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Behavioral Bias, Valuation, and Active Management

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We examine the consequences of behavioral biases in the context of valuation theory. Although the biases we consider have been well documented elsewhere, the framework we provide is new. It not only allows a rationalization of previous findings, but it also makes possible identification of the types of stocks for which specific biases will be strongest. We provide empirical evidence concerning the ability of an array of commonly used active investment strategies, such as value and growth tilts, to exploit biases. We also use the framework to test the relative importance of prospect theory and the overconfidence hypothesis as justification for momentum investing.

A large and rapidly growing body of literature attributes various stock market anomalies to behavioral biases. Most articles focus on individual anomalies, such as the low-P/E effect or the behavior of stock prices subsequent to earnings announcements. Little work has been conducted to link the anomalies to, or discuss them within, the framework of a broad model of security prices. For example, recent empirical work suggests that the low-P/E effect may be the result of a tendency of investors to overextrapolate past problems into the future—a finding that provides important support for value, or low-P/E, investing (Lakonishok, Shleifer, and Vishny 1994). Many other widely used—and frequently successful—alternatives to low-P/E investing exist, however, including buying high-momentum growth stocks. Moreover, many behavioral biases exist in addition to overextrapolation.

We examine the consequences of two types of behavioral bias in the context of valuation theory. Although the biases we examine have been documented elsewhere, the framework we provide is new. It allows us not only to rationalize previous findings but also to suggest the types of stocks for which various biases will be strongest. We suggest that behavioral finance offers much more than a simple prescription to own value stocks. We provide empirical evidence about the ability of an array of commonly used active investment strategies to exploit biases. In addition, we use the framework to empirically test the relative importance of prospect theory and the overconfidence hypothesis for momentum investing. Finally, we suggest some criteria investors might use to assess active managers.

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Behavioral Biases

Although the overextrapolation effect (Lakonishok, Shleifer, and Vishny) is the most well known of behavioral biases, behavioral science is replete with examples of other biases that can affect decision making and, possibly, security prices. Biases are many, but they can be grouped into two general categories: (1) overconfidence and (2) prospect theory.

Overconfidence. We use the term "overconfidence" to characterize a broad group of human foibles. Studies have demonstrated that humans tend to ascribe an unduly high probability of success to their forecasts (Kahneman and Tversky 1973). Similarly, individuals are poor Bayesians: They overemphasize their own judgmental forecasts relative to unbiased probabilities (Grether 1980). Some researchers (Kahneman and Tversky 1972) have referred to this trait as "representativeness bias," which, simply put, means that people tend to think "if it walks like a duck and quacks like a duck, it must be a duck." People's preferences also depend on how an argument, or situation, is framed (Kahneman and Tversky 1984), which suggests that choice does not always reflect a dispassionate analysis. Finally, people tend to overreact to dramatic events (De Bondt and Thaler 1985); that is, they tend to attach unduly high probabilities to, for example, aircraft and stock market crashes,

which are spectacular but rare. In short, human beings develop, and stick to, stronger views than warranted by impartial analysis of the data.

An overconfidence bias also suggests that investors adjust their expectations only slowly (Daniel, Hirshleifer, and Subrahmanyam 1998). In this sense, overconfidence implies that, because investors adjust to new information with a lag, a postevent drift in stock prices should be evident.

Prospect Theory. In prospect theory, utility functions are more complex than those supporting conventional microeconomic models. Prospect theory posits that utility depends on deviations from moving reference points (Kahneman and Tversky 1979) rather than on absolute levels of wealth or consumption. Recent empirical studies have suggested that people fear losses more than they value gains—that losing $1 is about twice as painful as the pleasure of gaining $1 (Kahneman and Tversky 1991). Prospect theory predicts that people will tend to gamble in losses; that is, investors will tend to hold on to losing positions in the hope that prices will eventually recover. Prospect theory also predicts that investors will be risk averse in gains. When they make money, investors will move too quickly to "take some chips off the table."

Prospect theory predicts a payoff to momentum investing. To understand the connection, assume that some investors behave as if they have utility functions for losses and gains for each individual stock in their portfolios. If investors view stocks on an individual basis, then risk aversion in gains will cause them to sell too quickly into rising stock prices, thereby depressing prices relative to fundamentals. In other words, positive momentum sets the stage for a further rise in price when stock prices return to fundamental values. Conversely, risk seeking in losses will cause investors to hold on too long when prices decline, thereby causing the prices of stocks with negative momentum to overstate fundamental values.

Bias and Valuation Theory

Behavioral science tells us what biases to look for. Valuation theory tells us where to look for them. To clarify this concept, we use a simplified valuation model that presents the value of a share of stock in terms of two components—a part that represents the present value of earnings from existing assets and a part that represents the present value of future growth opportunities.

In 1961, Miller and Modigliani showed that if one assumes a company will have the opportunity to invest in projects that earn average returns of ρ^* for the next T years and if, during that time, the investments are a constant proportion of earnings, then the stock price, P, can be given by

$$P \cong \frac{NE}{\rho} + I\left(\frac{\rho^* - \rho}{\rho}\right)T, \tag{1}$$

where NE is normalized earnings, I is annualized net investment, and ρ is the cost of equity, or the equity discount rate. Conceptually, ρ in the growth portion (the second term) of Equation 1 may differ from ρ in the first term if the systematic risk for the company's growth opportunities differs from the systematic risk for current earnings.

Because $I\rho^* = gNE$, where g is the rate of growth of earnings, Equation 1 can also be expressed as

$$P \cong \frac{NE}{\rho} + \left(\frac{gNE}{\rho} - I\right)T. \tag{2}$$

As discussed in the next section, the second term, or growth portion, in Equation 1 or Equation 2 determines how an individual classifies stocks. As is well known, this term will be positive if a company's expected growth is profitable—that is, if ρ^*, the return on incremental equity, exceeds ρ, the cost of equity.

Suppose cognitive biases affect estimates of both the level of normalized earnings, NE, and growth in normalized earnings, g. Now, consider the implications of such biases for fast-growth and slow-growth companies. For slow-growth companies, Equation 2 shows that normalized earnings have an important effect on price whereas the term involving g is trivial. Consequently, any bias in price should involve primarily estimates of normalized earnings. Our hypothesis is that a bias in the stock price of a slow-growth company is likely to occur when enough overconfident investors believe a story about the company—either favorable or not—that is inconsistent with its lack of growth prospects and reasonable estimates of its normalized earnings.

Conversely, for fast-growth stocks, Equation 2 shows that the first term—the present value of normalized earnings—is trivial when compared with the present value of future growth opportunities. For these stocks, biased prices are more often associated with biased estimates of future growth. Unlike for their slow-growth counterparts, for which news may often relay information about random deviations from normalized earnings, news for fast-growth companies often conveys information about prospects for future growth. News may signal changed investment opportunities or, more importantly, changes in ρ^*, the return on incremental equity. Our hypothesis is that a bias in the stock price of a fast-growth company is likely

to occur when enough overconfident investors cling to their beliefs about the future growth prospects of the company despite the release of news that is inconsistent with those beliefs.

The higher the growth rate, g, the bigger the potential impact of a shift in perceived profitability. Viewed in this context, the importance of news increases with the company's growth rate. Biased responses to news should have a larger impact on market prices of rapidly growing companies. Biased estimates of normalized earnings should have a profound impact on the stock prices of slowly growing companies but a relatively small impact on the stock prices of rapidly growing companies.

Stock Classification

To investigate bias, we needed to identify slow-growth and fast-growth companies. To do so, we used past and expected growth rates. Then, we placed companies in a matrix shown in **Exhibit 1**.[1]

Because cognitive biases are most clearly associated with expectational extremes, we focused on stocks that lie in the four corners of the matrix. "Dogs" are companies that have grown slowly in the past and are expected to grow slowly in the future. "Stars" represent the opposite. Although most observations fall along the diagonal between Dogs and Stars, a few fall into the off-diagonal corners—"Fallen Angels" or "Old Dogs with New Tricks." In those cells, the future is expected to significantly diverge from the past. Companies in those cells are typically undergoing change for the better, or worse, and investor expectations are undergoing corresponding changes. Whether a company is a Fallen Angel or an Old Dog with New Tricks depends on the direction of the company's change.

Dogs. Earnings-to-price ratios (E/Ps) or book-to-price ratios (B/Ps) can be viewed as measures of investor overconfidence for slow-growth companies. According to Equation 2, price is proportional to normalized earnings (i.e., $P \approx NE/\rho$) because g is small for these companies. Furthermore, because normalized earnings tend to be relatively stable, earnings or book value can be used to derive noisy estimates of normalized earnings (although, in many cases, functions of earnings and book value may provide the best estimates). When investors overextrapolate past failure, price will be low relative to normalized earnings and, consequently, E/P and B/P will be high. When investors are too optimistic, E/P and B/P will be low. Thus, we would predict that for slow-growth companies, cheap stocks should appreciate and expensive stocks should fall in price.

Stars. In our taxonomy, Stars are companies that have grown quickly in the past and are expected to do so in the future. Normalized earnings for Stars are less important than they are for Dogs. The value of Star stocks is concentrated in estimates of the present value of future growth, and the value of the first term in Equation 1 or Equation 2 is trivial in comparison with the value of the stock. Consequently, earnings or book value, and thus E/P and B/P multiples, convey little information about value. News, however, can have profound consequences because it may provide information about uncertain future growth prospects. If bias affects the price of growth stocks, we would expect to discover the effect in the stocks' response to news.

Empirical Results

The overconfidence hypothesis suggests that value investing should work for slow-growth companies. These companies, with their high E/Ps and B/Ps, should outperform their low-E/P and low-B/P counterparts. The overconfidence hypothesis also suggests that a delayed reaction to news should be most important for fast-growth companies. To examine these hypotheses, we constructed portfolios of stocks based on E/P and on new information about future earnings growth. We used consensus estimates of EPS forecasts from the I/B/E/S International database for each quarter between 1989

Exhibit 1. EPS–Sales Growth Matrix

Historical Five-Year Sales Growth Quartile	Forecasted Long-Term EPS Growth Quartile			
	1 (low)	2	3	4 (high)
4 (high)	Fallen Angels			Stars
3				
2				
1 (low)	Dogs			Old Dogs with New Tricks

and 1997 and ranked the 1,000 largest publicly traded stocks into quartiles on the basis of five-year sales growth and mean forecasts for EPS growth over the next five years.[2] Because new information is unobservable, we used revisions of earnings forecasts made by security analysts, as well as earnings surprises, as proxies. E/P ratios were calculated using the average of consensus I/B/E/S EPS estimates for the next two fiscal years, where each estimate was weighted by the time remaining until earnings were actually reported.[3] Companies with a data history of less than five years and companies with fewer than three analysts following them were excluded from the sample. In the portfolio construction, we used both revisions and surprises reported in the three months prior to portfolio formation. We used revisions of fiscal year earnings estimates and revisions of estimated earnings for the upcoming calendar quarter. We considered earnings revisions to be positive when EPS estimates for the current fiscal quarter were not falling and at least 40 percent of annual EPS estimates were being revised upward.[4] Earnings reports were considered favorable if they met or exceeded consensus estimates.

Fast-Growth Stocks. Average returns on portfolios of Star stocks ranked by E/P and EPS revisions are provided in **Table 1**. For each type of revision, the first row, μ, is average excess return over the three months following portfolio formation; the second row, *se*, is the standard error; and the third row, *n*, is the number of observations. We defined excess return as the total return on a security minus the equally weighted average return of all stocks in the universe.[5] **Table 2** shows similar results for a two-way classification on E/P and earnings surprises.

- *E/P and Stars*. Tables 1 and 2 suggest that only a weak relationship exists between E/P and subsequent performance of Stars.[6] Returns are not monotonic in E/P, and in fact, some of the cheaper (second E/P quintile) Stars tended to lag their more expensive counterparts in this period. Although surprising at first, this result is entirely consistent with valuation theory, which would predict that near-term earnings are a poor measure of value for these stocks.
- *News and Stars*. In contrast to E/P, signals about future growth were found to be strongly related to subsequent performance. Tables 1 and 2 show that Star stocks experiencing downward estimate revisions, or negative earnings surprises, significantly underperformed the average Star. Keep in mind that these portfolios were constructed in the calendar quarter *following* either the revision or the earnings surprise, and consequently, they exclude the immediate price response to these unanticipated events. In a perfectly efficient market, we would expect an immediate response to unanticipated news but would not expect to see postannouncement drift.

Table 1. Average Quarterly Excess Returns for Portfolios of Stars Constructed on the Basis of E/P and EPS Estimate Revisions, 1989–97

	E/P Quintile					
EPS Estimate Revision	1 (high)	2	3	4	5 (low)	All
Negative						
μ	0.21	–3.91	–0.49	–3.58	–3.20	–1.92
se	1.32	1.27	1.33	1.60	1.33	0.63
n	321	217	165	150	185	1,038
Neutral						
μ	1.45	–0.40	–0.76	0.62	–0.71	0.01
se	1.43	1.24	1.09	0.87	0.77	0.47
n	321	255	279	340	490	1,685
Positive						
μ	2.48	2.52	5.27	0.99	3.80	2.98
se	1.82	1.59	1.55	1.16	1.34	0.66
n	206	175	185	236	280	1,082
All						
μ	1.23	–0.79	1.09	–0.13	0.15	0.33
se	0.86	0.79	0.76	0.65	0.62	0.33
n	848	647	629	726	955	3,805

Note: Quarterly returns include dividends and were calculated by Factset Data Systems. Returns equal the average of equally weighted returns for each cell less the corresponding equally weighted return on the entire sample for each quarter. Average excess returns equal the average quarterly excess returns on portfolios rebalanced each quarter.

Table 2. Average Quarterly Excess Returns for Portfolios of Stars Constructed on the Basis of E/P and Earnings Surprise, 1989–97

Earnings Surprise	E/P Quintile 1 (high)	2	3	4	5 (low)	All
Negative						
μ	–0.62	–1.91	–1.02	–1.75	–2.64	–1.61
se	1.53	1.33	1.42	1.44	1.15	0.63
n	269	203	142	172	264	1,050
Nonnegative						
μ	2.10	–0.28	1.70	0.37	1.22	1.07
se	1.04	0.97	0.89	0.72	0.73	0.39
n	579	444	487	554	691	2,755
All						
μ	1.23	–0.79	1.09	–0.13	0.15	0.33
se	0.86	0.79	0.76	0.65	0.62	0.33
n	848	647	629	726	955	3,805

Note: An earnings surprise was negative if reported quarterly earnings fell short of the average EPS estimate available just prior to the report date.

In contrast to the results for E/P, the findings about news are strongly monotonic and significant. Prices of stocks that have already experienced negative information about future growth might continue to fall for two behavioral reasons. First, overconfident investors might be slow to sell when provided with information that contradicts their prior optimistic beliefs about future growth. Second, prospect theory (see Kahneman and Tversky 1979 or, more recently, Statman 1995) suggests that individuals tend to gamble in losses. Growth stock prices frequently plummet on negative earnings surprises and analyst downgrades. These sharply lower prices, relative to the preannouncement reference prices, may induce loss-averse investors to hold on in the hopes of recouping lost gains. Prospect theory, however, as we will demonstrate later, appears to play a minor role.

Taken together, our results provide only limited support for investing in cheap Stars. Although the average excess return for the cheapest growth stocks is positive, it is not significantly different from zero. Therefore, successful GARP (growth-at-a-reasonable-price) investors must emphasize more than extremely cheap growth stocks. They must also hold only those stocks experiencing nonnegative earnings surprises. Those stocks may be tough to find, however, because shares with such characteristics constituted only 2 percent of the entire sample (which implies holding a portfolio of 20 stocks when drawn from a 1,000-stock universe). An easier and more profitable approach in this period would have been to invest only in the most expensive Stars experiencing positive news.

Slow-Growth Stocks. The analysis applied to the fast-growth Stars is repeated for the slow-growth Dogs in **Table 3** and **Table 4**.

E/P and Dogs. In our taxonomy, Dogs have grown slowly in the past and are expected to grow slowly in the future. As mentioned, we view E/P as a measure of investor overextrapolation. For these stocks, the first term in the valuation equation, which measures the value of normalized earnings, should dominate and the growth term should be insignificant.

Taken as a whole, Dogs tend to outperform the average stock. Moreover, as hypothesized, and in contrast to the findings for Stars, we found a strong relationship between E/P and subsequent performance. Although the average excess return on high-priced Dogs is negative, it is not significantly different from zero.

News and Dogs. News plays a secondary role for Dogs. We found, consistent with Equation 1, that the average excess return on Dogs experiencing positive revisions was not significantly different from Dogs experiencing negative revisions.[7] Perversely, Dogs with mixed revisions (Mutts?) exhibited the highest average return. Dogs experiencing negative revisions tended to underperform other Dogs, but neither negative revisions nor negative surprises led to significantly negative excess returns. Finally, the average return for Dogs with negative earnings surprises was significantly positive. Taken as a whole, the reaction of Dogs to news is consistent with the premise that investors view earnings news largely as information about the variability, not the mean, of normalized earnings.

Table 3. Average Quarterly Excess Returns for Portfolios of Dogs Constructed on the Basis of E/P and EPS Estimate Revisions, 1989–97

	E/P Quintile					
EPS Estimate Revision	1 (high)	2	3	4	5 (low)	All
Negative						
μ	1.64	2.17	–0.83	–0.30	–1.46	0.09
se	1.21	0.81	0.61	0.78	1.09	0.40
n	156	228	282	192	258	1,116
Neutral						
μ	3.75	1.28	0.80	0.07	1.41	1.15
se	1.00	0.53	0.43	0.66	1.29	0.30
n	174	410	552	333	193	1,661
Positive						
μ	2.97	0.12	0.34	–1.65	–0.32	0.33
se	1.22	1.01	1.22	0.98	1.26	0.51
n	119	106	93	118	98	534
All						
μ	2.80	1.39	0.26	-0.35	–0.25	0.66
se	0.66	0.41	0.34	0.45	0.72	0.22
n	449	744	927	643	548	3,311

Table 4. Average Quarterly Excess Returns for Portfolios of Dogs Constructed on the Basis of E/P and Earnings Surprise, 1989–97

	E/P Quintile					
Earnings Surprise	1 (high)	2	3	4	5 (low)	All
Negative						
μ	2.84	1.12	0.56	0.38	–1.54	0.70
se	1.12	0.61	0.49	0.75	1.10	0.34
n	172	330	400	251	242	1,395
Nonnegative						
μ	2.78	1.60	0.03	–0.83	0.82	0.63
se	0.81	0.55	0.47	0.56	0.95	0.29
n	277	414	527	392	306	1,916
All						
μ	2.80	1.39	0.26	–0.35	–0.25	0.66
se	0.66	0.41	0.34	0.45	0.72	0.22
n	449	744	927	643	548	3,311

Fallen Angels and Old Dogs with New Tricks. Cognitive bias potentially plays a role for the off-diagonal stocks. The tendency for individuals to be overconfident suggests that investor expectations may reflect bias whenever forecasts materially diverge from historical experience. In our framework, the outlook may be too pessimistic for Fallen Angels and too optimistic for Old Dogs with New Tricks.

Table 5 shows average quarterly excess returns for equally weighted portfolios constructed using the classification matrix. Note that far fewer observations, *n*, fall in the off-diagonal corner cells (n = 525 and n = 324) than in the Dog cell (n = 3,332) and Star cell (n = 3,822). Nevertheless, average excess returns were found to be positive for Fallen Angels and negative for Old Dogs with New Tricks—a finding consistent with the overconfidence hypothesis.

Fallen Angels tend to behave more like growth stocks. These companies have exhibited rapid rates of growth in the past, but their growth is expected to slow in the future. Our research (not shown here) suggests that news is much more important than E/P for these stocks. Although the sample studied here is quite small, we did find the average return to be negative (positive) for Fallen Angels experiencing bad (good) news. We found no apparent relationship to E/P.

Investing in Old Dogs with New Tricks is dangerous. Expectations are high for these stocks, despite the fact that they have been among the slowest growers in the past. Taken as a whole, these stocks generated a significant negative return over the period studied. These stocks tended to underperform all other categories regardless of news or E/P.

Table 5. Average Quarterly Excess Returns by Company Classification, 1989–97

Historical Five-Year Sales Growth	Forecasted Long-Term EPS Growth				
	1 (low)	2	3	4 (high)	All
4 (high)					
μ	0.75	–1.20	–0.12	0.32	0.07
se	0.62	0.47	0.38	0.33	0.22
n	525	815	1,622	3,822	6,784
3					
μ	–0.13	0.38	–0.03	–0.07	0.11
se	0.37	0.26	0.26	0.51	0.16
n	1,165	2,055	2,598	1,024	6,842
2					
μ	–0.75	–0.08	0.33	–0.31	–0.25
se	0.23	0.23	0.33	0.91	0.15
n	2,520	2,411	1,541	367	6,839
1 (low)					
μ	0.63	0.16	–0.63	–1.60	0.18
se	0.22	0.28	0.40	0.87	0.16
n	3,332	2,015	1,109	324	6,780
All					
μ	0.10	–0.01	–0.07	0.10	0.03
se	0.14	0.14	0.17	0.26	0.09
n	7,542	7,296	6,870	5,537	27,245

Prospect Theory versus Overconfidence. So far, we have emphasized the impact of overconfidence on stock prices, but as mentioned previously, prospect theory suggests that stocks with positive (negative) momentum should subsequently outperform (underperform). So, controlling for the type of stock, we compared whether overconfidence or prospect theory was the better explanation for stock price movements.

Table 6 shows the relationship between past performance and news for Stars. The bottom section (labeled "All") suggests a univariate relationship

Table 6. Average Quarterly Excess Returns for Portfolios of Stars Constructed on the Basis of EPS Revisions and 12-Month Excess Returns, 1989–97

EPS Estimate Revision	Alpha Quintile					
	1 (low)	2	3	4	5 (high)	All
Negative						
μ	–1.15	–2.95	–2.89	–1.52	–2.22	–1.92
se	1.09	1.35	1.56	1.61	1.49	0.63
n	422	166	153	132	158	1,040
Neutral						
μ	–1.75	0.59	–0.99	1.48	0.29	0.01
se	1.32	1.08	1.15	0.98	0.84	0.47
n	276	236	241	356	581	1,697
Positive						
μ	1.24	–1.09	0.73	–0.03	4.47	2.95
se	3.39	2.39	2.70	1.42	0.84	0.66
n	52	69	66	174	718	1,085
All						
μ	–1.20	–0.90	–1.59	0.48	2.09	0.32
se	0.82	0.80	0.88	0.72	0.56	0.33
n	750	471	460	662	1,454	3,800

Note: Momentum was measured as the intercept (alpha) from a regression of 52 weekly returns against the corresponding return on the value-weighted NYSE index. For any stock, the alpha quintile represents the quintile ranking of the intercept from a regression of weekly returns against the value-weighted NYSE for the 52 weeks prior to the portfolio formation date.

between past and future performance—a finding that is consistent with a number of recent empirical studies (see, for example, Jegadeesh and Titman 1993; Lee and Swaminathan 1998). However, most of the relationship is explained by a lagged response to news; that is, past performance seems to be proxying for past news. To see this relationship, note that most of the stocks with negative momentum (Column 1) had negative or neutral earnings revisions and that their subsequent returns were negative. The stocks with negative momentum but with positive revisions had positive subsequent returns, but there were too few of them to outweigh the sheer number of stocks with bad news. The same logic applies to the high-momentum stocks. Finally, note that the relationship between past momentum (alpha) and future return appears randomly distributed across any μ row (where each row controls for the direction of "news"). The differences in mean returns between high- and low-momentum stocks across any μ row are insignificant. We found similar results for Dogs.

Rather than negative momentum causing poor performance, the data suggest that bad news causes these stocks to underperform (thereby creating negative momentum). Then, a lagged reaction to bad news resulting from overconfidence causes the stocks to underperform in the next quarter.

Implications for Active Investors

These results suggest that some investment strategies are more likely to succeed than others and that value investing is not the only route to exploiting bias. The preceding framework also provides interesting implications for several popular investment strategies.

- *Growth investing*. Because current valuation measures such as E/P have little meaning, growth managers must seek out cheap growth stocks. Furthermore, because investors react slowly to news, growth stock managers should ride winners and look for good news. Sell disciplines, however, are critical for growth managers. Successful growth managers should be quick to sell and should rapidly revise forecasts of future earnings following any evidence of faltering growth.
- *GARP*. Pursuing growth at a reasonable price represents the intersection of value and growth investing. GARP should emphasize stocks for which expectations are diametrically opposed to past performance—for example, stocks that have had among the highest growth in the past but are now expected to have among the slowest. Stars provide some opportunities for GARP investors, but more prospects lie in the Fallen Angel category. Because Fallen Angels have characteristics that closely resemble growth stocks, GARP investors should emphasize Fallen Angels that are experiencing some evidence of a turnaround (i.e., positive news).
- *Value investing*. Value investors are lucky because they swim with the tide. As Tables 3 and 4 show, a randomly constructed portfolio of Dogs tends to outperform—even if it includes some expensive Dogs with negative news. Consequently, holding value index funds may make sense. Actively managed value portfolios should emphasize cheap Dogs. Although looking for signs of a turnaround (e.g., rising EPS estimates and positive surprises) may help performance, most of the value investor's effort should be focused on finding low-priced stocks and on constructing estimates of normalized earnings. Value portfolios can also hold GARP stocks, which may not be especially cheap but for which expectations significantly diverge from historical experience.
- *Old Dogs with New Tricks*. All investors should avoid the well-framed story suggesting that an old dog has learned new tricks. The exception is short sellers, who might find this quadrant fertile ground to plow. This warning also applies to initial public offerings and other special situations in which investors may be subject to representativeness bias and carefully framed reasons to buy.
- *Momentum*. Although risk and loss aversion may create bias in stock prices, our research suggests that the momentum effect may actually have more to do with an overconfidence bias. We found little behavioral support for strategies that rely exclusively on momentum, other than as a once-removed cousin of a strategy that responds to news.

Notes

1. Most analysts and practitioners classify stocks into growth and value categories. In one conventional classification, growth stocks are companies that are expensive and value stocks are companies that are cheap relative to earnings or book value. Although nothing is wrong with this conventional approach, it blends the type of stock (either fast or slow growth) with the market's assessment of the company. The value category, for example, can include growth stocks (as evidenced by the popular GARP, growth-at-a-reasonable-price, strategy). We were interested specifically in the market's assessment of expected growth and, consequently, did not want to mix the two characteristics.

We used historical sales growth rather than historical EPS growth as the measure of past growth because expectations appear to be more aligned with sales than the more variable earnings growth—especially for rapidly growing companies with a history of low earnings.

We weighted year-over-year sales growth for each of the past five years with the more recent years receiving the higher weight. Specifically, we assigned sales growth for five years ago a weight of 1/15 and last year's sales growth a weight of 5/15. This methodology is similar to that used in Lakonishok, Shleifer, and Vishny.

2. Although we would have preferred to study a longer interval, quarterly EPS estimate revisions and earnings surprises from I/B/E/S (used later in the analysis) were not available until 1989.
3. For example, for a company that reported earnings in February, at the end of September, current fiscal year earnings forecasts received a weight of 5/12 and the next fiscal year's earnings forecasts received a weight of 7/12. Time weighting earnings in this manner provides a constant 12-month-ahead EPS forecast.
4. Specifically, we wanted to capture good long-term news that was not rendered ambiguous by contrary short-term news. The following two conditions were required to hold for revisions to be considered positive. First, the net (up minus down) number of revisions for the current fiscal year made over the prior three months exceeded 40 percent of the total number of analysts following the stock. Second, the net number of EPS estimate revisions for the latest fiscal quarter made over the prior three months was nonnegative.
5. Returns were unavailable for companies that vanished (e.g., merged or were delisted) during a quarter, and these companies were excluded from the analysis. Because most mergers and potential bankruptcies are known some time in advance, we assumed that most information on mergers and bankruptcies was captured in returns over prior quarters.

   We measured E/P using 12-month-ahead consensus EPS forecasts, which we believe more accurately represent expectations than trailing earnings. These EPS forecasts were estimated by time weighting individual EPS estimates (from I/B/E/S) for each of the next two fiscal years by the time remaining until annual results were reported. We "normalized" E/P by grouping stocks into quintiles by expected long-term earnings growth and then ranking stocks by E/P within each group. Consequently, the E/P quintiles for Stars shown in Tables 1 and 2 represent rankings relative to other fast-growth companies.

   For any quarter, excess return on a stock equaled the total return on the stock (including dividends) minus the equally weighted average return on all stocks in the entire universe.
6. We view this result as a refinement of Lakonishok, Shleifer, and Vishny. They concluded that overextrapolation of past success causes "glamour" stocks (companies with high historical sales growth that are trading at low E/Ps) to subsequently underperform. Our study focused on a subset of glamour stocks—companies that grew quickly in the past *and are expected to grow quickly in the future* (i.e., Stars).
7. One nonbehavioral explanation for this lack of difference is that past estimate revisions may be better predictors of future revisions for Stars than for Dogs. We found no difference, however, in the serial correlation of surprises between Dogs and Stars.

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