BEHAVIORAL FINANCE
AND THE SOURCES OF ALPHA

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Behavioral Finance and the Sources of Alpha

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ABSTRACT

Behavioral finance is a new field in economics that has recently become a subject of significant interest to investors. This article provides a general discussion of behavioral finance and presents some insights from this field that apply to the problems plan sponsors face when evaluating and selecting active equity managers.

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Behavioral Finance and the Sources of Alpha

Behavioral finance is a relatively new field in economics that has become a "hot topic" for investment professionals. For example, a large number of conferences oriented toward investors have recently featured sessions on behavioral finance. However, because the field is so new, most professionals responsible for large portfolios were not exposed to the principles of behavioral finance in their college curricula and these principles have significant practical implications for investment management. Consequently, this article provides an overview of behavioral finance. The conclusion presents some insights from behavioral finance that specifically apply to the problem plan sponsors face when evaluating and selecting active equity managers

What is Behavioral Finance?

Behavioral finance has recently become a subject of significant interest to investors. Because it is a relatively new and evolving field in economics and consequently not well defined, a legitimate question is: "What exactly is behavioral finance?" I personally describe behavioral finance in the following ways:

- Behavioral finance is the integration of classical economics and finance with psychology and the decision-making sciences.

- Behavioral finance is an attempt to explain what causes some of the anomalies that have been observed and reported in the finance literature.

- Behavioral finance is the study of how investors systematically make errors in judgement, or "mental mistakes."

All economic models make simplifying assumptions about both market conditions and the behavior of market participants. Sometimes the simplifying assumptions underlying the model are explicitly stated and sometimes the assumptions are implicit – the latter is often the case regarding the behavioral assumptions underlying the model.

To illustrate, consider the efficient market hypothesis (EMH), an economic model of considerable importance to investors. The simplifying assumptions regarding <u>market conditions</u> that underlie the EMH frequently include, among others, assumptions such as:

- Transaction costs are zero.

- Markets are not segmented.

- Easy (even unlimited) entry into the security markets exists.

The <u>behavioral assumptions</u> that underlie the EMH can be expressed as:

- Investors act, in an unbiased fashion, to maximize the value of their portfolios.

- Investors always act in their own self-interest.

The first behavioral assumption is frequently stated as investors are "rational expectations wealth maximizers" – this means that investors form unbiased expectations of the future and given these expectations, they buy and sell in the securities markets at prices which they believe will maximize the future value of their portfolios.

Behavioral finance questions whether the behavioral assumptions underlying the EMH are true. For example, consider the assumption that individuals always act in their economic self-interest. Suppose you are having dinner at an out-of-town restaurant and it is extremely unlikely that you will ever return to this restaurant. Do you leave a tip?

Most people do, but in this case leaving a tip decreases, rather than increases one's wealth, and because you won't be returning to this restaurant there are (presumably) no "costs" associated with not leaving a tip. In this case leaving a tip violates the rational expectations and self-interest assumptions.

More germane to the EMH, consider "social investing" such as arbitrarily deciding not to invest in tobacco stocks or deciding to overweight environmentally clean industries, etc. Such behavior is not consistent with pure wealth maximization, if for no other reason than opportunities for forming better-diversified portfolios are foregone. Why investors might engage in non-wealth maximizing behavior, and what are the implications of such behavior for security pricing, are areas of inquiry in behavioral finance.

Another aspect of behavioral finance concerns how investors form expectations regarding the future and how these expectations are transformed into security prices. Researchers in cognitive psychology and the decision sciences have documented that, under certain conditions, people systematically make errors in judgement or mental mistakes. These mental mistakes can cause investors to form biased expectations regarding the future that, in turn, can cause securities to be mispriced.

By considering that investors may not always act in a wealth maximizing manner and that investors may have biased expectations, behavioral finance may be able to explain some of the anomalies to the EMH that have been reported in the finance literature. Anomalous returns such as those associated with "value" stocks, earnings surprises,

short-term momentum and long-term price reversals are fertile ground for researchers in behavioral finance.[1]

Better Expectations: The Mother of All Alphas

Alpha can be defined as the difference between a portfolio's risk-adjusted return and the return for an appropriate benchmark portfolio. Most active investors are trying to maximize alpha. In contrast, passive investors generally accept the EMH and merely try to match the benchmark return.

In the process of forming portfolios, active investors buy and sell securities based on their expectations about the future – typically expectations regarding the future profitability and risk characteristics of the firm issuing the securities. For example, a company's stock price may be largely determined by the consensus expectation (the market's expectation) regarding the company's future earnings. (From this point forward I will refer to the consensus of investors, as reflected in current prices, as the "market.")

If today's stock price is based on the market's expectation regarding the future, then in order to predict tomorrow's stock price change, one must have better expectations about the future than the market. In this sense, the mother of all alphas is the ability to form expectations that are better than the market's expectations. Consequently, for an active investment manager to claim that he can generate above normal returns (a positive alpha) in the future, he must argue that, in some manner, his expectations regarding the future are better than the market's expectations.

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[1] These anomalies have been documented by many studies. For example, with respect to the "value" anomaly, see Lakonishok, Shleifer and Vishny [1994]; with respect to earnings surprise, see Bernard and Thomas [1990]; with respect to short-term momentum, see Jegadeesh and

Three Sources of Alpha

If having better expectations than the market is the mother of all alphas, the issue of how expectations are formed is important in order to understand the sources, or causes, of alpha. In general, when forming expectations people use:

- a set of information

- procedures (models) for processing the information

This suggests two potential sources of alpha:

1. Superior (Private) Information: Most traditional investment managers try to generate a better information set. For example, they may try to generate a superior earnings forecast, or they may try to better understand the economics underlying a particular industry's profitability. These types of managers are frequently referred to as <u>traditional managers</u> or fundamental managers.

2. Process Information Better: Some investment managers assume that most information is commonly available to all investors and focus their energy on trying to develop better procedures for processing this information. Managers that try to do this in a formal way are frequently called <u>quantitative managers</u>.

It is important to note that if a particular investor has superior information, this does not necessarily imply that the market's expectations are biased – the market cannot incorporate information it does not have into its expectations in either a biased or unbiased fashion. Rather, in this case, the market's expectations are simply not as good

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Titman [1993]; with respect to long-term price reversals, see DeBondt and Thaler [1985, 1987, and 1990].

as they would be if the market had the private information. The key question to consider, however, is: What are the probabilities of any individual investor or investment manager <u>consistently</u> gathering superior, private information when so many other investors are trying to do the same thing?
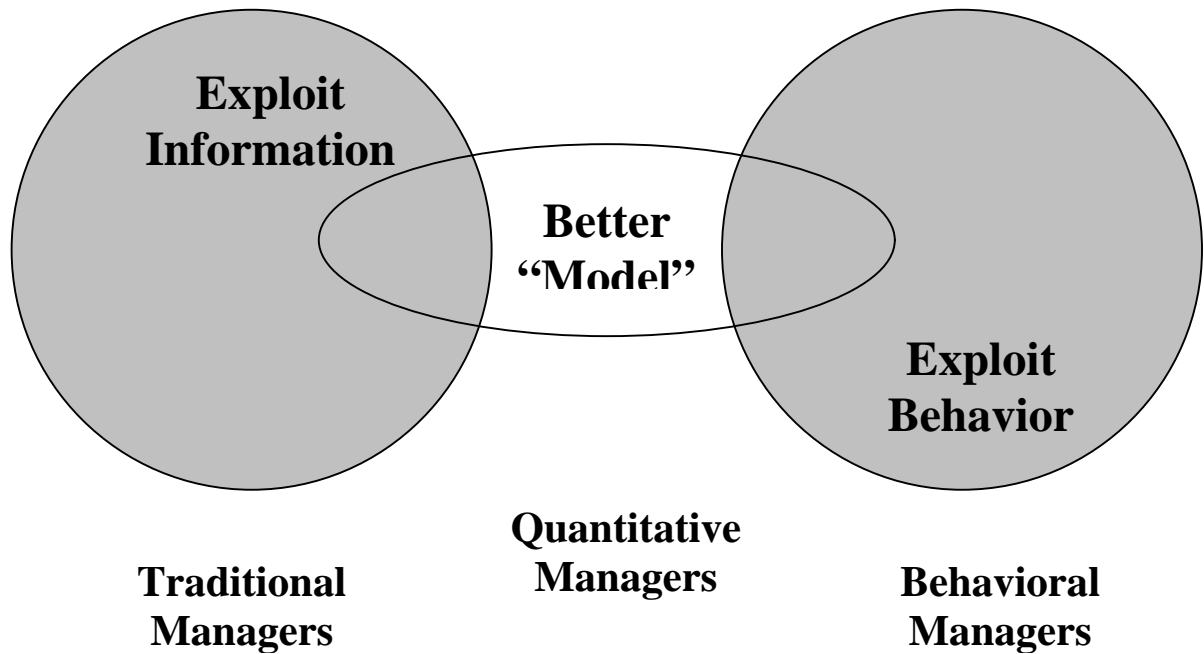
A similar point can be made with respect to processing information. If the market does not know the best way to process information, it may still form unbiased expectations that are simply not as good as they might be if the market knew the better method for processing information. To illustrate, suppose a three-factor model generates returns, but the market uses a two-factor model in processing information. In this case the market's expectations might be unbiased, but not as good as the expectations of an individual investor using the correct three-factor model. Again, the key question to ask is: What are the probabilities of any single investor or investment manager discovering the true factor model when so many other investors are trying to do the same thing?

There is a third possible source of alpha:

> **3. Behavioral Biases:** Scholars in psychology and the decision making sciences have documented that in some circumstances investors do not try to maximize wealth and in other circumstances investors make systematic mental mistakes. Both of these cases can result in mispriced securities and both are the result of behavioral biases.

The conditions under which behavioral biases occur and how they might affect security pricing are discussed in the next section. For now, simply note that there are three possible sources of alpha: Superior (private) information, better methods for processing information and behavioral biases. These are illustrated in Exhibit 1.

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EXHIBIT 1
THREE SOURCES OF ALPHA

Exploit Information

Better "Model"

Exploit Behavior

Quantitative Managers

Traditional Managers

Behavioral Managers

As mentioned earlier I generally think of investors who try to generate superior information as fundamental or traditional managers, and the majority of active investors are in this group. For example, almost all of Wall Street's research represents an attempt to generate superior information. I also tend to think of investors who try to develop better procedures (better models) for processing information as quantitative managers. Behavioral managers try to exploit situations where securities are mispriced by the market because of behavioral factors.

Of course there is overlap between all three types of managers. For example, many traditional managers who primarily focus on generating, say, better earnings estimates

may also try to develop better ways for processing such information. Similarly, many traditional and quantitative managers may also try to exploit behavioral biases.

Types of Behavioral Biases

It would be convenient if a taxonomy existed for classifying behavioral biases that was generally accepted by scholars in the field. However, because behavioral finance is a relatively new field, no such classification scheme currently exists, at least to my knowledge. Thus, I will present my personal method for classifying behavioral biases that affect investor behavior, and the reader should be aware that scholars may subsequently develop better classification methods.

First, it is important to understand that we are not dealing with truly irrational behavior. For example, suppose someone prefers a gift, with no strings attached, of $1,000 to a gift of $2,000. In the economic sense this would be truly irrational behavior and I, for one, do not expect to observe such behavior in the securities markets.

The types of behavioral biases we do observe in securities markets fall into two broad categories:

> **1. Non Wealth-Maximizing Behavior:** The economist's view of rational behavior assumes that investors act only to maximize the expected value of their portfolios. In fact, investors may maximize other things that are more important to them than their wealth.

> **2. Heuristic Biases and Systematic Mental Mistakes:** Heuristic biases cause investors to make systematic mental mistakes and as a result incorrectly process available information. Before the fact investors believe they are correctly processing information and acting in a manner

which maximizes their expected wealth. After the fact they <u>may</u> discover
the mental mistake, but frequently they are not even aware of the error.

There are many examples of non wealth-maximizing behavior. Agency problems represent one broad class of this type of behavior. "Window dressing" at the end of a quarter or year is an example. Selling stocks just before the end of a quarter which have been big losers and buying stocks that have been big winners will not raise the portfolio's return and the associated transaction costs of trading may actually lower the return. However, the portfolio manager may have an easier time at the quarterly client meeting if highly visible "losers" are not in the portfolio at the end of the quarter.

The concept of regret can cause another class of problems that result in non wealth-maximizing behavior.   Kahnamen and Tversky's (1979) prospect theory formally addresses the fact that for most investors the pain associated with losses exceeds the pleasure of gains. One manifestation of this is the fact that investors tend to hold onto their loser too long and tend to sell their winners too soon.[2]

People also suffer from a lack of self-control, which can lead to non-wealth maximizing behavior. Statman (1995) shows that dollar cost averaging is sub-optimal with respect to maximizing wealth. Nevertheless, dollar cost averaging is used by many investors who apparently lack the discipline (and fortitude) to invest all of their wealth in risky assets at one point in time.

However, for non-wealth maximizing behavior to result in mispriced securities, the market as a whole must engage in this type of behavior, as opposed to isolated investors. Further, for an investment strategy to be able to exploit such mispricings, the market must engage in non-wealth maximizing behavior in a systematic fashion. These two conditions

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are not likely to be met. On the other hand, heuristic biases can cause the majority of investors to make systematic mental errors. These mental mistakes, in turn, cause the market to have biased expectations and, as a result, misprice securities. Thus, heuristic biases are potentially exploitable.

**Heuristics, Heuristic Biases and Optical Illusions**

Heuristics are rules of thumb, or mental shortcuts, the human brain uses to quickly solve complex problems. For example, a billiard player does not solve the trigonometric and differential equations needed to determine at what angle and speed to hit the cue ball in order to put another ball in the correct pocket. Rather, a billiard player uses rules of thumb and mental shortcuts that allow him to play the game, even though he may not understand the mathematics. Thus, heuristics are very useful, powerful problem solving tools.

However, when used in the wrong situation, heuristics can cause people to make systematic mental mistakes. Optical illusions are a simple way of illustrating heuristic biases. Vision is a very complex problem for the brain to solve. The eye generates a tremendous amount of information which must be quickly analyzed and interpreted by the brain to form the images which we "see." Over many thousands of years the human brain has developed mental shortcuts for interpreting vision data and these vision heuristics typically work quite well. However, when these mental shortcuts for solving vision problems are used in the wrong context, a heuristic bias results in an optical illusion. To illustrate, look at Exhibit 2 on the next page and answer the question: Which of the two vertical straight-line segments appears to be longer?

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[2] See Shefrin and Statman (1985) and O'Dean (1996).

EXHIBIT 2
OPTICAL ILLUSIONS AND HEURISTIC BIASES
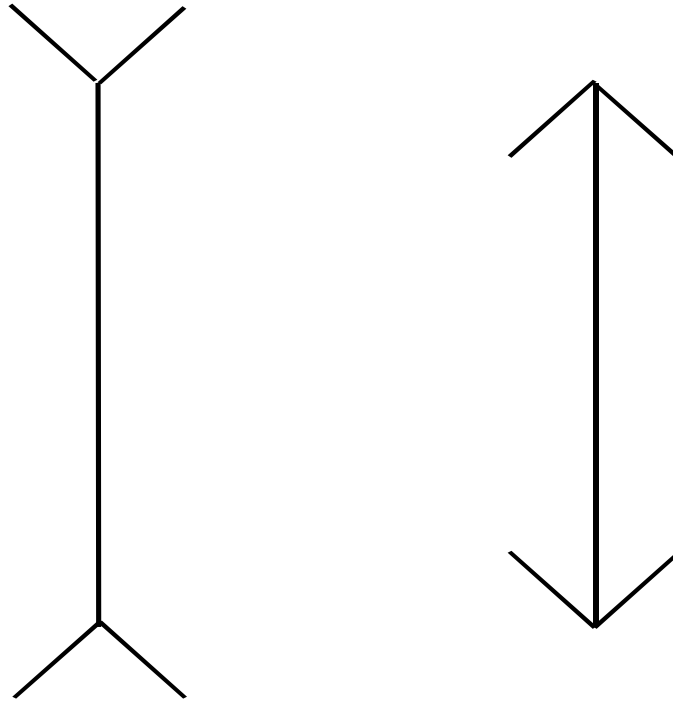
The answer to this question (assuming the respondent is human and not cheating) is the vertical straight line on the left "looks" longer. In fact, the two lines are drawn to be exactly the same length. The optical illusion results from the brain using heuristics for solving three-dimensional vision problems when the lines are drawn on a two-dimensional surface. What "tricks" the brain into thinking it is receiving three-dimensional data from the eye are the arrowheads drawn on the end of each vertical line segment. The reverse arrowheads drawn on the left line segment give the illusion of depth and the line appears to be farther away from the eye than it really is. The regular arrowheads on the right line also give the illusion of depth, but in this case the brain is tricked into thinking the line is closer to the eye that it actually is. The brain uses the following heuristic for converting three-dimensional vision information: Objects that are

farther away are bigger than they appear and objects that are close are smaller than they appear. (For example, a house observed from a long distance creates a very small image on your eye's retina, but you still know the house is a large object.) Thus, while both vertical line segments create the same image on your eye's retina, your brain converts this information so that the vertical line on the left, which appears to be farther away, is longer than the vertical line on the right, which appears to be closer.

An interesting, and important, aspect of heuristic biases is that they are very difficult to overcome. For example, now that you understand what causes the optical illusion, look again at the two vertical line segments in Exhibit 2. Which vertical line appears longer? If you are typical, the line on the left still appears longer, even though you know the two line segments are the same length and you understand what causes the optical illusion. Heuristics, which have evolved over thousands of years, can be thought of as being part of the brain's hardware. Unlike software, these mental shortcuts are such useful and powerful problem solving tools they simply cannot be reprogrammed. However, when a heuristic is used in the wrong situation (when the wrong rule-of-thumb is used to solve a problem), a heuristic bias causes the person to make a mental mistake.

Heuristic Biases and Errors in Expectations

Today's stock prices are based on the market's expectations about the future. If the market has biased expectations, then stocks may be mispriced. If an investor has unbiased expectations, and knows the direction of the market's bias, she can predict future price changes and consequently form portfolios that have a future alpha. As the optical illusion illustrates, heuristics, when used in the wrong situation, can cause mental mistakes -- in

the case of the investment process, heuristics can cause investors to form biased expectations.

People use many different heuristics in solving problems. This section will concentrate on only four heuristics that are closely related to the most common mental mistakes, or errors in judgement, made by investors.[3] These heuristics are:

1. **Representativeness:** This heuristic is the source of the adage, "if it looks like a duck and quacks like a duck, it probably is a duck." With respect to forming expectations, people evaluate the probability of an uncertain future event by the degree to which it is similar to recently observed events. Representativeness can cause investors to <u>over</u>react to new information, i.e., investors give new information too much weight in forming their expectations about the future.

2. **Saliency:** For events which occur infrequently, people tend to overestimate the probability of such an event occurring in the future if they have recently observed such an event. For example, commercial airplane crashes occur infrequently. However, if an airplane crash has recently been prominently reported in the media, people will greatly overestimate the probability of a crash occurring in the future. Saliency can cause investors to <u>over</u>react to new information.

3. **Overconfidence:** People are grossly overconfident regarding their ability and their knowledge. For example, when people say that they are 90 percent sure that an event will happen or that a statement is true, they typically are correct less than 70 percent of time. Overconfidence can cause investors to <u>under</u>react to new information.

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[3]For a more complete treatment of heuristics and heuristic biases, see Shiller (1997) or DeBondt and Thaler (1994).

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4. **Anchoring:** Psychologists have documented that when people make quantitative estimates, their estimates may be heavily influenced by previous values of the item. For example, it is not an accident that a used car salesman always starts negotiating with a high price and then works down. The salesman is trying to get the consumer anchored on the high price so that when he offers a lower price, the consumer will estimate that the lower price represents a good value. Anchoring can cause investors to underreact to new information.

Expectations are based on a set of information and procedures for processing the information. A simple way of thinking about how the market can form biased expectations is that the market can either overreact or underreact to new information. Overreaction means investors place too much weight on recent, new information in forming their expectations regarding future events. Underreaction means investors give too little weight to recent, new information.

As noted above, the representativeness and saliency heuristics can cause investors to overreact to new information. These heuristic biases are probably the source of alpha for most value and contrarian strategies. For example, suppose earnings changes follow a random walk for most companies.[4] If this is true, then tomorrow's earnings change is just as likely to be positive, as it is negative for any particular company. However, if the majority of investors are vulnerable to representativeness bias, they might naively extrapolate a recent negative earnings change for a company far into the future, particularly if the recent earnings announcement is very vivid, or salient. In this case, the market's expectations regarding the company's future profitability are biased downward,

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[4] Many researchers have shown that a random walk is a reasonable model for earnings changes. For a recent article, see Fuller, Huberts and Levinson (1993). However, these authors also argue

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the price falls and the stock sells at a P/E that is "too low" relative to trailing earnings. This mispricing results in the stock subsequently generating a positive alpha.

It is important to note that the use of heuristics results in mental mistakes <u>only under certain conditions</u>. These conditions must occur infrequently, or the heuristic would not have successfully evolved over time. Thus, most stocks with low P/E ratios are probably correctly priced. To find the mispriced stock from among the universe of low P/E stocks, one should try to determine which stocks are subject to the conditions that cause investors, as a group, to be vulnerable to the heuristic biases that cause overreaction.

The flip side of overreaction is underreaction. It is important to note that different heuristics (anchoring and overconfidence) cause underreaction and the conditions under which investors are vulnerable to these heuristics are different from the conditions that cause investors to be vulnerable to overreaction.

Underreaction is probably the primary source of the alpha associated with earnings surprise and short-term momentum strategies. This is easy to see with respect to earnings surprises. Suppose a company had reported EPS of approximately $1.00 for many quarters and the analysts' current estimates are also around $1. Suppose the company then reports quarterly EPS of $1.50, which represents a large change in earnings and a large earnings surprise. If the analysts are overconfident and also anchored to their most recent estimate, they may be reluctant to give as much weight as they should to the information in the current earnings announcement and not raise their estimate. However, if the change in earnings that caused the surprise is permanent, over time the analysts will figure this out, slowly raise their estimates and the stock price will drift upward after the earnings

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that the market forecasts earnings better than a simple random walk model and as a result, low P/E stocks tend to have lower future growth than high P/E stocks.

announcement, generating the well-documented post-announcement alpha associated with earnings surprises.

Again, it is important to note that analysts are unlikely to be vulnerable to the heuristics biases associated with anchoring and overconfidence, except under unusual conditions. And, of course, if the earnings change that caused the surprise is not permanent, the analysts will be correct if they do not raise their estimates. Thus, the keys to exploiting the true source of the earnings surprise alpha are determining under what conditions analysts are likely to be overconfident and anchored, and whether the earnings change associated with the surprise is permanent in nature.

Exhibit 3 summarizes the manner in which investors incorporate new information into their expectations regarding future events.

EXHIBIT 3
BEHAVIORAL BIASES AND ERRORS IN EXPECTATIONS

A Distribution of Expectations Based on New Information

■ Over Reaction ■ Correctly Processed ■ Under Reaction
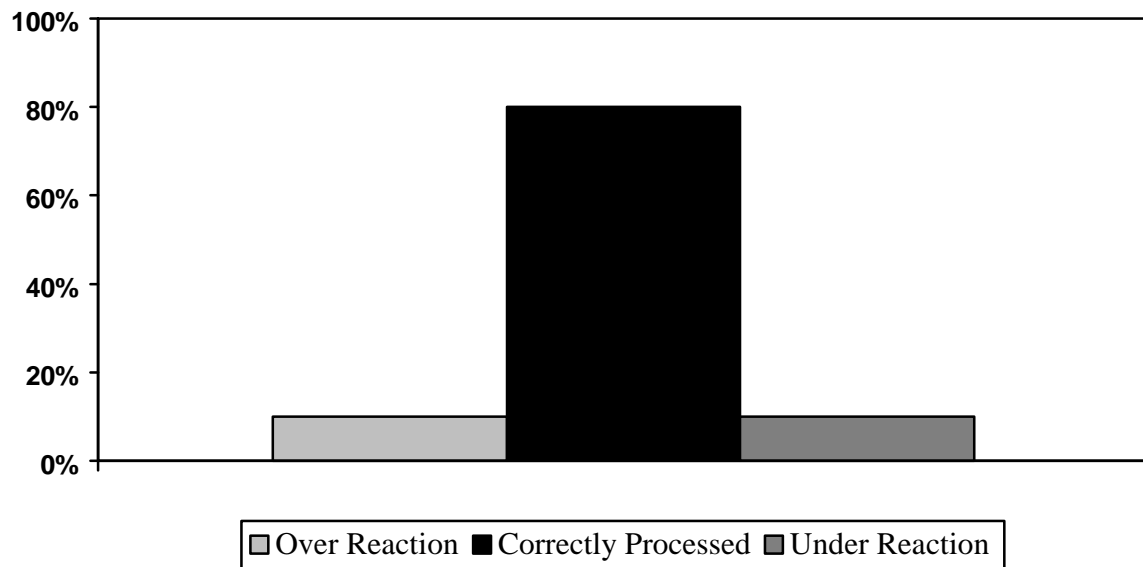
Most of the time the information is correctly processed and the market's expectations are unbiased. Under some conditions the market may overreact to the information, resulting in biased expectations. This overreaction is likely due to biases associated with the representativeness and saliency heuristics and may be the source of the alpha for most value and contrarian strategies. Under other conditions the market may underreact to the new information, which again results in the market's expectations being biased and stocks being mispriced. Underreaction is likely due to biases associated with the overconfidence and anchoring heuristics and may be the source of the alpha for most momentum and earnings surprise strategies.

Questions Plan Sponsors Should Ask Prospective Managers

Behavioral finance provides a number of insights that should be useful to plan sponsors when evaluating and selecting active investment managers. The primary, if not the sole reason for selecting and hiring an active manager is the belief that the manager will provide a positive alpha in the future. If one agrees with the proposition that current prices are based on the market's expectations regarding the future, then the genesis of all alphas is having better expectations than the market.

Because expectations are formed by processing an information set, two potential sources of alpha are: 1) Generating a better information set by obtaining information that the market does not have, i.e., private information; 2) Processing information better than the market. A third potential source of alpha is: 3) Exploiting behavioral factors that cause the market's expectations to be biased.

One of the first questions to ask a prospective manager is: "What is the source of your alpha?" If the manager cannot describe the source of his alpha, you may want to politely end the interview. Most managers, of course, will have an answer to this question, but the answer should fall into one or more of the three sources of alpha noted above.

A second question might be: "Can you specifically relate the source of your alpha to the past returns of portfolios you have managed?" If a manager answered the first question by indicating he generates private information that the market does not have, then ask him to give specific examples of private information he obtained for specific stocks. Just as importantly, ask him to explain how he obtained this information. For example, he may argue that his firm employs the best analyst in, say, the semiconductor industry, and this analyst formed an earnings estimate for Intel that was superior to the consensus estimate. Follow up questions might include: "Is the analyst still employed by the manager? Why does the manager believe this particular analyst is superior to the many smart, highly trained analysts following Intel? Does the manager have other superior analysts and, if so, how is the manager able to hire so many superior analysts when so many other managers are also trying to hire these superior analysts?" My personal view is that, given the amount of competition among analysts and the competition among managers to hire superior analysts, it is not very likely that any investment manager will have enough superior, private information to generate a significant alpha in the future.

On the other hand, if the manager claims the source of his alpha is that his firm processes information better than the market, ask for specific details as to how his firm

does this. If the manager responds that they simply understand an industry better, or they somehow have a better sense of value, I would be very skeptical.

If the manager is a pure quantitative manager and argues that his firm has the best model, ask for specific details about their "black box." Although not as ubiquitous as traditional fundamental managers, there are quite a few quantitative managers, all of who are trying to develop the best model. Ask this manager: "Why do you believe your firm's model processes information better than the rest of the market?"

Finally, if the manager responds that the source his alpha is the result of exploiting behavior, ask him to describe the specific behavioral bias, or biases, his firm exploits. If he answers in generalities, such as his firm exploits overreaction, ask: "What are the specific heuristic biases causing the overreaction?" Just as importantly, ask: "Under what conditions is the market vulnerable to these heuristic biases?" If the manager cannot answer these questions, he probably does not know how to exploit behavioral biases.

To summarize, ask the manager to identify the source of his firm's alpha and to clearly document the relationship between past portfolio returns and this source of alpha. If the manager passes these tests, ask why he expects his firm's source of alpha to persist in the future. Most things change over time. Truly superior analysts change firms, or retire. Better models for processing information may be replicated by competitors.

One of the appealing things about managers who exploit behavioral biases (assuming they really do) is that human behavior changes very slowly. Thus, strategies that exploit behavior and have generated a positive alpha in the past are likely to continue to be successful in the future.

Conclusion

Behavioral finance offers many useful insights for investment professionals. From the plan sponsor's viewpoint, behavioral finance provides a framework for evaluating active investment managers, as illustrated by the "questions to ask" in the previous section.

Another insight that was not discussed, but is potentially useful to plan sponsors, is the issue of diversification across active investment managers. If the source of alpha for most managers is derived either by generating private (or superior) information or by processing information better, then managers whose alpha is derived by capitalizing on behavioral biases will be better "diversifiers." This follows from the idea that if the source of alpha for behavioral managers is different from the source of alpha for the vast majority of managers, then the returns generated by behavioral managers will tend to have a low correlation with the returns generated by more traditional managers.

There are many other potentially useful applications of behavioral finance that were not discussed in this article due to space constraints. For example, principles of behavioral finance, and psychology in general, might be quite useful in dealings between the plan sponsor staff and the plan's board of directors or trustees.

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