

Investor Overreaction: Evidence That Its Basis Is Psychological

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Probably no subject in recent financial literature has generated more controversy than whether investors behave rationally in pricing stocks, or whether they overreact to market information, resulting in prices being too high or too low. Although the efficient market hypothesis states that, with minor exceptions, securities are rationally priced, repeated evidence has been presented of predictable over- and underreactions. This evidence is based primarily on consistently higher returns for out-of-favor stocks and below-average returns for favored issues. The existence of overreaction in the marketplace, if it can be proven, is important to both investment decision-making and theory, and in more acute cases can be the major cause of financial bubbles and panics.

We present evidence of overreaction by showing that important fundamentals upon which securities prices depend demonstrate little movement in the face of major changes to the returns of favored and unfavored stocks. We can find no explanation other than psychological influences to account for this finding. The paper also provides evidence that over- and underreaction may be a part of the same process.

Do investors overreact by consistently overpricing favored stocks and underpricing out-of-favor issues? Although the efficient market hypothesis states that this is impossible, because intelligent and rational investors as a group keep prices where they should be, a growing body of literature provides evidence of this phenomenon.

To date, the most extensive research on overreaction has focused on the returns of favored stocks compared to those that are out of favor. Evidence going back over fifty years demonstrates conclusively that out-of-favor (or contrarian) stocks clearly outperform favorites. A second line of research indicates that the stocks declining the most in one time period as a group outperform the averages significantly in the next. The conclusion for both phenomena is that the underlying cause of the overreactions is investor psychology.

However, the analysis lacks proof that the cause is psychological. Could important valuation measures used to price both favorite and out-of-favor stocks, for example, have changed significantly instead? If this were the case, favored stocks would experience

deteriorating fundamental measures, while out-of-favor stocks would show improving ones. Thus, the consistent underperformance of favored stocks and outperformance of out-of-favor issues would be entirely justified in an efficient market.

This paper examines this subject by using five of the most important fundamental criteria used in stock evaluation: growth in earnings, growth in cash flow, growth in sales, return on equity (ROE), and profit margin. These measurements demonstrate how rapidly a company is growing and how profitable this growth is. The higher each of these measures, the more promising a company appears to investors, and vice versa. We then measure the rate of change of these important fundamentals against the above-average returns of out-of-favor stocks on the one hand and the below-average returns of favorites on the other.

We find that very large changes take place in stock returns relative to the minor changes in the underlying fundamentals for both favored and unfavored stocks. This finding cannot be reconciled with the supposition that major stock price changes result from large changes in underlying fundamentals. Indeed, when carried through time, the fundamentals are remarkably consistent: Favored stocks have superior fundamentals, while unfavored stocks have inferior fundamentals. The findings support the psychological or overreaction hypothesis.

A second objective of this paper is to determine when the overreaction actually occurs. Most researchers believe it takes place after the time of portfolio formation, but some have posited that it occurs beforehand. Since

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the period before portfolio formation, to our knowledge, has not been examined to date, the overreaction process itself may not have been measured fully to this time. In section 4 we address this question by measuring stock price movements and fundamentals for favored and unfavored stocks for five and ten years, respectively, before portfolio formation. The evidence suggests that overreaction occurs before portfolio formation, and regression to the mean takes place in the following period.

The third objective of the paper is to examine the seemingly disparate results of overreaction and underreaction (see the definition of underreaction in section 2). These findings can be reconciled in the following way. We observe that the superior performance of the best (worst) stocks can be explained by investor overreaction *before* portfolio formation resulting in their returns being driven too high (low). *After* portfolio formation, the correction can take five years or more, indicating underreaction. Thus, overreaction and underreaction can be seen as part of the same process.

Overreaction in the Finance Literature

Although the term “investor overreaction” is as old as the markets, probably no subject in the recent financial literature has generated more controversy than whether investors behave rationally in pricing stocks or whether they overreact. Here we briefly review the overreaction literature.

Basu [1978] put forth a mispricing hypothesis, a precursor to the overreaction hypothesis, related to his findings of superior returns of low P/E stocks and inferior returns of high P/E stocks. According to Basu, “As a result of inappropriate responses to information, the market’s initial reaction to securities trading at different multiples of earnings is believed to be exaggerated; thus, it is eventually followed by a corrective price movement.” This version of the hypothesis is consistent with more recent ones, but its scope is limited to low P/E stocks.

Dreman [1979] posited a statistically testable hypothesis based on psychological forces that states that investors react to events in a predictable fashion: They fairly consistently overvalue the prospects of the “best” investments and undervalue those of the “worst.” They extrapolate positive or negative outlooks well into the future, pushing the prices of favored stocks to excessive premiums and out-of-favor stocks to discounts. Similar reactions were found with high-yield bonds (Hickman [1958]; Atkinson [1967]), and stocks reporting disappointing earnings¹. In all three cases, these disappointing investments consistently outperformed their respective peer groups.

The explanation for this effect derives from the hypothesis that the mispricing is based on investor perceptions. For example, Dreman and Berry (DB) [1995b]

hypothesize that if a stock is out of favor, negative news causes little or no change in perception and therefore has little effect on the stock’s price. Positive news, on the other hand, does initiate a change in perception, sending the stock’s price higher. Good and bad news would affect the “best” stocks in the opposite way: Good news would be taken for granted, while bad news would send the stock’s price plummeting (the much-feared “earnings torpedo”). The relative amounts of good and bad news would be about equal for both the “best” and the “worst” stocks,² but the net effect of surprises is that the “worst” stocks outperform the market and the “best” stocks underperform. DB provide evidence that the “earnings surprise” hypothesis is valid.

DB updated the original overreaction hypothesis to include six predictable recurring events brought on by overreaction.³ According to their hypothesis, overreaction occurs before the portfolios of “best” and “worst” are formed. Nevertheless, the effects of the overreaction can be measured after the portfolios are formed. In the specific case of out-of-favor stocks (measured by low P/E), DB show that the “best” (high P/E) and the “worst” (low P/E) stocks have an asymmetric response to earnings surprises (noted above). On average, surprises as a whole send low P/E stocks sharply higher and high P/E stocks sharply lower relative to the market. Dreman [1998] and Dreman and Lufkin [1997] subsequently showed the effects of overreaction by three other valuation methods—low price-to-book, low price-to-cash flow, and high yield.

Value Strategies

Value strategies have a rich history in the literature of overreaction. Early work by Nicholson [1960, 1968] shows that stocks with low price-earnings ratios beat the market. His results were subsequently corroborated by the work of McWilliams [1966], Miller and Widman [1966], and Breen [1968]. Later, Basu [1977, 1978, 1983] brought the work to a new level of analytical sophistication.

Contrarian strategies became headline news in the academic press with the publication of works by Fama and French [1992] and Lakonishok, Shleifer, and Vishny [1994] in the *Journal of Finance*. Other researchers have also noted the superior returns of low P/E and similar strategies (e.g., Fuller, Huberts, and Levinson [1993]; Downen and Bowman [1986]). Although the explanation of this effect is not generally agreed upon, its existence is almost universally accepted.

For more detail on the various types of overreaction, as well as criticisms of overreaction studies and the rebuttals to those criticisms, see Caginalp, Porter, and Smith [this issue].

Underreaction: A Challenge to the Overreaction Literature

Confusion has arisen from many event studies that have found evidence for underreaction, not overreaction. In essence, underreaction refers to cases in which market participants react to news slowly (week, months, even years) and/or insufficiently. By contrast, the efficient market hypothesis states that markets should adjust to new information quickly and correctly. In modern domestic financial markets, stock prices can move in a matter of hours or minutes in response to new information. Thus, as with overreaction studies, in which the market's adjustments are too extreme, underreaction studies show many cases in which investors react too little and too slowly.

Principal among the underreaction studies are the observations of Abarbanell and Bernard [1992] and Bernard and Thomas [1990], who find that analysts apparently underreact to earnings announcements. Analysts continue to overestimate (underestimate) corporate quarterly earnings after a positive (negative) earnings surprise, for as long as three or four quarters after the initial earnings announcement, rather than adjusting their estimates immediately.

Another example is Michael, Thaler, and Womack [1995], who find that the price response following dividend cuts and initiations continues for two years or more. They find that firms initiating dividends outperformed the market by 7.5% in the first year, while those omitting dividends underperformed by 11.0% over the same period.

Ikenberry, Lakonishok, and Vermaelen [1995] document that investors underreact to firms' share repurchases by failing to recognize management's knowledge of positive future returns. Using a sample of 1,239 share repurchases from 1980 to 1990, they find an excess return of 12.6% over the subsequent four years.

Even stock splits result in prolonged stock price movements or underreaction. Splits have long been believed to contain no relevant pricing information, and therefore to have no impact on stock prices after the split is announced. Fama et al. [1969], for example, in what is regarded as the original event study, measured the returns following 940 stock splits from 1927 through 1959 and concluded that after the split date there were no abnormal returns.⁴ However, more recent work by Ikenberry, Rankine, and Stice [1996] finds a significant difference in returns between splitting and non-splitting firms, amounting to 12% over three years. They interpret their results to mean that company management has knowledge about future prospects that they use in deciding to split the stock, and that investors are slow to take account of it (underreact).

As noted above, we believe that underreaction and overreaction are parts of the same psychological phenomenon, which we will attempt to explain in our findings.

Data and Method of Analysis

Our universe consists of companies listed on the Compustat monthly and annual files between 1973 and 1998. Delisted companies were included, as well as the back data annual files. To maintain as much homogeneity as possible, we drew from the full sample the largest 1,500 companies by market capitalization as measured from the monthly file at the beginning of each year. Compustat often adds up to two years of back-filled data when adding a new company to the database. To correct for any resulting selection biases, we therefore required two years of previous price data for all companies used. The total number of companies in the sample was 4,721 for the full twenty-five years. Depending on data availability and screening criteria,⁵ about 1,000 to 1,400 companies are used each quarter. Identical experiments requiring five years of previous price data yielded essentially the same results.

Portfolios were formed based on quintile rankings of the price ratios, price-to-earnings (P/E), price-to-cash flow (P/CF), and price-to-book value (P/BV). (We ran separate tests for each price ratio; quintiles are based on ranks of one price ratio at a time.) The time of formation was the first trading day of January, April, July, and October for companies of all fiscal year-ends. (We use eighty-five five-year periods between 1973 and 1998. A five-year portfolio is thus formed in each quarter between 1973Q1 and 1994Q1. We start in 1973 to allow for ten years of back data to 1963, the first year for which data are available on the Compustat Monthly file.) The price ratios were based on the closing price on the last trading day of the prior month divided by twelve-month trailing earnings, book value, and cash flow. The minimum trailing lag is three months.⁶ For earnings, which are reported quarterly on a twelve-month moving basis, the lag time can be three, four, or five months depending on the company's fiscal year-end. For book value and cash flow, which are measured annually, the lag time can be from three to fourteen months.

Once portfolios were formed, they were held intact for holding periods of up to five years. If a price was not available at quarter-end, that company was dropped from the portfolio for the remainder of the holding period. It was assumed to trade at the last available quarter-end price and proceeds were distributed evenly to the rest of the portfolio. Portfolios were equally weighted at inception, but there was no

rebalancing to maintain equal weighting thereafter. In the buy-and-hold strategy we use, dividends were fully reinvested in their respective stocks. Returns are reported as arithmetic means taken over the specified time periods.

We used the following fundamental measures to characterize whether a company's outlook was good or bad: growth in cash flow, growth in sales, growth in earnings, return on equity (ROE), and profit margin. We used portfolio medians rather than averages for the fundamental measures within each quarter to avoid the problem of distorted numbers resulting from outliers or negative numbers. We used arithmetic means of these medians over all portfolio formation quarters to get the average measures displayed in the charts.

Results

To date, overreaction has always been measured from the time of portfolio formation. As noted, some researchers have concluded that the overreaction in selecting the "best" and "worst" stocks occurs before portfolio formation. To address this question, the work is carried back in time to ten years before portfolio formation.

We use the terminology of Loughran and Ritter [1996] to distinguish between time periods. Portfolios are formed at time $t = 0$. The *measurement period* of almost all prior overreaction studies commences at $t = 0$ and extends into the future. The measurement period contains returns that an investor could have generated by trading on information available at $t = 0$. The *prior period* is the time before $t = 0$ (see figure 1).

Our research focuses on two points. The first part looks at the returns to the best and worst stocks before the portfolios are formed (the period prior to $t = 0$). In the second part, we determine how much the fundamentals change for the three value measures—low P/E, P/CF, and P/BV—and the three growth measures—high P/E, P/CF, and P/BV. This tells us if improvement in the underlying fundamentals is the cause of value

stocks outperforming growth stocks in the period after $t = 0$ (after having underperformed growth stocks in the period before $t = 0$).

Returns Before and After Portfolio Formation

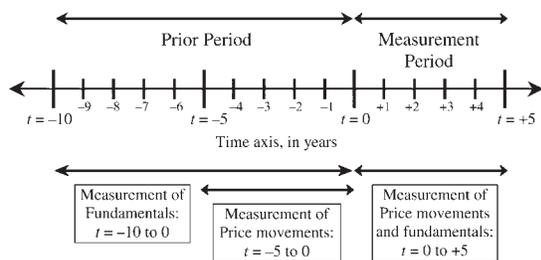
The top panels of figures 2 to 4 show the returns of the lowest 20% and the highest 20% of stocks ranked by price-to-book, price-to-cash flow, and P/E, respectively, for the five years before and after the portfolios are set up. The market return in each chart is set at 0 (the average market return in the $t = 0$ to +5 years is 16.5%). Thus excess or below-market returns are the only ones viewed.

The first year's returns and fundamentals are calculated running from $t = 0$ to $t = +1$. The return for this period is shown at the end of year +1 on the charts. All other returns are plotted in the same way. Thus, in the measurement period, we plot five one-year periods of returns and fundamentals at the end of years +1, +2, +3, +4, and +5.

We can see at a glance that value stocks (low P/BV, P/CF, and P/E) do significantly better than "growth" stocks (high P/BV, etc.) after the portfolios are formed (the measurement period, years +1 to +5). For each of the three measures, the value portfolio outperforms the growth portfolio in every year for at least five years. Low P/E stocks, for example, outperformed high P/E stocks by about 7 percentage points in years 1–4, and about 5 percentage points in year 5. (The differences in returns, as measured by standard t-tests, are statistically significant throughout this period, for all three value measures.)

Several previous studies show results similar to these for the measurement period (e.g., Nicholson [1960, 1968], Basu [1977, 1978, 1983], Dreman [1979, 1982], Fama and French [1992], and Lakonishok, Shleifer, and Vishny [1994]). What has not been shown before is what happens to the prices of favored stocks before they have reached their highest price-to-book value, price-to-cash flow, or price/earnings ratios, and to out-of-favor issues before they hit the bottoms of these groupings. Recall that we posit overreaction to have occurred in the prior period (before $t = 0$). If the investor overreaction hypothesis is correct, we should expect two complementary processes to take place. First, favorite stocks should outperform the market during the prior period as they move up to the priciest quintile. Second, out-of-favor stocks should underperform as they drop toward the lowest quintile. Thus, we should have two distinct and opposite overreactions taking place concurrently, and continuing for a number of years. Favored stocks should become increasingly overpriced, and out-of-favor issues should get increasingly less expensive relative to the market.

FIGURE 1



Note: Portfolio formation takes place at $t = 0$. Returns and fundamentals are shown in figures 2–4 at the end of each year.

FIGURE 2
High and Low P/BV Performance vs. Fundamentals: 1973–1998

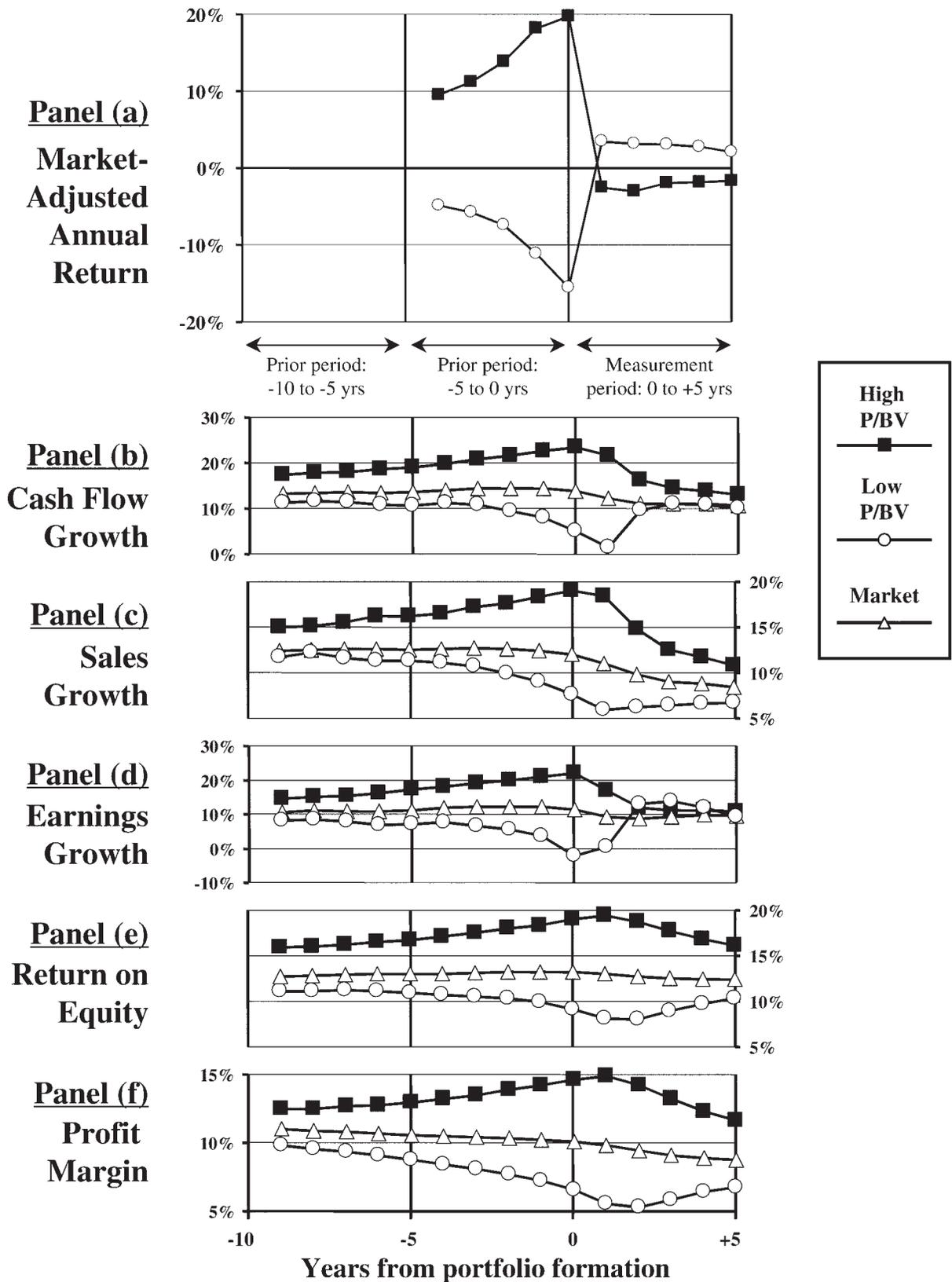


FIGURE 3
High and Low P/CF Performance vs. Fundamentals: 1973–1998

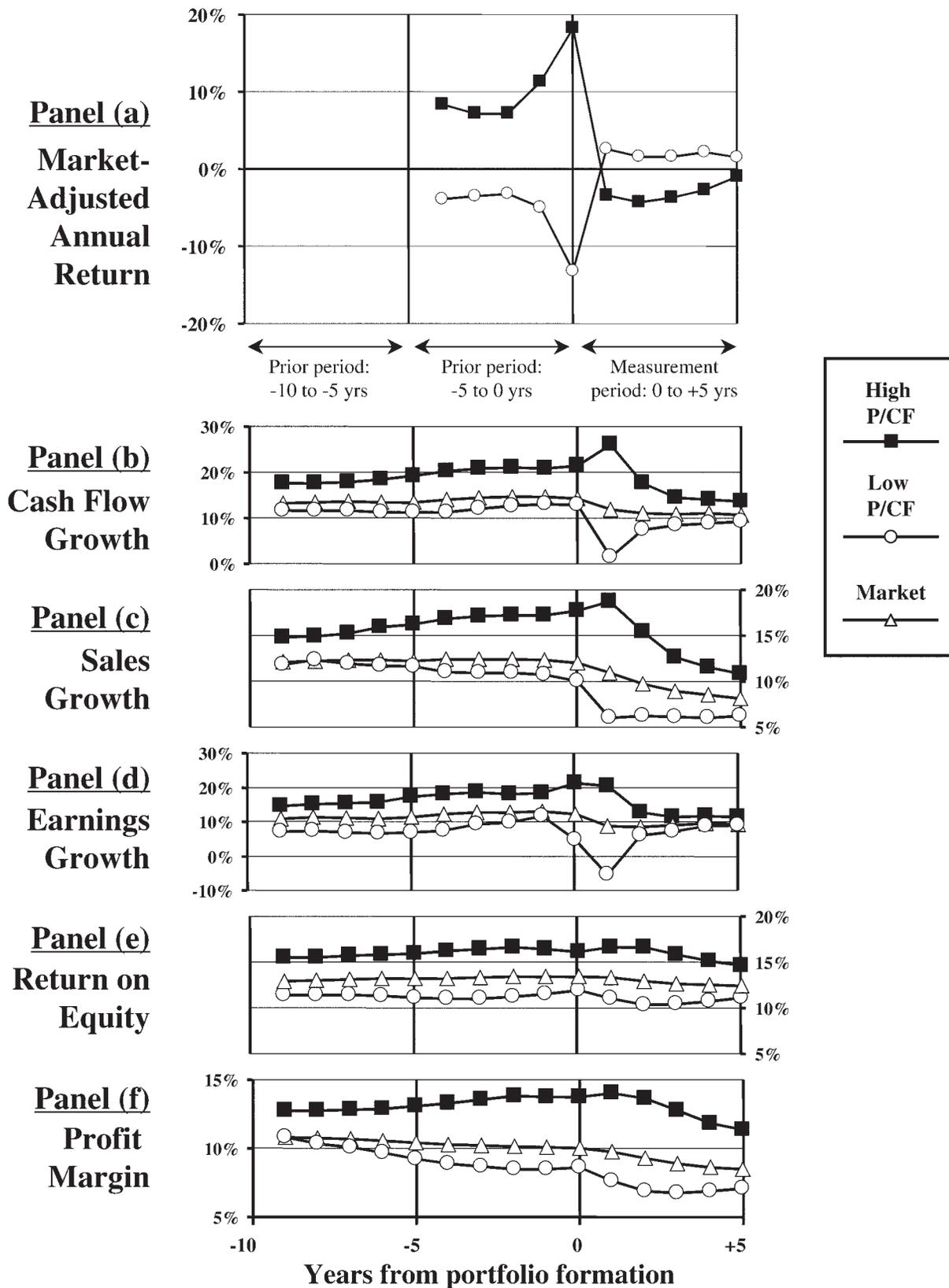
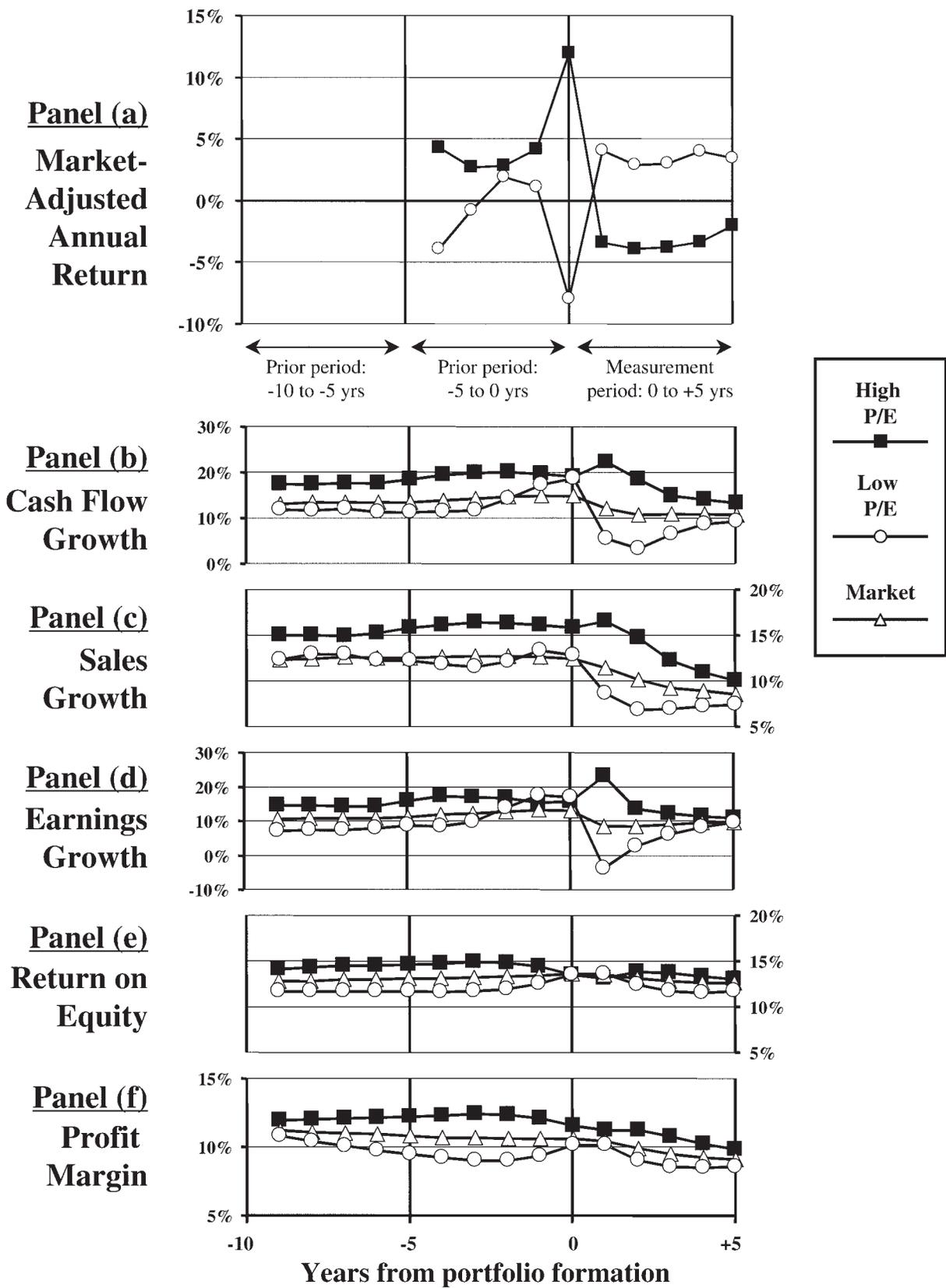


FIGURE 4
High and Low P/E Performance vs. Fundamentals: 1973–1998



Next, we used the same portfolios that were tracked from $t = 0$ to $t = +5$ years. However, we now ran a backplay of these portfolios, calculating the returns for the stocks in the highest and lowest P/BV, P/CF, and P/E quintiles for the prior five years. Measuring returns in the past shows how the most out-of-favor portfolios acted as they fell out of favor, and how the favored stocks performed as they became increasingly hotter issues. The performance is also shown in the top panels of figures 2 to 4, this time to the left of point 0 (the prior period, -5 to 0 years before portfolio formation).⁷

The returns in the $t = -5$ to $t = 0$ period are striking. In every case, the favorite stocks outperform the out-of-favor issues consistently and by a wide margin. This is precisely the opposite result of what has occurred in every study measuring contrarian strategies (all have started in the $t = 0$ time period and measured forward). The findings prior to $t = 0$ are predicted by the investor overreaction hypothesis, which states that investors overprice favorites and underprice investment “dogs” in the period prior to portfolio formation.

Figures 2 to 4 indicate that growth portfolios enjoyed much higher returns than value portfolios throughout the prior period. The effect is most pronounced for high and low P/BV stocks. High P/BV stocks (Figure 2, panel a) outperformed the market by 10% to 20% annually in each of the five years before portfolios were formed. Low P/BV stocks, on the other hand, underperformed the market by between about 5% and 15% annually during the same period. The pattern is similar for low and high P/E and P/CF stocks.

Figure 5 summarizes the results by market-adjusting and compounding the returns from left to right separately in the periods before and after portfolio formation. For example, the low P/BV portfolio be-

gins with a one-year market-adjusted return of -4.9% from $t = -5$ to $t = -4$. By $t = -3$, low P/BV stocks, on average, underperformed the market by -12.7% for the two years. After five full years, the cumulative underperformance to the market had grown to -79.4% . At $t = 0$, the compounding is restarted. Here, low P/BV stocks outperformed the market by 3.5% on average in the first year, 8.3% for the total of the first two years, and so on, until the total five-year outperformance reached 33.3% .

The cumulative outperformance of favored stocks and underperformance of unfavored issues is significant. The highest price-to-book value stocks, for example, outperformed the market by 187.1% in the five years they moved toward their highest valuations and the lowest P/BV issues moved toward the lower extreme. This is 5.6 times the outperformance that the lowest 20% of price-to-book value stocks originally showed over the market in the five years after they reached the bottom P/BV group (during the measurement period, $t = 0$ to $+5$ years).

Similarly, the highest P/E stocks outperformed the market by 58.7% in the five years before portfolio formation, while the lowest P/E stocks underperformed by 20.5% over the same period. This amounts to an absolute difference of 79.2% . At the same time, the highest P/CF quintile outperformed the market by 128.1% in the prior five-year period, compared to a 54.1% underperformance by the low P/CF quintile—for a remarkable absolute difference of 182.2% .

These are striking results, but as noted above, they cannot be predicted in advance. The returns from the prior period are only known after the fact, at $t = 0$, when investors are forming portfolios based on this information.

FIGURE 5
Market-Adjusted Returns Looking Forward and Backward in
Time From Portfolio Formation: 1973–1998

Year ending at:	→ Returns compounded from $t = -5$					→ Returns compounded from $t = 0$				
	$t = -4$	$t = -3$	$t = -2$	$t = -1$	$t = 0$	$t = +1$	$t = +2$	$t = +3$	$t = +4$	$t = +5$
Low P/BV	-4.9%	-12.7%	-24.5%	-45.5%	-79.4%	3.5%	8.3%	14.9%	23.3%	33.3%
High P/BV	9.5	25.8	54.2	104.9	187.1	-2.6	-7.4	-11.8	-17.5	-26.5
Low P/CF	-3.8	-8.8	-14.8	-24.4	-54.1	2.6	5.4	9.6	15.8	22.3
High P/CF	8.2	19.1	35.5	65.1	128.1	-3.4	-9.8	-16.5	-23.0	-30.1
Low P/E	-4.1	-6.1	-4.8	-2.9	-20.5	4.0	8.6	14.9	23.7	33.5
High P/E	4.5	8.4	14.8	25.1	58.7	-3.5	-9.4	-16.0	-23.3	-30.9

This table reports the same return measurements as in panel a of figures 2-4. Here, the returns are compounded from left to right separately in the periods before and after portfolio formation and then market-adjusted. For example, the low P/BV portfolio begins with a one-year market-adjusted return of -4.9% from $t = -5$ to $t = -4$. By $t = -3$, low P/BV stocks, on average, had underperformed the market by -12.7% for the two years. After five full years, the cumulative underperformance to the market had grown to -79.4% . At $t = 0$, the compounding is restarted. Here, low P/BV stocks outperformed the market by 3.5% on average in the first year, 8.3% for the total of the first two years, and so on, until the total five-year outperformance reached 33.3% .

To see how the returns can provide insight into the process of investor overreaction in the prior period, we next compare them with changes in fundamentals in the prior and measurement periods.

Fundamentals Before and After Portfolio Formation

We now come to the most important objective of the paper: to determine whether the major underperformance of “worst” by “best” stocks in the period prior to portfolio formation and their subsequent significant outperformance of favorites following $t=0$ is caused by significant changes in underlying fundamentals or by investor overreaction. We examine the changes in the fundamentals before and after $t=0$. If, for example, fundamentals improve significantly in the period before $t=0$, accompanied by markedly superior performance of the “best” stocks, we might reasonably conclude that these fundamentals are responsible for the superior price action. Similarly, if the fundamentals deteriorated sharply after $t=0$ for the favored group, we could also conclude that it was the fundamentals that resulted in the subsequent underperformance.

However, if we find that the fundamentals show relatively small movements in the face of the major under- and outperformance of the “best” and “worst” stocks in the various charts, we would believe the evidence points to overreaction.

We examine whether the fundamentals of value stocks are better than those of growth stocks in the period following portfolio formation, and worse before. Is this the reason that value stocks outperform growth stocks in the $t=0$ to $t=+5$ time span and underperform in the previous one? We also examine the changing trends in fundamentals—do they improve dramatically for unfavored stocks and deteriorate for favored stocks in the $t=0$ to $t=+5$ period, which would account for the enormous changes in returns?

We plot the five important fundamentals over the same two five-year periods for which we measured the performance of “best” and “worst” stocks ($t=-5$ to $t=0$ and years $t=0$ to $t=+5$). Panels b-f of figures 2 to 4 give these results.

To illustrate the information available to investors at the beginning of year -5 , we include an additional five years of prior fundamental data (years ending at -9 to -5). Thus, for example, the investor at $t=-5$ has five years of prior fundamental information on which to base his investment decisions.

Years -10 to -1 . When evaluating stocks at point $t=0$, investors examine the record of each of the five important fundamentals—growth in earnings, sales, and cash flow, profit margin, and ROE—in the prior

period to decide which stocks have the most and least favorable prospects. Looking at years ending at -9 to -5 in the last five panels of figures 2–4, we see that the fundamentals for favored stocks in this period are very good. Investors at $t=-5$ could look back at the excellent characteristics of the best stocks.

Moreover, the good times just kept rolling. The years ending at -4 to 0 show that the fundamentals for the favorites kept improving in this period from those in years ending at -9 to -5 . Earnings growth for the high P/BV group, for example, accelerated from a well above-market 18% annually (averaged over years ending -9 to -5) to 23.1% (averaged over years ending at -4 to 0), while sales growth increased from 17.9% annually to 19.6%. Looking back from $t=-5$, the best stocks not only had excellent fundamentals in the previous five years, but were reinforced by progressively better fundamentals in the five years ending at 0 , when they posted their strong above-market returns.

The lowest P/BV group is almost a mirror image. Fundamentals, already lackluster for the five-year period before the retroactive returns were measured, continued to deteriorate. Investors, already seeing mediocre results, watched them get progressively worse during the five years these stocks are falling to their lowest valuations (to $t=0$). The poor fundamentals of this group at the beginning of the $t=-5$ to 0 period, and the subsequent further deterioration through this period, would probably reinforce investor opinion that the prospects of the “worst” group were mediocre, resulting in the substantial underperformance seen in the top panel.

That growth stocks have better fundamentals before portfolio formation comes as no surprise. Superior growth and profitability in the prior period would naturally lead to better returns, as seen in the top panel of each of the figures. Superior returns naturally lead to the higher valuations enjoyed by growth stocks at the time the portfolios are formed.

If the overreaction hypothesis is correct, however, investors place too much emphasis on the fundamentals shown in figures 2 to 4 in the period $t=-10$ to $t=0$, thereby carrying to extremes the prices of stocks that appear to have the “best” and “worst” prospects.

Investors are likely to forecast a future not very different from the recent past, i.e., continuing improving fundamentals for favorites and deteriorating fundamentals for out-of-favor issues. Such forecasts result in favorites being overpriced, while out-of-favor issues are priced at a substantial discount to their real worth. The extrapolation of past results well into the future and the high confidence in these precise forecasts is one of the most common errors made in finance. In recent work on analyst forecasts, Dreman and Berry [1995a] examine more than 90,000 consensus estimates over twenty-five years, and find that future estimates are consistently far off the mark for both the

“best” and the “worst” stocks. (For an update, see Dreman [1998] and references therein.) Similar misplaced confidence in the accuracy of future forecasts has been found in fields as diverse as radiology, psychology, law, and even soil sampling (see Tversky [1995]).

Major price reversals are not caused by major reversals in fundamentals. In this section, we discuss the evolution of fundamentals during the period when investors use that information to make investment decisions. We then observe the change in fundamentals from $t = -10$ to after $t = 0$, and find that there is no reversal in fundamentals to match the reversal in returns. That is, as favored stocks go from outperforming the market to underperforming the market, their fundamentals do not deteriorate significantly, and in some cases they actually improve. They remain stronger than those of the market, and of out-of-favor stocks, in both periods. Similarly, as out-of-favor issues go from having sharply below-market returns in the period prior to $t = 0$ to consistently above-market returns afterward, their fundamentals do not go from being weaker than those of the market, and of favored stocks before $t = 0$, to being stronger afterward. The fundamentals of the “worst” stocks are weaker than both those of the market and of the “best” stocks in both periods.

The change in fundamentals is also too small to account for the substantial underperformance of the “worst” stocks in the $t = -5$ to $t = 0$ period and their substantial outperformance thereafter. The same is true for the change in fundamentals relative to the changes in returns of the “best” stocks.

We note further that the change in the *trends* of fundamentals of both the “best” and the “worst” stocks is also too small to initiate such large performance changes for both favored and unfavored stocks. For example the “worst” stocks on a P/E basis underperform the market by 20.5% in years ending at -4 to 0 and outperform by 33.5% in the subsequent five years, while cash flow growth for this group actually decreases from 14.6% to 6.6% during the same time period. The story is no different for the “best” stocks. Looking at price-to-book value, for example, the highest P/BV stocks went from outperforming the market by 187% cumulatively in the five years ending at 0 , to underperforming by 26.5% for the subsequent five years. However, cash flow growth remained well above the market average in both time periods (both before and after $t = 0$), declining relatively moderately from about 22% per year in the $t = -5$ to 0 period to around 16% annually in the $t = 0$ to $+5$ period. We note a similar pattern for price-to-earnings and the other fundamental measures.

Thus, while there is a marked transition in the return profiles, with value stocks underperforming growth

stocks in the prior period, and outperforming growth stocks in the measurement period, this is not true for fundamentals. In nearly every panel, fundamentals for growth stocks are better than those for value stocks *both before and after portfolio formation*. Although there is a major reversal in returns to the best and worst stocks, there is no corresponding reversal in their fundamentals. The returns to contrarian strategies do not arise from a straightforward reversal in the fortunes of growth and value stocks.

Next, we focus on the critical period, from $t = 0$ to $t = +1$. During this period, there is no reversal in the level of growth or profitability between the “best” and “worst” stocks, as well as no change in the direction of their fundamentals. Fundamentals of favored stocks continue to be strong, even as their returns take a sudden dive from outperforming the market to underperforming the market. At the same time, the fundamentals of out-of-favor stocks continue to falter as they abruptly begin to outperform the market. Finally, we look at the period after year $+1$ to see if future changes in fundamentals can in any way account for the reversals in returns. We find again that they cannot. Although fundamentals do begin to revert to the mean in years $+2$ to $+5$, the reversion alone does not appear strong enough to generate the enormous changes in returns between the prior period and the measurement period.

Changes in Fundamentals Compared to Changes in Returns

The next question is whether fundamentals of value stocks have improved sharply enough during the measurement period (and those of growth stocks deteriorated enough) to be responsible for the impressive price reversal. Although there are no reversals in the levels of fundamentals, as we just saw, the fundamentals of out-of-favor stocks are at their lowest on the whole in the year following $t = 0$ and improve or are relatively stable for favorites during the same period. After $t = +1$, fundamentals begin to trend moderately upward for value stocks and downward for growth stocks, even though they both remain below and above the market average, respectively. To assess the importance of this effect, we zero in on the period of transition from year -1 to year $+1$. We find that the changes in fundamentals on the whole take place after changes in price movements.

Years $t = -1$ to $t = +1$. The first year before portfolio formation and the first year after deserve special attention, because the largest changes in returns take place during this time.

By far the largest difference in returns comes in year -1 (the year ending at $t = 0$), with high P/CF stocks, for example, returning 18.2% above market and low P/CF stocks providing a 13.3% below-market return for the year. Panel d of figure 3 shows that in year -1 the high P/CF portfolio also enjoyed considerably better earnings growth (21.1%) than the low P/CF portfolio (4.6%). In fact, of all the years prior to $t = 0$, year -1 shows the greatest separation in the earnings growth rate between the two quintiles.

In the following year (year $+1$), the situation for returns dramatically reverses. Having underperformed the market by -13.3% the previous year, low P/CF stocks suddenly beat the market by 2.5% (and continue to do so for at least the next four years). The net change in returns from $t = 0$ to $t = +1$ is 15.8% for low P/CF, 19.0% for low P/BV, and 12.0% for low P/E. High P/CF stocks, by contrast, drop from an 18.2% above-market return to a 3.4% below-market return over the same year—a net change of 21.6% (22.2% for high P/BV, 15.4% for high P/E). The subpar performance continues for high P/CF (and P/E and P/BV) stocks as well, again for at least four years.

This reversal in returns is quite abrupt, and is seen in all three value measures. It may seem surprising, though, that in year $+1$ the fundamentals continue to improve for high P/CF stocks and continue to deteriorate for low P/CF stocks. In other words, the striking change in returns is not supported by a corresponding change in fundamentals. Even though the returns have reversed dramatically, the fundamentals have continued on course from year -1 . For example, in year $+1$, growth in cash flow increases from 21% to 26% annually for high P/CF stocks, and gets even worse, from 13% almost to zero, for the low P/CF quintile. At the same time, earnings growth remains nearly steady at about 20% annually for the high P/CF portfolio (while declining for the market) and runs negative (-5.5% in year $+1$) for the low P/CF portfolio. This is during the same year that low P/CF stocks outperformed high P/CF stocks by nearly 6 percentage points on average.

The same pattern holds for the other fundamental measures. In every case, the gap in fundamentals widens between low and high P/CF stocks in year $+1$ relative to the previous year (and in nearly every case for high and low P/E and P/BV stocks). Not only is there no reversal in the level of growth rates and profitability, there is no reversal in trend in year $+1$ either—if anything, the trend accelerates. “The rich get richer while the poor get poorer”: The fundamentals of the “best” stocks get better while those of the “worst” get worse—in the face of startling changes in returns.

Having exhausted the other possibilities, we believe investor overreaction is the only explanation consistent with the evidence.

Discussion: The overreaction process. How is it possible for stocks with deteriorating fundamentals to outperform the market while those with improving results underperform? The traditional view in finance, of course, is that all available information is incorporated into stock prices. Thus, value stocks would have to be riskier than growth stocks.

However, no solid evidence has yet been presented that shows value stocks to be riskier than growth stocks (Caginalp et al. [this issue]). On the contrary, the evidence indicates that, if anything, value stocks are less risky than growth issues. It appears that the paradigm of efficient markets cannot explain these results.

We believe a better explanation for the striking reversal in prices is found in the overreaction hypothesis. Investors in favorite stocks in panel a of figures 2–4 pay higher and higher prices for improving fundamentals in the five years prior to $t = 0$. At $t = 0$, investors have ten years of improving fundamentals, ranging from improving cash flow growth to rising sales in almost every case.⁸ And, in each case, the improvements are built upon growth in cash flow, earnings, and sales as well as profit margins and return on equity, which are already well above those of the average stock. As these fundamentals continue to improve, the valuation premium put on this group gets higher relative to the rest of the market in years ending at $t = -1$ and $t = 0$. This probably occurs because investors looking back at eight years of rapidly improving fundamentals extrapolate even faster growth, higher profit margins, and higher returns on equity in the years ahead. Looking at price-to-cash flow (figure 3), for example, the “best” stocks provide an 18.2% return in the year ending at $t = 0$, which in turn was an 11.2% above-market return in the year ending at $t = -1$, higher than the 7.1% in the year ending at $t = -2$. Fundamentals through these two years change very little. For out-of-favor stocks the reasoning is reversed.

But, as we have seen, prices for all three sets of favored stocks in figures 2, 3, and 4 dive in the year from $t = 0$ to $t = +1$. For price-to-book (figure 2), the performance of favorite stocks drops from 19.7% above market in the year to $t = 0$ to 2.5% below market in the year to $t = +1$, for a total change of 22.2%. From $t = +1$, the “best” stocks consistently underperform the market for the next four years.

Again, for out-of-favor stocks the performance is a mirror image. Viewing price-to-book (figure 2), low P/BV stocks improve by 19% in the $t = 0$ to $t = 1$ period. Just as striking, however, fundamentals do not get better, they continue to deteriorate for all measurements other than earnings growth, which shows a nominal increase.

What then causes the major reversal of returns of “best” and “worst” stocks through these two periods in the light of at best modest changes in fundamentals—

and in some cases a continuation or even an acceleration of current improving or deteriorating trends?

Two findings from the overreaction literature help explain these results. DB show that even a small earnings surprise can initiate a reversal in returns that lasts many years. They demonstrate that negative surprises on favorite stocks result in significant underperformance of this group not only in the year of the surprise but for at least four years following the initial event. They also show that positive surprises on out-of-favor stocks resulted in significant outperformance in the year of the surprise, and again for at least the four years following the initial event. DB attribute these results to major changes in investor expectations following the surprises. Rather than extrapolating only “five-star” growth characteristics for favorites and the most mediocre future for out-of-favor issues, the surprises rein in investor expectations for favorites and increase expectations for the “worst” stocks. DB refer to negative surprises on favored stocks and positive surprises on out-of-favor issues “event triggers,” meaning that they result in major reassessments of the prospects for both the “best” and the “worst” stocks. The fact that the “best” stocks dropped sharply after negative surprises, and the “worst” stocks increased substantially is attributed to prior investor overreaction (in the period before $t = 0$).

DB also posit that other surprises not related to earnings themselves could result in similar reactions for favored and out-of-favor stocks. Examples for a favorite stock would be the introduction of new innovative products, which could threaten the company’s current markets, increasing competition, management problems, and a host of similar problems. For unfavored stocks, the mirror image again applies.

An example would be the 35% drop in the stock price of Dell Computer in the spring of 1999, despite the company’s years of flawless market performance. Dell’s sales and earnings growth of over 50% a year rocketed the stock to a P/E multiple of over 100 in early 1999. Analysts considered its direct selling model so superior to competitors, who sold through distributors, that the company was expected to maintain these growth rates even in the face of developing price wars in the PC industry. When Dell announced in its 1999 first quarter that earnings were in line with analysts’ forecasts, but revenues fell slightly short of expectations, the price suddenly dropped sharply. Investors began to ponder whether the company—as well managed as it was—could be vulnerable to industry competition. Dell continued to turn in subpar returns for several months (to the time of this writing). In the context of the evidence presented here, this may be the beginning of a correction process that could take a number of years. As we saw, event surprises can initiate an enormous reversal in prices, as figures 2–4 show in year +1.

The second finding, by Abarbanell and Bernard [1992], also helps to explain the major price reversals. They studied analyst estimates and found analysts “underreact to recent earnings reports” by being too slow to adjust to earnings surprises. Whether the estimate was too high or too low, analysts do not revise them accurately immediately, but can take as long as three quarters after the surprise. When the forecasts are too high, they continue to be high for the next nine months, and when they are too low, they continue to be low for the next three quarters.

Overreaction and underreaction. We believe that overreaction and underreaction are part of the same process. We view overreaction as the overpricing of favored stocks and underpricing of out-of-favor issues that takes place *at and before* $t = 0$. After this time, new events and earnings surprises “trigger” a change in perception. More generally, an “event trigger” can be any surprise—or series of surprises, not just earnings announcements—that is previously unanticipated, that prompt changes in investor perceptions.

This underreaction—the failure to adjust forecasts sufficiently—generates new surprises, which in turn reinforce investors’ changing opinions of a company. If, for example, investors are shaken by a negative earnings surprise on a favorite stock, and more negative surprises occur in the following quarters (as a result of analysts not revising earnings down quickly enough, or for other reasons), investors’ increasingly poor reappraisal of the company drops the stock even lower. The change in investor perceptions in this case can continue for a number of quarters. The same is true for a series of positive surprises on an out-of-favor company.

This underreaction mirrors the slow correction process documented above for the year +1 to year +5 period, and in DB. In our view, this slow correction process is the normal consequence of the overreaction that has taken place in the prior period. Investors first overreact by steeply overpricing favorite stocks and sharply underpricing out-of-favor stocks. They then underreact by failing to correct the prior mispricing quickly. Perceptions of stocks change, but not instantaneously as efficient market theory would have us believe. Instead, the process is rather slow. The belief in the inevitable 20%+ growth of an Avon Products or a Polaroid in the early 1970s, or the 50%+ earnings growth of a Dell Computer or many of the Internet stocks in the late 1990s, does not change overnight. It can take years for the transition in thinking to be complete. This is what we believe causes the five years of overblown returns for favored stocks in the $t = -5$ to $t = 0$ period, and the equally long period of underperformance thereafter.

The evidence presented here also shows that the prior overreaction is so extreme that it sets up profound

and sudden price reversals. Because the initial mispricing is so large, investors appear slow to react at first, even given the enormous changes in return that take place in the $t = 0$ to $+1$ period. But, eventually, throughout the $t = 0$ to $t = +5$ period, new information accumulates to prove that the prior expectations were too extreme—too positive for the “best” stocks and too negative for the “worst.”

Conclusions and Suggestions for Further Work

In our introduction, we stated three objectives. The first was to determine whether changes in fundamentals were responsible for the major outperformance of out-of-favor stocks and the underperformance of favorites in the period beginning at portfolio formation ($t = 0$) noted in numerous studies beginning in the 1960s. If strongly improving fundamentals of the “worst” stocks, and sharply worsening fundamentals of the favorites, were the cause, the findings could easily be explained within the framework of efficient markets. Rational investors would simply adjust prices so that they were in line with current company information.

Using five major fundamentals over time—growth of earnings, cash flow, and sales, as well as profit margin and return on equity—we show this is clearly not the case. Fundamentals show very little or no change, and sometimes continue the current trend even as sharp reversals in the performance of the “best” and “worst” stocks take place in the first year after portfolio formation. Our discussion also indicates that the reversals in performance cannot be attributed to risk. With the elimination of these factors, we conclude that the cause of the major price reversals is psychological, or more specifically, investor overreaction.

The second objective of the paper was to determine when the overreaction, if there was one, actually occurred. To do so, we divided the returns of the “best” and “worst” stocks and their fundamentals into two distinct periods: before portfolio formation ($t = -5$ to $t = 0$), and after ($t = 0$ to $t = +5$). We showed significant outperformance of favored versus out-of-favor stocks in the period prior to portfolio formation and a sharp reversal in performance thereafter. The “best” stocks outperformed sharply as fundamentals continued to improve in the earlier period. In fact, in the first two years before portfolio formation, the “best” stocks displayed their sharpest outperformance, with only minimal improvement in fundamentals. The “worst” stocks, on the other hand, showed an almost perfect mirror image. Both groups displayed sharp price reversals in the first year after portfolio formation, with the new return pattern continuing for the next four years. This evidence, when coupled with the findings of DB and AB, leads us to conclude that the overreaction occurs in the period prior to portfolio formation.

The third goal of the paper was to examine the seemingly disparate results in the literature on overreaction and underreaction. Numerous studies conclude that only one or the other actually occurs. We conclude that over- and underreaction are part of the same process. We observe that the superior performance of the “best” (or the “worst”) stocks can be explained by investor overreaction *before* portfolio formation, which results in their returns being driven too high (low). This is an extended process, which in this study occurred over a five-year period. Similarly, the correction process in the study took five years, indicating underreaction. The “best” and “worst” stocks drift gradually but persistently away from their fundamental values in the overreaction period, years -5 to $t = 0$. In the first part of the underreaction period, year $+1$, there is nothing leisurely about the correction of the undervaluation of the “worst” stocks and the overvaluation of the “best.” The corrections are sharp and, we suspect, violent. But they do not fully adjust prices to more realistic levels. After this period, we return to a gradual but persistent move to more realistic levels as the underreaction process continues through years $+1$ to $+5$.

Suggestions for Further Research

Our research, as well as the empirical findings of a generation of researchers, indicates that overreaction, followed by underreaction, not equilibrium, is the normal state of investment markets. We believe that follow-up work will determine what turns a period of overreaction into a bubble or a panic, where prices drift so far away from underlying fundamentals that they cause a disconnect. We believe the current investor enthusiasm for Internet stocks may be an example. For instance:

- The Nasdaq 100, rich in technology and Internet stocks but with almost no earnings, has risen over 700% in the past five years, accounting for nearly all the gains in the broader Nasdaq Composite Index.
- Although 400 Internet-related companies had a combined market value of \$1 trillion at the end of 1999, total revenues last year were only \$29.5 billion (for a price/sales ratio of 34), and as a group, they lost \$9 billion.
- The recent IPO of eToys, which has \$30 million in sales and lost \$86 million in the last twelve months, was valued at \$7.8 billion, one and a half times the market capitalization of Toys “R” Us, with \$11 billion in sales and \$400 million⁹ in profits.

A second important area of potential research would be to determine what causes the sharp reversals

in the prices of the “best” and “worst” stocks that we have observed in the $t = 0$ to $t = +1$ periods. How much can be attributed to earnings surprises, or to other types of surprises? What other factors precipitate major perceptual changes as to the values of best and worst stocks?

Such research would also be of interest to researchers studying the phenomenon of investment bubbles. Why, for example, was a rare tulip in the Holland of 1637 worth the modern-day price of a Mercedes convertible one day, and next to nothing several weeks later? Or why did PC stocks drop 90% in value in the early 1980s, despite the PC industry’s better than 30% growth since then? The study of perceptual change in markets would be invaluable to investors, as well as possibly providing important psychological insights in other areas.

Notes

1. November 1968 report, Marine Midland Bank. See Dreman [1982, p. 168].
2. DB show that low and high P/E stocks have about the same size and number of positive and negative surprises. Thus positive and negative surprises favor neither low P/E nor high P/E stocks.
3. The investor overreaction hypothesis predicts (see Dreman and Berry [1995]):
 1. The “best” stocks underperform the market, while the “worst” stocks outperform, for long periods.
 2. Positive surprises boost the “worst” stocks significantly more than the “best” stocks.
 3. Negative surprises knock the “best” stocks down much more than they do the “worst” stocks.
 4. There are two distinct categories of surprise: *event triggers* (positive surprises on the “worst” stocks, and negative surprises on the “best”), and *reinforcing events* (negative surprises on the “worst” stocks and positive surprises on the “best”). *Event triggers* result in much larger price movements than *reinforcing events*.
 5. The differences are significant only in the extreme quintiles, with minimal impact on the 60% of stocks in the middle.
 6. Overreaction occurs before the announcement of an earnings or other surprise. A correction of the previous overreaction occurs after the surprise. The “best” stocks move lower relative to the market, while the “worst” stocks move higher, for a relatively long time following a surprise.

DB demonstrate that all six predictions of the investor overreaction hypothesis have been confirmed to a high level of statistical probability.
4. The authors concede that the split announcement date, which usually occurs two to four months before the effective date, is the correct date from which to measure the returns. They did this with a subsample of the data, and found essentially the same results.
5. In this large-cap sample, there are few companies with nominal and negative earnings and cash flows, so it is simplest to exclude them, which has a minimal effect on the size of the sample. Accordingly, we limited P/E and P/CF values to run between 0 and 75, and P/B to run from 0 to 50. The upper cutoff

was enforced to control for nominal earnings. Experiments show that these limits have little effect on the results, and the methodology satisfies the criterion that all information be available to investors at the time of portfolio formation.

6. On balance, it is probably less accurate to require a lag of longer than three months for P/E ratios, as much information available to market participants is thereby neglected. The SEC requires that earnings be reported within ninety days of the fiscal quarter-end. Although there are exceptions, in practice we find that allowing for longer lag times up to six months does not significantly alter the results. Exceptions to the ninety-day rule are few, and earnings are often known, or can be estimated, in advance of announcements.
7. As with returns and fundamentals after $t = 0$, they are also plotted here at each year-end. The returns and fundamentals for the first year before portfolio formation (the twelve months beginning at -1) are calculated from $t = -1$ to $t = 0$, and the results are shown at $t = 0$ on the charts. In the period prior to $t = 0$, we plotted five one-year fundamental and return periods. Results are shown at the end of year -5 (point $t = -4$ years), at the end of year -4 (point $t = -3$), and so on. Fundamentals from $t = -10$ to $t = -5$ are plotted in the same way.
8. The one exception is the slight decrease in the rate of growth in cash flow, sales, and earnings in figure 4.
9. Projected earnings for fiscal 1999.

References

- Abarbanell, Jeffrey S., and Victor L. Bernard. “Tests of Analyst’s Overreaction / Underreaction to Earnings Information as an Explanation for Anomalous Stock Price Behavior.” *Journal of Finance*, 47, (1992), 1181–1207.
- Atkinson, Thomas R. *Trends in Corporate Bond Quality*. NBER: Columbia University Press, 1967.
- Basu, S. “The Effect of Earnings Yield on Assessments of the Association Between Annual Accounting Income Numbers and Security Prices.” *The Accounting Review*, 53, (1978), 599–625.
- Basu, Sanjoy. “Investment Performance of Common Stocks in Relation to Their Price-Earnings Ratios: A Test of the Efficient Markets Hypothesis.” *Journal of Finance*, 32 (1977), 663–682.
- Basu, Sanjoy. “The Relationship Between Earnings’ Yield, Market Value and Return for NYSE Common Stocks: Further Evidence.” *Journal of Financial Economics*, 12, (1983), 129–156.
- Bernard, V., and J.K. Thomas. “Evidence That Stock Prices do not Fully Reflect the Implications of Current Earnings for Future Earnings.” *Journal of Accounting and Economics*, 13, (1990), 305–340.
- Breen, William. “Low Price-Earnings Ratios and Industry Relations.” *Financial Analysts Journal* (1968), 125–127.
- Dreman, David. *Contrarian Investment Strategies: The Next Generation*. New York: Simon & Schuster, 1998.
- Dreman, David. *Contrarian Investment Strategy*. New York: Random House, 1979.
- Dreman, David. *The New Contrarian Investment Strategy*. New York: Random House, 1982.
- Dreman, David, and Eric Lufkin. “Do Contrarian Strategies Work Within Industries?” *Journal of Investing*, 6, (1997), 7–29.
- Dreman, David, and Michael Berry. “Analyst Forecast Errors and Their Implications for Securities Analysis.” *Financial Analysts Journal* (1995), 30–41.
- Dreman, David, and Michael Berry. “Overreaction, Underreaction and the Low P/E Effect.” *Financial Analysts Journal* (1995), 21–30.
- Downen, Richard J., and W. Scott Bauman. “The Relative Importance of Size, P/E and Neglect.” *Journal of Portfolio Management* (1986), 30–34.

- Fama, Eugene F., and Kenneth R. French. "The Cross-Section of Expected Stock Returns." *Journal of Finance*, 46, (1992), 427–465.
- Fama, Eugene F., Lawrence Fisher, Michael C. Jensen, and Richard Roll. "The Adjustment of Stock Prices to New Information." *International Economic Review*, 10 (1969), 1–21.
- Fuller, R., L. Huberts, and M. Levinson. "Returns to E/P Strategies, Higgledy-Piggledy Growth, Analysts' Forecast Errors, and Omitted Risk Factors." *Journal of Portfolio Management*, (1993), 13–24.
- Hickman, W. Braddock. *Corporate Bond Quality and Investor Experience*, Princeton University Press for NBER, 1958.
- Ikenberry, David L., Graeme Rankine, and Earl K. Stice. "What do Stock Splits Really Signal?" *Journal of Financial and Quantitative Analysis*, 31, (1996), 357–375.
- Ikenberry, David, Josef Lakonishok, and Theo Vermaelen. "Market Underreaction to Open Market Share Repurchases." *Journal of Financial Economics*, 39, (1995), 181–208.
- Lakonishok, Josef, Andrei Shleifer, and Robert Vishny. 1994, "Contrarian Investment, Extrapolations, and Risk." *Journal of Finance*, 49, (1994), 1541–1578.
- Loughran, Tim, and Jay Ritter. "Long-Term Market Overreaction: The Effect of Low-Priced Stocks." *Journal of Finance*, 51, (1996), 1959–1970.
- McWilliams J.D. "Prices and Price/Earnings Ratios." *Financial Analysts Journal*, 22 (1966), 137–142.
- Michaely, Roni, Richard Thaler, and Kent Womack. "Price Reactions to Dividend Initiations and Omissions: Overreaction or Drift?" *Journal of Finance*, 50, (1995), 573–608.
- Miller, P.F., and E.R. Widmann. "Price Performance Outlook for High and Low P/E Stocks," 1966 Stock and Bond Issue. *Commercial & Financial Chronicle* (1966), 26–28.
- Nicholson, Francis. "Price-Earnings Ratios." *Financial Analysts Journal* (1960), 43–45.
- Nicholson, Francis. "Price-Earnings Ratios in Relation to Investment results." *Financial Analysts Journal* (1968), 105–109.
- Tversky, A. "The Psychology of Decision Making," in A. Wood, ed. *Behavioral Finance and Decision Theory in Investment Management*, Charlottesville: AIMR, (1995), 2–5.

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