers be at odds with what managers face in the real world?

The case of Herman-Miller is an example to be juxtaposed against the textbook prescriptions.³⁰ In 1995, Herman-Miller adopted an EVA-based approach to its decision-making, and in so doing dramatically increased its profitability. Yet in deciding to go the value-based management route, Herman-Miller found themselves in conflict with the analysts covering their firm. Herman-Miller CFO Elizabeth Nickel said that analysts had been pressuring her firm “to do an acquisition that would build earnings even while it destroyed economic value.” In fact, Nickel had already rejected an acquisition that analysts were recommending, and she stated, “We took a lot of grief from analysts who said we should have done the deal because it was good for EPS.” This was not an issue for Nickel to have treated lightly. Some research suggests that stock returns are more closely related to accounting earnings than to EVA.³¹ Nickel was able to convince one of the most skeptical analysts by walking him through the EVA analysis.

This is not to suggest that at Herman-Miller, EVA *always* overrides concerns that stem from earnings. Nickel described another occasion when Herman-Miller was analyzing an online initiative that would have created value. However, her team was reluctant to go ahead because of the negative impact the initiative would have had on short-term earnings per share. They all recognized that their reluctance stemmed from accounting considerations rather than from cash flow considerations, and was related to the fact that the items reported would have been capitalized rather than expensed. In other words, the financial managers at Herman-Miller made their decision based on framing – on how the financial implications of the decision were packaged.

Market Efficiency and Behavior

In the traditional approach to corporate finance, managers are urged to act as if markets are efficient. For example, Brealey and Myers suggest six lessons or operating principles for managers.³² Their first lesson is that markets have no “memory”—that a stock’s past price behavior is no indication of its future price behavior. Yet they point out that managers appear to act as if markets do have memory because managers like to issue new stock after the price of their firm’s shares has risen, and that, by the same token, managers appear to be reluctant to issue new shares after the price of their firm’s shares has declined.

Do managers act in the way that Brealey and Myers describe? Do markets have memory? The answer to both questions is yes. Take the case of 3Com, which manufactures equipment used in networking, such as adapter cards, switches for local area networks, and remote-access products for network service providers including AOL and Sprint PCS.³³ Through its acquisition of modem manufacturer US Robotics Corp., 3Com inherited the division that makes the Palm Pilot, a popular handheld organizer. In March 2000, 3Com began to

²⁸ Brealey and Myers (2000, p. 326), cited earlier.

²⁹ Brealey and Myers (2000, p. 947), cited earlier.

³⁰ This case is written up in an article by G. Millman, “Capital Allocation: When the Right Thing is Hard to Do,” *Financial Executive*, September/October 2000.

³¹ G. Biddle, R. Bowen, and J. Wallace, “Does EVA Beat Earnings? Evidence on Associations with Stock Returns and Firm Value,” *Journal of Accounting and Economics*, Vol. 24 (1997).

carve out this division by selling 6 percent of Palm’s outstanding shares, mostly in an initial public offering (IPO). As part of the IPO, 3Com sold the shares to an investment banking syndicate, which in turn placed the shares with institutional investors at a price agreed upon by the investment banks and 3Com. (The lead underwriters were Goldman Sachs and Morgan Stanley.) The investment banks received a share of the gross offering.

Researchers argue that as a general matter IPOs feature three behavioral phenomena that involve market memory and that are inconsistent with the efficient markets hypothesis. The three phenomena are: (1) “hot issue” markets, (2) initial underpricing, and (3) long-term underperformance.³⁴ Were Palm’s shares issued in a “hot issue” market? Absolutely. The first trading day for Palm’s shares was March 2, 2000. Recall that between August 1999 and March 10, 2000, the Nasdaq composite index virtually doubled, and peaked above 5000 on March 10. The managers of 3Com were thus acting as if markets had memory.

Were Palm’s shares underpriced? The offer price was \$38. At that offer price, Palm held the record for the highest market capitalization of any high-technology IPO in U.S. history. Its associated \$22 billion market capitalization made it the fourth-largest technology firm, behind Cisco Systems, Microsoft, and Intel, and the 49th most valuable firm in the U.S. Yet on March 2, Palm traded as high as \$165. It closed the day at \$95. Did the markets price Palm efficiently on March 2? Probably not. At the close of trading on March 2, Palm, with fewer than 700 employees, had a market cap of \$53.4 billion. At \$165 per share, Palm had the 14th highest market capitalization in the U.S., larger than firms such as Disney and Boeing. When it comes to IPOs, part of market memory is what researchers call the long-term underperformance aspect of the “new issues puzzle.” New issues tend to earn lower returns than stocks with comparable characteristics against which they have been matched.³⁵ In respect to long-term underperformance, the price of Palm’s stock went from its all-time high of \$165 on March 2, 2000 to its all-time low of \$1.35 on September 27, 2001.

In order to explore the efficiency question in more depth, consider what the market capitalization (MVE) of Palm implies about the market capitalization of 3Com. Remember that on March 2, 2000, 3Com retained 94 percent of Palm’s shares. Therefore, in theory we can write:

$$\text{MVE of 3Com} = (0.94 \times \text{MVE of Palm}) + \mathbf{X}$$

where \mathbf{X} represents the value of the non-Palm portion of 3Com.

We can solve for \mathbf{X} . At the March 2 close, Palm's market capitalization was \$53.4 billion. Although 3Com shares had been rising shortly before the Palm IPO, on March 2 they fell by 21 percent. 3Com's closing market capitalization was \$28 billion on that day. Therefore,

$$\text{MVE of 3Com} = (0.94 \times \text{MVE Palm}) + \mathbf{X}$$

$$\$28 \text{ billion} = (0.94 \times \$53.4 \text{ billion}) + \mathbf{X}$$

Hence, $\mathbf{X} = -\$22.2$ billion! Was the non-Palm portion of 3Com less than worthless? If markets were efficient, we would have to conclude that the answer is yes.³⁶ However, five months later, 3Com spun off the remaining

³² Brealey and Myers (2000, p. 368), cited earlier.

³³ O. Lamont and R. Thaler, “Can the Market Add and Subtract? Mispricing in Tech Stock Carve-Outs,” Working Paper, University of Chicago, 2000.

³⁴ T. Loughran and J. Ritter, “The New Issues Puzzle,” *Journal of Finance*, Vol. 50 (1995).

³⁵ *Ibid.*

³⁶ At the time, 3Com held about \$3 billion in cash. On February 9, 2001, I interviewed Chris Paisley and Judy Bruner. Bruner is Palm’s CFO, and Paisley was 3Com’s CFO when Palm was spun off. Paisley suggested that the negative implied value of \mathbf{X} reflected two issues: (1) in March 2000, investors doubted that 3Com would

shares of Palm. If the rest of its projects were truly worthless, its shares should have been priced near zero at that time. Yet on the day it spun off the remaining shares of Palm, the price of a 3Com share dropped from just above \$65 to about \$15. Had the market reappraised 3Com during the intervening five months? Interestingly, the price of a 3Com share at the time of the spinoff was about the same as it had been in late February, days before the initial Palm IPO. The more compelling explanation is that Palm's shares traded well above fundamental value on March 2. Indeed, as noted earlier, Palm's shares fell dramatically in the subsequent months.

Did 3Com's managers plan to do its original shareholders a favor by bringing Palm out when they thought it was overpriced? The evidence suggests that they did. 3Com's CFO argued vigorously about Palm's valuation with the lead investment bankers, who had initially proposed a market capitalization of \$3-4 billion. In response, 3Com's CFO suggested \$15 billion, based on what was happening in the market. (The night before the final offer price was set, 3Com's CFO was insisting on \$22 billion, and the investment bankers from Goldman Sachs were arguing for \$15.6 billion.) Palm's CFO later indicated that she would not have wanted to raise equity in the conditions prevailing 11 months after Palm's issue, with Palm's stock down 45 percent from its offer price and the Nasdaq composite down by about the same amount. The managers of many Internet firms did not believe their firms were overvalued at the time of their IPOs.³⁷ Of course, this does not preclude the possibility that the managers were as irrationally exuberant as investors. In July 1999, 3Com's management had decided that in the exuberant market environment of the time, the appropriate course of action was for them to spin off their most viable division, and to avoid making acquisitions. This view stemmed from having observed that the equity investments they had made in other firms had been significantly outperforming their core businesses.

A front page story in the *Wall Street Journal* documents the behavioral costs that afflicted Palm's management in the first half of 2001.³⁸ Palm's managers turned out to be overconfident that past growth rates for its main product would continue. In an attempt to revive disappointing demand, they accelerated the next version of their device. In doing so, they committed the same overconfidence-induced error that Sony had made years earlier with the Chromatron. Palm announced the new version of their product before they had the manufacturing process in place—and the value of the inventory of their existing product declined dramatically, as customers opted to wait for the newer model.

Capital Budgeting and Capital Structure

Mispricing creates all kinds of conflicts for managers. In addition to the problem of when to time new issues of equity, financial managers also need to be concerned about how to set project hurdle rates appropriately. In traditional corporate finance, the capital asset pricing model (CAPM) provides the theoretical basis for deriving the appropriate hurdle rates to be used in capital budgeting. However, the traditional approach rests on the premise that prices are efficient.

distribute the remaining 96 percent of Palm stock during the summer of 2000, as planned; and (2) investors regarded Palm's stock to be overpriced, and as a result were unwilling to bid up the price of 3Com stock accordingly.

³⁷ P. Schultz and M. Zirman, "Do the Individuals Closest to Internet Firms Believe They are Overvalued?," *Journal of Financial Economics*, Vol. 59 (2001).

There are two main elements in approaching the problem of how managers can arrive at appropriate discount rates when prices are inefficient but managers are fully rational (that is, managers do not commit behaviorally induced errors).³⁹ The first element is the time horizon over which managers seek to maximize value. The second element involves interactions between capital budgeting and capital structure in the face of inefficient prices. When investors and analysts are unduly optimistic about a firm's future prospects, and as a result bid up the price of its stock, the attendant mispricing causes the firm's future expected returns to be abnormally low. Managers might then want to consider either the issuance of new equity or the funding of new projects.⁴⁰

In the simplest case, the firm is unconcerned about the correct mix of debt and equity, and the market does not immediately react to a new equity issue by drastically bidding down the price of its shares. In this case, the appropriate course of action is for the firm to issue new, overpriced shares, thereby transferring wealth from new shareholders to old shareholders. But what about funding a new project that increases the stock price of the firm in the current overly optimistic climate, but would decrease value if the firm were correctly priced?

If the firm's current shareholders were rational and informed, then they would not plan to hold overpriced stock long-term. Instead, they would sell it before its price dropped back towards fundamental value. In this case, an argument can be made that the manager's responsibility is to maximize the wealth of the current shareholders by undertaking projects that will increase the current market value of the firm, even at the expense of long-term value. (A similar argument might be made even if the firm's shareholders were irrational, traded frequently, and only held the stock short-term.) However, if the firm's current shareholders plan to hold the stock long-term, either because they are irrational, poorly informed, or constrained from selling short-term, then the manager may well choose to forgo projects that lead to only a short-term increase in value. In this case, the manager may choose to maximize long-term value, which may be closer to the typical situation.

Behavioral finance offers prescriptive guidelines for value-maximizing managers when the stocks of their firms are mispriced. These guidelines suggest that there are some circumstances in which managers should adjust hurdle rates, and other circumstances in which they should not. In this respect, capital budgeting policy is more complex than when stock prices are efficient. In a nutshell, the guidelines are as follows:

1. If there are no germane spillover effects from project selection decisions onto capital structure, and managers seek to maximize long-term value, then the appropriate hurdle rate to use is the CAPM-based rate. And managers should only adjust the hurdle rate to reflect the level of project risk.

³⁸ "Pilot Error: How Palm Tumbled From Star of Tech to Target of Microsoft," *The Wall Street Journal*, September 7, 2001.

³⁹ J. Stein, "Rational Capital Budgeting in an Irrational World," *Journal of Business*, Vol. 69 (1996).

⁴⁰ Some managers may not know whether or not their firms are mispriced in the market. In February 2001, the CFO of Palm indicated that in view of the volatility in the price of Palm stock, her firm was trying to understand how the market values Palm, relative to the *right* factors to value Palm. She indicated that she focused on trailing P/E and price-to-sales, noting that these may send conflicting signals. For example, she indicated that the market assigned Palm a high P/E ratio (145 at the time), but relative to other firms such as Handspring, a low price-to-sales ratio (8 at the time).

2. If project selection decisions do have germane spillover effects onto capital structure, then value-maximizing managers will need to adjust their project hurdle rates to reflect the degree to which the equity of their firm is mispriced in the market. Otherwise they might, say, use cash to fund a project when they could create greater value by using the cash to repurchase undervalued shares.

Consider each guideline in turn. Imagine that investors are irrationally exuberant about the value potential of a firm's projects, and in consequence bid up the price of its stock to the point that it becomes overvalued. A rational manager expects that in the long run, the firm's stock price will revert to fundamental value, thereby causing the current objective expected return to be low. Therefore, a manager who decides to adopt the project for short-term advantage implicitly uses an objective hurdle rate that is low. In this case the manager accepts a project that is expected to be uneconomic in the long run, but whose adoption leads the stock price to rise in the short run.

In contrast, a rational manager with the goal of maximizing value for long-term investors rejects projects that only have a short-term advantage and implicitly uses a higher hurdle rate. Indeed, a manager who is guided by considerations of long-term value is effectively advised to use the traditional CAPM hurdle rates. Why? Because in the long term, prices revert to fundamental value. Hence, the best forecast of long-run returns is based on the CAPM beta. That is, the CAPM rate is the appropriate hurdle rate whenever capital budgeting decisions and financing structure are independent.

Consider the second guideline. When capital budgeting decisions and financing decisions are linked, the appropriate hurdle rate is effectively a weighted average of the CAPM rate and a behaviorally based rate that reflects the degree of mispricing in the market, with the weights determined by the firm's capital structure. For example, if the firm's debt-to-equity ratio is 1.0, the CAPM-derived rate is 10 percent, and mispricing leads the objective expected return on the firm's shares to be 20 percent, then the appropriate hurdle rate is 15 percent—midway between 10 percent and 20 percent (because the debt-to-capital and equity-to-capital ratios are each 50%).

In order to understand how to determine the *appropriate* hurdle rate, consider a situation in which the firm's stock is undervalued, and the optimal debt ratio is zero (perhaps because the expected costs of bankruptcy are very high owing to the firm's riskiness). Moreover, suppose that the firm holds cash. In this case, the firm has two choices about what to do with its cash. It can repurchase undervalued shares, or it can fund a project with a nonnegative fundamentally computed NPV. Which is the better use of the firm's cash? Consider this question from the perspective of a rational investor who, at the time of the decision, plans to retain his or her shares in the firm. The repurchase decision involves trading cash for a more concentrated ownership of the future cash flows generated by the firm's other assets. Funding the project involves trading cash for a share in the future cash flows from the new project. If the objectively correct NPV of the share repurchase exceeds the objectively correct NPV of the project, then a rational long-term investor would favor the share repurchase over the project. In the case of a zero-NPV project, a rational investor would definitely favor the share repurchase.

A manager who rejects a positive-NPV project in favor of a share repurchase implicitly uses a hurdle rate that is higher than the corresponding fundamental rate. Notice that a value-maximizing manager is forced to adopt a higher hurdle rate because of the interaction between capital structure and capital budgeting. A manager who is not constrained by capital structure would take on debt, then finance the project *and* repurchase shares. That is, an unconstrained manager would adopt a fundamentally based hurdle rate. Hence, it is the cost of debt

(or the unavailability of debt or the firm's unwillingness to take on additional debt) that effectively leads the manager of the constrained firm to adopt the higher hurdle rate for projects.

The general thrust of the argument holds even when the firm's optimal debt ratio is positive. However, the firm is now willing to fund the project partially with debt. The expected return on the portion funded with debt will have to be at least the fundamentally based rate. But the portion funded with equity will have to earn the expected return on equity, which is higher because the stock is undervalued. Hence, the overall hurdle rate will be a weighted average of the two, with the weights respectively given by the debt-to-capital and equity-to-capital ratios.⁴¹

This analysis holds interesting implications about the interactions between mispricing and investment policy and suggests that the firm's stock price is relevant to the capital budgeting process. The hurdle rates and investment policies of firms that are tightly constrained by capital structure tend to fluctuate more with mispricing than those of firms that are less tightly constrained by capital structure. In the airline industry, for example, when investors become unduly pessimistic about airline stocks, constrained firms tend to increase their hurdle rates and sell assets to unconstrained firms. Conversely, when investors turn unduly optimistic, constrained airlines cut their hurdle rates and purchase assets.⁴²

As mentioned earlier, managers should match the hurdle rate for a project to the level of systematic risk associated with that project's future returns, although risk assessment can be far from straightforward. In practice, however, capital budgeting is often loosely done. Firms tend to apply their firm's cost of capital uniformly across all projects. Palm's CFO stated that her firm computes its cost of capital "from time to time," and as far as computing the expected return on individual projects, "we do try to do this once in a while, but probably not as much as you might think we do."⁴³

CONCLUSION

Managers and board members need to recognize two key behavioral impediments to the process of value maximization, one internal to the firm and the other external. I call the internal obstruction behavioral costs. Behavioral costs stem from psychologically induced errors made by managers and employees. External obstructions stem from psychologically induced errors made by analysts and investors.

In this article I have focused on the importance of recognizing behaviorally induced obstructions. In a sequel to this article, I will discuss potential remedies for dealing with behavioral obstacles that are internal to the firm. These remedies are based on the characteristics of effective group processes. Poor group processes tend to amplify individual errors. In contrast, effective group processes attenuate individual errors.

⁴¹ One caveat relates to price pressure stemming from either a share repurchase or a new issue. Price pressure tends to cause the hurdle rate to rise, in that the return on the project must be high enough to compensate for the deleterious effects of the market's response to changes in the number of shares issued and outstanding. In this case, the hurdle rate will be the sum of the weighted average described above and an additional term.

⁴² Stein (1996), cited earlier. An unconstrained firm maintains its hurdle rate. It is the difference in hurdle rates that provides the rationale for the transaction. An unconstrained firm is willing to purchase assets from a constrained firm because it is willing to accept an objectively lower rate of return than is the constrained firm. Undue optimism tends to make the stocks of all airline firms overvalued, and hence generates an incentive for the managers of both firms to issue new equity.

⁴³ Interview, February 9, 2001 (see footnote 36).

It is important for board members, not just managers, to be involved in effective group processes that address behavioral costs. The involvement of board members is critical because senior managers are particularly vulnerable when it comes to the escalation of commitment in highly visible projects.

Hersh Shefrin is the Mario L. Belotti Professor of Finance at Santa Clara University.