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Momentum Strategies

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ABSTRACT

We examine whether the predictability of future returns from past returns is due to the market's underreaction to information, in particular to past earnings news. Past return and past earnings surprise each predict large drifts in future returns after controlling for the other. Market risk, size, and book-to-market effects do not explain the drifts. There is little evidence of subsequent reversals in the returns of stocks with high price and earnings momentum. Security analysts' earnings forecasts also respond sluggishly to past news, especially in the case of stocks with the worst past performance. The results suggest a market that responds only gradually to new information.

AN EXTENSIVE BODY OF RECENT finance literature documents that the cross-section of stock returns is predictable based on past returns. For example, DeBondt and Thaler (1985, 1987) report that long-term past losers outperform long-term past winners over the subsequent three to five years. Jegadeesh (1990) and Lehmann (1990) find short-term return reversals. Jegadeesh and Titman (1993) add a new twist to this literature by documenting that over an intermediate horizon of three to twelve months, past winners on average continue to outperform past losers, so that there is "momentum" in stock prices. Investment strategies that exploit such momentum, by buying past winners and selling past losers, predate the scientific evidence and have been implemented by many professional investors. The popularity of this approach has grown to the extent that momentum investing constitutes a distinct, well-recognized style of investment in the United States and other equity markets.

The evidence on return predictability is, as Fama (1991) notes, among the most controversial aspects of the debate on market efficiency. Accordingly, a large number of explanations have been put forward to account for reversals in stock prices. For example, Kaul and Nimalendran (1990) and Jegadeesh and

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Titman (1995) examine whether bid-ask spreads can explain short-term reversals. Short-term contrarian profits may also be due to lead-lag effects between stocks (Lo and MacKinlay (1990)). DeBondt and Thaler (1985, 1987), and Chopra, Lakonishok, and Ritter (1992) point to investors' tendencies to overreact. Competing explanations for long-term reversals are based on microstructure biases that are particularly serious for low-priced stocks (Ball, Kothari, and Shanken (1995), Conrad and Kaul (1993)), or time-variation in expected returns (Ball and Kothari (1989)). Since differences across stocks in their past price performance tend to show up as differences in their book-to-market value of equity and in related measures as well, the phenomenon of long-term reversals is related to the kinds of book-to-market effects discussed by Chan, Hamao, and Lakonishok (1991), Fama and French (1992), and Lakonishok, Shleifer, and Vishny (1994).

The situation with respect to stock price momentum is very different. In contrast to the rich array of testable hypotheses concerning long- and short-term reversals, there is a woeful shortage of potential explanations for momentum. A recent article by Fama and French (1996) tries to rationalize a number of related empirical regularities, but fails to account for the profitability of the Jegadeesh and Titman (1993) strategies. In the absence of an explanation, the evidence on momentum stands out as a major unresolved puzzle. From the standpoint of investors, this state of affairs should also be a source of concern. The lack of an explanation suggests that there is a good chance that a momentum strategy will not work out-of-sample and is merely a statistical fluke.

The objective of this article is to trace the sources of the predictability of future stock returns based on past returns. It is natural to look to earnings to try to understand movements in stock prices, so we explore this avenue to rationalize the existence of momentum. In particular, this article relates the evidence on momentum in stock prices to the evidence on the market's underreaction to earnings-related information. For instance, Latane and Jones (1979), Bernard and Thomas (1989), and Bernard, Thomas, and Wahlen (1995), among others, find that firms reporting unexpectedly high earnings outperform firms reporting unexpectedly poor earnings. The superior performance persists over a period of about six months after earnings announcements. Givoly and Lakonishok (1979) report similar sluggishness in the response of prices to revisions in analysts' forecasts of earnings. Accordingly, one possibility is that the profitability of momentum strategies is entirely due to the component of medium-horizon returns that is related to these earnings-related news. If this explanation is true, then momentum strategies will not be profitable after accounting for past innovations in earnings and earnings forecasts. Affleck-Graves and Mendenhall (1992) examine the Value Line timeliness ranking system (a proprietary model based on a combination of past earnings and price momentum, among other variables), and suggest that earnings surprises account for Value Line's ability to predict future returns.

Another possibility is that the profitability of momentum strategies stems from overreaction induced by positive feedback trading strategies of the sort

discussed by DeLong, Shleifer, Summers, and Waldmann (1990). This explanation implies that "trend-chasers" reinforce movements in stock prices even in the absence of fundamental information, so that the returns for past winners and losers are (at least partly) temporary in nature. Under this explanation, we expect that past winners and losers will subsequently experience reversals in their stock prices.

Finally, it is possible that strategies based either on past returns or on earnings surprises (we refer to the latter as "earnings momentum" strategies) exploit market under-reaction to different pieces of information. For example, an earnings momentum strategy may benefit from underreaction to information related to short-term earnings, while a price momentum strategy may benefit from the market's slow response to a broader set of information, including longer-term profitability. In this case we would expect that each of the momentum strategies is individually successful, and that one effect is not subsumed by the other. True economic earnings are imperfectly measured by accounting numbers, so reported earnings may be currently low even though the firm's prospects are improving. If the stock price incorporates other sources of information about future profitability, then there may be momentum in stock prices even with weak reported earnings.

In addition to relating the evidence on price momentum to that on earnings momentum, this article adds to the existing literature in several ways. We provide a comprehensive analysis of different earnings momentum strategies on a common set of data. These strategies differ with respect to how earnings surprises are measured and each adds a different perspective. In the finance literature, the most common way of measuring earnings surprises is in terms of standardized unexpected earnings, although this variable requires a model of expected earnings and hence runs the risk of specification error. In comparison, analysts' forecasts of earnings have not been as widely used in the finance literature, even though they provide a more direct measure of expectations and are available on a more timely basis. Tracking changes in analysts' forecasts is also a popular technique used by investment managers. The abnormal returns surrounding earnings announcements provide another means of objectively capturing the market's interpretation of earnings news. A particularly intriguing puzzle in this regard is that Foster, Olsen, and Shevlin (1984) find that while standardized unexpected earnings help to predict future returns, residual returns immediately around the announcement date have no such power. Our analysis helps to clear up some of these lingering issues on earnings momentum. We go on to confront the performance of price momentum with earnings momentum strategies, using portfolios formed on the basis of one-way, as well as two-way, classifications. These comparisons, and our cross-sectional regressions, help to disentangle the relative predictive power of past returns and earnings surprises for future returns. We also provide evidence on the risk-adjusted performance of the price and earnings momentum strategies.

We confirm that drifts in future returns over the next six and twelve months are predictable from a stock's prior return and from prior news about earnings. Each momentum variable has separate explanatory power for future returns,

so one strategy does not subsume the other. There is little sign of subsequent reversals in returns, suggesting that positive feedback trading cannot account for the profitability of momentum strategies. If anything, the returns for companies that are ranked lowest by past earnings surprise are persistently below average in the following two to three years. Security analysts' forecasts of earnings are also slow to incorporate past earnings news, especially for firms with the worst past earnings performance. The bulk of the evidence thus points to a delayed reaction of stock prices to the information in past returns and in past earnings.

The remainder of the article is organized as follows. Section I describes the sample and our methodology. Univariate analyses of our different momentum strategies are carried out in Section II, while the results from multivariate analyses are reported in Section III. Section IV examines whether price and earnings momentum are subsequently corrected. Section V checks that our results are robust by replicating the results for larger companies only, and by controlling for risk factors. Section VI concludes.

I. Sample and Methodology

We consider all domestic, primary stocks listed on the New York (NYSE), American (AMEX), and Nasdaq stock markets. Closed-end funds, Real Estate Investment Trusts (REITs), trusts, American Depository Receipts (ADRs), and foreign stocks are excluded from the analysis. Since we require information on earnings, the sample comprises all companies with coverage on both the Center for Research in Security Prices (CRSP) and COMPUSTAT (Active and Research) files. The data for firms in this sample are supplemented, wherever available, with data on analysts' forecasts of earnings from the Lynch, Jones, and Ryan Institutional Brokers Estimate System (I/B/E/S) database.

At the beginning of every month from January 1977 to January 1993, we rank stocks on the basis of either past returns or a measure of earnings news. To be eligible, a stock need only have data available on the variable(s) used for ranking, even though we provide information on other stock attributes. The ranked stocks are then assigned to one of ten decile portfolios, where the breakpoints are based only on NYSE stocks. In our earnings momentum strategies, the breakpoints in any given month are based on all NYSE firms that have reported earnings within the prior three months. This takes into account a complete cycle of earnings announcements. All stocks are equally-weighted within a given portfolio.

The ranking variable used in our price momentum strategy is a stock's past compound return, extending back six months prior to portfolio formation. In our earnings momentum strategies, we use three different measures of earnings news. Our first is the commonly used standardized unexpected earnings (SUE) variable. Foster, Olsen, and Shevlin (1984) examine different time series models for expected earnings and how the resulting measures of unanticipated earnings are associated with future returns. They find that a seasonal random walk model performs as well as more complex models, so we use

it as our model of expected earnings. The SUE for stock i in month t is thus defined as

$$\text{SUE}_{it} = \frac{e_{iq} - e_{iq-4}}{\sigma_{it}} \tag{1}$$

where e_{iq} is quarterly earnings per share most recently announced as of month t for stock i, e_{iq-4} is earnings per share four quarters ago, and σ_{it} is the standard deviation of unexpected earnings, $e_{iq} - e_{iq-4}$, over the preceding eight quarters.

Another measure of earnings surprise is the cumulative abnormal stock return around the most recent announcement date of earnings up to month t, ABR, defined as

$$\text{ABR}_{it} = \sum_{j=-2}^{+1} (r_{ij} - r_{mj}) \tag{2}$$

where r_{ij} is stock i's return on day j (with the earnings being announced on day 0) and r_{mj} is the return on the equally-weighted market index. We cumulate returns until one day after the announcement date to account for the possibility of delayed stock price reaction to earnings news, particularly since our sample includes Nasdaq issues that may be less frequently traded. This return-based measure is a fairly clean measure of earnings surprise, since it does not require an explicit model for earnings expectations. However, the abnormal return around the announcement captures the change over a window of only a few days in the market's views about earnings. The SUE measure incorporates the information up to the last quarter's earnings and hence in principle measures earnings surprise over a longer period.

Our final measure of earnings news is given by changes in analysts' forecasts of earnings. Since analyst estimates are not necessarily revised every month, many of the monthly revisions take the value of zero. To get around this, we define REV6, a six-month moving average of past changes in earnings forecasts by analysts:

$$\text{REV6}_{it} = \sum_{j=0}^{6} \frac{f_{it-j} - f_{it-j-1}}{p_{it-j-1}} \tag{3}$$

where f_{it} is the consensus (mean) I/B/E/S estimate in month t of firm i's earnings for the current fiscal year (FY1). The monthly revisions in estimates are scaled by the prior month's stock price.[1] Analyst estimates are available on

[1] Scaling the revisions by the stock price penalizes stocks with high price-earnings ratios. To circumvent this possibility, we also scaled revisions by the book value per share. We also experimented with the percent change in the median I/B/E/S estimate, as well as the difference between

a monthly basis[2] and dispense with the need for a model of expected earnings. However, the estimates issued by analysts may be colored by other incentives such as the desire to encourage investors to trade and hence generate brokerage commissions.[3] As a result, analyst forecasts may not be a clean measure of expected earnings.

For each of our momentum strategies, we report buy-and-hold returns in the periods subsequent to portfolio formation. Returns measured over contiguous intervals may be spuriously related due to bid-ask bounce, thereby attenuating the performance of the price momentum strategy. To control for this effect, we skip the first five days after portfolio formation before we begin to measure returns under the price momentum strategy and, for the sake of comparability, under the earnings momentum strategy as well. If a stock is delisted after it is included in a portfolio but before the end of the holding period over which returns are calculated, we replace its return until the end of the period with the return on a value-weighted market index. At the end of the period we rebalance all the remaining stocks in the original portfolio to equal weights in order to calculate returns in subsequent periods. In addition to returns on the portfolios, we also report two attributes of our portfolios—the book-to-market value of equity and the ratio of cash flow (earnings plus depreciation) to price—at the time of portfolio formation. Finally, we also track our three measures of earnings surprise (SUE, ABR, and REV6) at the time of portfolio formation and thereafter.

II. Price and Earnings Momentum: Univariate Analysis

A. *Price Momentum*

We first examine the ability of each of the momentum strategies to predict future returns, and the characteristics of the momentum portfolios. To lay the groundwork, Table I reports correlations between the various measures we use to group stocks into portfolios. The correlations are based on monthly observations pooled across all stocks. Although the variables are positively correlated with one another, the coefficients are not large. In particular, the differ-

the number of upward and downward revisions as a proportion of the number of estimates. Our results are robust to these alternative measures of analyst revisions.

[2] In the context of an implementable investment strategy, all stocks are candidates for inclusion in our price momentum or earnings momentum portfolios in a given month. The strategy based on analyst revisions automatically fulfills this requirement, since consensus estimates are available at a monthly frequency. The portfolios based on standardized unexpected earnings and abnormal announcement returns will pick up an earnings variable that may be somewhat out-of-date for those firms not announcing earnings in the month of portfolio formation. This may lead to an understatement of the returns to these two earnings momentum strategies, but in any event we are able to compare directly the results from the price momentum and from the earnings momentum strategies.

[3] Several recent examples of these kinds of pressures on analysts are described by Michael Siconolfi in "A rare glimpse at how Wall Street covers clients," *Wall Street Journal*, July 14, 1995, and "Incredible buys: Many companies press analysts to steer clear of negative ratings," *Wall Street Journal*, July 19, 1995.

Table I

Correlations Between Prior Six-Month Return and Past Earnings Surprises

Correlation coefficients are calculated over all months and over all stocks for the following variables. R6 is a stock's compound return over the prior six months. SUE is unexpected earnings (the change in the most recent past quarterly earnings per share from its value four quarters ago), scaled by the standard deviation of unexpected earnings over the past eight quarters. REV6 is a moving average of the past six months' revisions in Institutional Brokers Estimate System (I/B/E/S) median analyst earnings forecasts relative to beginning-of-month stock price. ABR is the abnormal return relative to the equally-weighted market index cumulated from two days before to one day after the most recent past announcement date of quarterly earnings. The sample includes all domestic primary firms on New York Stock Exchange (NYSE), American Stock Exchange (AMEX), and Nasdaq with coverage on the Center for Research in Security Prices (CRSP) and COMPUSTAT. The data extend from January 1977 to December 1993.

	R6	SUE	ABR	REV6
R6	1.000			
SUE	0.293	1.000		
ABR	0.160	0.236	1.000	
REV6	0.294	0.440	0.115	1.000

ent measures of earnings surprises are not strongly associated with each other. The highest correlation (0.440) is between standardized unexpected earnings and revisions in analyst forecasts, while the correlation between analyst revisions and abnormal returns around earnings announcements is 0.115. The low correlations suggest that the different momentum variables are not entirely based on the same information. Rather, they capture different aspects of improvement or deterioration in a company's performance.

Panel A of Table II documents the stock price performance of portfolios formed on the basis of prior six-month returns, where portfolio 1 comprises past "losers" and portfolio 10 comprises past "winners." Subsequent to the portfolio formation date, winners outperform losers, so that by the end of twelve months there is a large difference of 15.4 percent between the returns of the winner and loser portfolios. This difference is driven by the extreme decile portfolios, however. Comparing the returns on decile portfolios 9 and 2 reveals a smaller difference of 6.3 percent.

While there is prior evidence on the profitability of price momentum strategies, we go further and provide additional characteristics of the different portfolios. In Panel B, there is a fairly close association between past return performance and the portfolios' book-to-market ratios (measured as of the portfolio formation date). The portfolio of past winners tends to include "glamour" stocks with low book-to-market ratios. Conversely, the portfolio of past losers tends to include "value" stocks with high book-to-market ratios. This is not necessarily surprising, however. Even if the different portfolios had similar book-to-market ratios at the beginning of the period, book values change very slowly over time but one portfolio rose in market value by 70 percent while the other fell by 31 percent. However, the ten portfolios display smaller differences

Table II

Mean Returns and Characteristics for Portfolios Classified by Prior Six-Month Return

At the beginning of every month from January 1977 to January 1993, all stocks are ranked by their compound return over the prior six months and assigned to one of ten portfolios. The assignment uses breakpoints based on New York Stock Exchange (NYSE) issues only. All stocks are equally-weighted in a portfolio. The sample includes all NYSE, American Stock Exchange (AMEX), and Nasdaq domestic primary issues with coverage on the Center for Research in Security Prices (CRSP) and COMPUSTAT. Panel A reports the average past six-month return for each portfolio, and buy-and-hold returns over periods following portfolio formation (in the following six months and in the first, second, and third subsequent years). Panel B reports accounting characteristics for each portfolio: book value of common equity relative to market value, and cash flow (earnings plus depreciation) relative to market value. Panel C reports each portfolio's most recent past and subsequent values of quarterly standardized unexpected earnings (the change in quarterly earnings per share from its value four quarters ago, divided by the standard deviation of unexpected earnings over the last eight quarters). Panel D reports abnormal returns around earnings announcement dates. Abnormal returns are relative to the equally-weighted market index and are cumulated from two days before to one day after the date of earnings announcement. In Panel E, averages of percentage revisions relative to the beginning-of-month stock price in monthly mean I/B/E/S estimates of current fiscal-year earnings per share are reported.

	1 (Low)	2	3	4	5	6	7	8	9	10 (High)
Panel A: Returns										
Past 6-month return	−0.308	−0.126	−0.055	0.000	0.050	0.099	0.153	0.219	0.319	0.696
Return 6 months after portfolio formation	0.061	0.086	0.093	0.096	0.102	0.104	0.105	0.111	0.120	0.149
Return first year after portfolio formation	0.143	0.185	0.198	0.208	0.214	0.222	0.223	0.235	0.248	0.297
Return second year after portfolio formation	0.205	0.201	0.205	0.206	0.208	0.208	0.204	0.208	0.207	0.199
Return third year after portfolio formation	0.194	0.196	0.197	0.196	0.199	0.202	0.205	0.201	0.208	0.206
Panel B: Characteristics										
Book-to-market ratio	1.080	1.004	0.965	0.943	0.916	0.888	0.855	0.827	0.785	0.696
Cash flow-to-price ratio	0.111	0.144	0.149	0.152	0.151	0.149	0.148	0.144	0.139	0.115
Panel C: Standardized Unexpected Earnings										
Most recent quarter	−0.879	−0.336	−0.092	0.046	0.196	0.316	0.433	0.570	0.670	0.824
Next quarter	−1.052	−0.414	−0.147	0.034	0.192	0.350	0.479	0.613	0.744	0.919
Panel D: Abnormal Return Around Earnings Announcements										
Most recent announcement	−0.027	−0.013	−0.007	−0.003	0.000	0.004	0.007	0.012	0.018	0.035
First announcement after portfolio formation	−0.011	−0.004	−0.001	0.000	0.002	0.003	0.004	0.006	0.009	0.015
Second announcement after portfolio formation	−0.002	0.000	0.000	0.001	0.001	0.003	0.003	0.003	0.005	0.008
Third announcement after portfolio formation	0.002	0.001	0.002	0.001	0.002	0.001	0.003	0.003	0.003	0.005
Fourth announcement after portfolio formation	0.003	0.001	0.002	0.001	0.001	0.000	0.001	0.002	0.001	0.001

Table II—*Continued*

	1 (Low)	2	3	4	5	6	7	8	9	10 (High)
Panel E: Revision in Analyst Forecasts (%)										
Most recent revision	−2.190	−0.576	−0.401	−0.262	−0.212	−0.127	−0.129	−0.028	−0.003	0.086
Average over next 6 months	−2.138	−0.578	−0.368	−0.282	−0.220	−0.152	−0.117	−0.068	−0.041	0.004
Average from months 7 to 12	−1.843	−0.555	−0.378	−0.318	−0.248	−0.206	−0.191	−0.165	−0.153	−0.180

with respect to their ratios of cash flow to price. The extreme portfolios feature low ratios of cash flow to price, but for different reasons. The portfolio of past losers contains stocks with relatively depressed past earnings and cash flow, while the portfolio of past winners contains glamour stocks that have done well in the past.

The last three panels of Table II provide clues as to what may be driving price momentum. Perhaps not surprisingly, the past price performance of the portfolios is closely aligned with their past earnings performance. There is a large difference between the past winners and past losers in terms of the innovation in their past quarterly earnings (Panel C). Past abnormal announcement returns (Panel D) also rise across the momentum portfolios, with a large difference (6.2 percent) between portfolios ten and one. Stocks that have experienced high (low) past returns are associated with large upward (downward) past revisions in analysts' estimates (Panel E).[4]

More remarkably, the differences across the portfolios in their past earnings performance continue over the periods following portfolio formation. The spread between the SUEs of the winner and loser portfolios is actually wider in the following quarter. This may simply be a symptom of a misspecified model of expected earnings,[5] so examining the behavior of returns around earnings announcement dates provides a more direct piece of evidence. We find that the market continues to be caught by surprise at the two quarterly earnings announcements following portfolio formation, particularly for the extreme decile portfolios.[6] In particular, the abnormal return around the first subsequent announcement is higher by 2.6 percent for winner stocks compared

[4] Note that in Panel E we report statistics for monthly percentage revisions in the consensus estimates (while portfolios are formed on the basis of a six-month moving average of revisions). The presence of reporting delays in the individual estimates underlying the consensus may induce apparent persistence on a month-by-month basis, so we report average percent changes over the first and second six-month periods following portfolio formation.

[5] Fama and French (1993, 1995) argue that the statistical process for earnings changed during the 1980s. It might be suggested that this prolonged period of continuous rational surprises could account for part of the earnings surprise effects in returns. On the other hand, numerous studies document the existence of earnings surprise effects before the start of our sample period. See, for example, Givoly and Lakonishok (1979), Jones and Litzenberger (1970), and Latane and Jones (1979).

[6] Note that the average abnormal return around announcement dates is positive. This is consistent with the findings of Chari, Jagannathan, and Ofer (1988).

to loser stocks. In the second announcement following portfolio formation, the abnormal return is again larger for winner stocks by 1 percent. To put this in perspective, the spread in returns between portfolios 10 and 1 is 8.8 percent in the first six months after portfolio formation. The combined difference of 3.6 percent in abnormal returns around the subsequent two announcements of quarterly earnings thus accounts for 41 percent of this spread. After two quarters, there is not much difference between the portfolios' abnormal returns around earnings announcements.

Panel E examines the behavior of analysts' revisions in earnings forecasts. The revisions across all the portfolios are mostly negative, a finding consistent with the notion that analysts' forecasts initially tend to be overly optimistic and are then adjusted downward over time. Such optimism may reflect the incentives faced by analysts. In particular, analysts' original estimates may be overly favorable in order to encourage investors to buy a stock and hence generate brokerage income. There are more potential buyers (all the clients of the brokerage firm) than potential sellers (who are limited to current holders of the stock, given the difficulty of short-selling). Hence an analyst is less likely to benefit from issuing a negative recommendation. An unfavorable forecast may damage relations between management and the analyst, and jeopardize other relations between management and the brokerage firm (such as underwriting and investment banking).

In the period following portfolio formation, revisions for the loser portfolio are relatively unfavorable, while those for the winner portfolio are relatively favorable. The adjustments in forecasts are especially protracted for the loser portfolio, as there is a large downward monthly revision averaging 2.1 percent (relative to the stock price at the beginning of the month) in the first six months after portfolio formation. The average monthly revision from seven to twelve months afterwards is still large (1.8 percent). Klein (1990) also finds that analysts remain overly optimistic in their forecasts for firms that have experienced poor stock price performance. One conjecture is that it may not be in an analyst's best interest to be the first messenger with bad news (a negative forecast), as this might antagonize management. Instead analysts may remain optimistic and wait for additional confirmatory evidence of poor earnings before slowly modifying their estimates. Further, the dependence of analysts' incomes on the amount of business they generate (as reflected by trading volume) may make them less willing to disseminate unfavorable news (see Lakonishok and Smidt (1986)). The market, however, is not necessarily taken in by such reticence on the part of analysts. The abnormal returns around earnings announcements (Panel D) show no marked asymmetries between the loser and winner portfolios and they also appear to adjust faster, so that the average abnormal return is very close to zero by the time of the third announcement following portfolio formation. All in all, the association between prior returns and prior earnings news, as well as the sluggishness in the market's response to past earnings surprises, instills some confidence that the momentum in stock prices may at least partially reflect the market's slow adjustment to the information in earnings.

B. Earnings Momentum

Investment rules based on standardized unexpected earnings (SUE) have a long history dating back at least to Jones and Litzenberger (1970) and Latane and Jones (1979). Accordingly, Table III starts off our evaluation of earnings momentum by applying a strategy based on SUE as a measure of the news in earnings. In the first six months after portfolio formation, the arbitrage portfolio (portfolio 10 minus portfolio 1) earns a return of 6.8 percent. The superior performance is relatively short-lived, however. The spread in returns after a year is only slightly higher at 7.5 percent.

The evidence in the other panels of Table III is consistent with the idea that the superior stock price performance reflects the market's gradual adjustment to earnings surprises. In particular, the past SUE contains information that is not incorporated into the stock price. Instead, at the next announcement date of earnings the market is still surprised by stocks with good or bad past SUE, and there is a difference in returns of 2.4 percent between stocks with the best and worst past SUE. At the second subsequent announcement of earnings, the abnormal returns still differ by 0.8 percent, so that almost half, or 3.2 percent, of the spread in the first six months occurs around the release of earnings. As is the case in Panel A, the higher returns do not persist for long, and by the third announcement the returns of the different portfolios are very similar. In the period following portfolio formation, the behavior of subsequent standardized unexpected earnings and consensus estimates also shows delays in the adjustment of forecasts. The sustained nature of the adjustment in analyst forecasts is particularly notable in the case of firms in portfolio 1 with large unexpected declines in earnings.

It is possible that the results in Table III are influenced by measurement errors in earnings or misspecification of the model for expected earnings. Another variable that may give a clearer, more objective measure of the informativeness of earnings for investors is the stock market's response around the time when earnings are announced. Hence, Table IV provides results for portfolios formed on the basis of abnormal returns around the most recent past earnings announcement. To the extent that the market responds slowly to the news in earnings, we should expect to see a drift in future stock returns that can be predicted by the sign and magnitude of the abnormal announcement return. Surprisingly, however, Foster, Olsen, and Shevlin (1984) find that future returns are associated with past SUE but not with past abnormal announcement returns. Our results in Table IV actually indicate that the differences in returns associated with differences in past abnormal announcement returns are as large as the differences induced by ranking on SUE.[7] Stocks with large favorable announcement returns subsequently out-

[7] Bernard, Thomas, and Wahlen (1995) find, as we do, that announcement period returns help to predict future excess returns. They argue that the holding period used in Foster, Olsen, and Shevlin (1984) to track returns after an earnings announcement stops short of the next announcement. Hence, a possible explanation for the weaker results in Foster, Olsen, and Shevlin (1984) is that they miss much of the stock price reaction around subsequent announcements.

Table III

Mean Returns and Characteristics for Portfolios Classified by Standardized Unexpected Earnings

At the beginning of every month from January 1977 to January 1993, all stocks are ranked by their most recent past standardized unexpected earnings and assigned to one of ten portfolios. Standardized unexpected earnings is unexpected earnings (the change in quarterly earnings per share from its value four quarters ago) divided by the standard deviation of unexpected earnings over the last eight quarters. The assignment uses breakpoints based on New York Stock Exchange (NYSE) issues only. All stocks are equally-weighted in a portfolio. The sample includes all NYSE, American Stock Exchange (AMEX), and Nasdaq domestic primary issues with coverage on the Center for Research in Security Prices (CRSP) and COMPUSTAT. Panel A reports the average past six-month return for each portfolio, and buy-and-hold returns over periods following portfolio formation (in the following six months and in the first, second, and third subsequent years). Panel B reports accounting characteristics for each portfolio: book value of common equity relative to market value, and cash flow (earnings plus depreciation) relative to market value. Panel C reports each portfolio's most recent past and subsequent values of quarterly standardized unexpected earnings. Panel D reports abnormal returns around earnings announcement dates. Abnormal returns are relative to the equally-weighted market index and are cumulated from two days before to one day after the date of earnings announcement. In Panel E, averages of percentage revisions relative to the beginning-of-month stock price in monthly mean I/B/E/S estimates of current fiscal-year earnings per share are reported.

	1 (Low)	2	3	4	5	6	7	8	9	10 (High)
Panel A: Returns										
Past 6-month return	−0.052	−0.004	0.027	0.062	0.099	0.127	0.149	0.166	0.186	0.226
Return 6 months after portfolio formation	0.051	0.063	0.081	0.091	0.105	0.114	0.114	0.115	0.119	0.119
Return first year after portfolio formation	0.138	0.160	0.193	0.205	0.225	0.232	0.227	0.226	0.225	0.213
Return second year after portfolio formation	0.169	0.183	0.194	0.212	0.218	0.215	0.218	0.211	0.204	0.180
Return third year after portfolio formation	0.185	0.189	0.204	0.216	0.208	0.211	0.211	0.208	0.197	0.179
Panel B: Characteristics										
Book-to-market ratio	1.074	1.046	1.028	0.995	0.935	0.894	0.834	0.802	0.759	0.700
Cash flow-to-price ratio	0.134	0.146	0.148	0.144	0.143	0.142	0.139	0.139	0.136	0.134
Panel C: Standardized Unexpected Earnings										
Most recent quarter	−2.882	−0.896	−0.398	−0.112	0.120	0.342	0.601	0.938	1.448	2.839
Next quarter	−2.364	−0.830	−0.377	−0.083	0.125	0.356	0.589	0.839	1.219	2.282
Panel D: Abnormal Return Around Earnings Announcements										
Most recent announcement	−0.023	−0.015	−0.009	−0.004	0.003	0.008	0.012	0.015	0.017	0.022
First announcement after portfolio formation	−0.012	−0.008	−0.005	−0.001	0.003	0.005	0.007	0.008	0.011	0.012
Second announcement after portfolio formation	−0.003	−0.002	0.001	0.001	0.004	0.004	0.004	0.003	0.003	0.005
Third announcement after portfolio formation	0.002	0.001	0.003	0.003	0.002	0.003	0.002	0.001	0.001	0.001
Fourth announcement after portfolio formation	0.003	0.005	0.002	0.001	0.002	0.001	−0.001	−0.001	0.001	−0.002

Table III—*Continued*

	1 (Low)	2	3	4	5	6	7	8	9	10 (High)
Panel E: Revision in Analyst Forecasts (%)										
Most recent revision	−1.558	−0.903	−0.547	−0.626	−0.268	−0.125	−0.059	−0.171	−0.066	0.107
Average over next 6 months	−1.480	−0.866	−0.647	−0.453	−0.325	−0.198	−0.119	−0.095	−0.054	0.005
Average from months 7 to 12	−1.160	−0.817	−0.659	−0.352	−0.352	−0.247	−0.296	−0.232	−0.199	−0.155

perform stocks with large unfavorable announcement returns by 5.9 percent in the first six months, and by 8.3 percent in the first year. Tables III and IV both suggest that the underreaction to quarterly earnings surprises seems to be a more short-lived phenomenon than the underreaction to past returns.

The news reflected in the past earnings announcement return continues to leave its traces at the next announcement following portfolio formation (Panel D). The spread in returns between stocks that have delivered favorable surprises and those with unfavorable surprises is especially striking (8.8 percent). Market forecasts of earnings, as represented by SUE or analyst estimates, also respond slowly to the new information in announcement returns.

While behavioral or sociological considerations may impart a bias to analysts' forecasts, an upward or downward revision in the consensus estimate may still convey information. Table V suggests that this is indeed the case. Moreover, of the three measures of earnings surprise, sorting stocks on REV6 yields the largest spread in one-year returns (9.7 percent).[8] In other respects, the results in Table V are very similar to those for either standardized unexpected earnings or announcement returns.

To summarize, sorting stocks on the basis of past returns yields large differences in subsequent returns. Sorting on past earnings surprise (measured in a number of ways) also gives rise to large spreads in future returns. The spreads in returns associated with the earnings momentum strategies, however, tend to be smaller and persist for a shorter period of time when compared to the results of the price momentum strategy. Our evidence is consistent with the idea that the market does not incorporate the news in past prices or earnings promptly. Instead, the adjustment is gradual, so that there are drifts in subsequent returns. In the same manner, security analysts are slow to revise their expectations about earnings, particularly when the news in earnings is unfavorable. The asymmetry in the behavior of revisions with respect to past losers and past winners hints at the importance of the incentive structures analysts face when they issue forecasts.

[8] We obtain similar results when we use monthly revisions in analyst forecasts instead of a six-month moving average. Womack (1996) also finds that changes in analyst buy or sell recommendations predict future returns.

Table IV

Mean Returns and Characteristics for Portfolios Classified by Abnormal Return Around Earnings Announcement

At the beginning of every month from January 1977 to January 1993, all stocks are ranked by their abnormal return around the most recent past announcement of quarterly earnings and assigned to one of ten portfolios. Abnormal returns are relative to the equally-weighted market index and are cumulated from two days before to one day after the date of earnings announcement. The assignment uses breakpoints based on New York Stock Exchange (NYSE) issues only. All stocks are equally-weighted in a portfolio. The sample includes all NYSE, American Stock Exchange (AMEX), and Nasdaq domestic primary issues with coverage on Center for Research in Security Prices (CRSP) and COMPUSTAT. Panel A reports the average past six-month return for each portfolio, and buy-and-hold returns over periods following portfolio formation (in the following six months and in the first, second, and third subsequent years). Panel B reports accounting characteristics for each portfolio: book value of common equity relative to market value, and cash flow (earnings plus depreciation) relative to market value. Panel C reports each portfolio's most recent past and subsequent values of quarterly standardized unexpected earnings (the change in quarterly earnings per share from its value four quarters ago, divided by the standard deviation of unexpected earnings over the last eight quarters). Panel D reports abnormal returns around earnings announcement dates. In Panel E, averages of percentage revisions relative to the beginning-of-month stock price in monthly mean I/B/E/S estimates of current fiscal-year earnings per share are reported.

	1 (Low)	2	3	4	5	6	7	8	9	10 (High)
Panel A: Returns										
Past 6-month return	−0.026	0.039	0.061	0.074	0.085	0.099	0.113	0.132	0.161	0.223
Return 6 months after portfolio formation	0.063	0.077	0.088	0.093	0.094	0.099	0.099	0.101	0.111	0.122
Return first year after portfolio formation	0.155	0.174	0.183	0.194	0.198	0.208	0.208	0.212	0.221	0.238
Return second year after portfolio formation	0.186	0.190	0.185	0.192	0.197	0.198	0.199	0.196	0.205	0.207
Return third year after portfolio formation	0.183	0.188	0.185	0.190	0.196	0.200	0.198	0.198	0.198	0.214
Panel B: Characteristics										
Book-to-market ratio	0.968	0.923	0.903	0.907	0.900	0.891	0.880	0.870	0.857	0.894
Cash flow-to-price ratio	0.119	0.140	0.146	0.150	0.148	0.149	0.148	0.146	0.139	0.122
Panel C: Standardized Unexpected Earnings										
Most recent quarter	−0.485	−0.169	−0.005	0.126	0.191	0.273	0.329	0.364	0.465	0.508
Next quarter	−0.635	−0.186	−0.034	0.119	0.183	0.256	0.293	0.371	0.499	0.529
Panel D: Abnormal Return Around Earnings Announcements										
Most recent announcement	−0.076	−0.033	−0.020	−0.011	−0.004	0.004	0.011	0.021	0.035	0.089
First announcement after portfolio formation	−0.040	−0.017	−0.010	−0.006	−0.001	0.003	0.007	0.012	0.020	0.048
Second announcement after portfolio formation	−0.001	−0.002	0.000	0.001	0.002	0.002	0.003	0.003	0.004	0.007
Third announcement after portfolio formation	0.000	0.002	0.002	0.001	0.001	0.002	0.002	0.002	0.003	0.005
Fourth announcement after portfolio formation	0.001	0.001	0.000	0.002	0.000	0.002	0.001	0.002	0.003	0.001

Table IV—*Continued*

	1 (Low)	2	3	4	5	6	7	8	9	10 (High)
Panel E: Revision in Analyst Forecasts (%)										
Most recent revision	−1.135	−0.564	−0.372	−0.257	−0.261	−0.232	−0.273	−0.252	−0.338	−0.321
Average over next 6 months	−1.314	−0.514	−0.329	−0.284	−0.263	−0.223	−0.202	−0.234	−0.312	−0.319
Average from months 7 to 12	−1.215	−0.506	−0.363	−0.271	−0.307	−0.271	−0.280	−0.260	−0.275	−0.518

III. Price and Earnings Momentum: Multivariate Analysis

The evidence in the last section indicates that each of the momentum strategies that we consider is by itself useful in predicting future stock returns. We now examine whether the continuation in past price movements and the underreaction to earnings news are the same phenomenon.

A. Two-way Analysis of Price and Earnings Momentum

Our first set of tests addresses this issue in terms of a two-way classification. At the beginning of each month, we sort the securities in the sample on the basis of their past six-month returns and assign them to one of three equally-sized portfolios. Independently, we sort stocks and group them into three equally-sized portfolios on the basis of the most recent earnings surprise. Under this procedure each stock is assigned to one of nine portfolios. Table VI reports buy-and-hold returns over each of several periods following portfolio formation, as well as the average earnings surprise over the first subsequent year. Panel A reports the results when earnings surprises are measured as abnormal returns around earnings announcements, while Panels B and C provide results for standardized unexpected earnings and analyst revisions, respectively.

The first three panels in Table VI tell a consistent story. Most important, past realizations of six-month returns and earnings news predict continued drifts in returns in the subsequent period. In particular, the two-way sort generates large differences in returns between stocks that are jointly ranked highest and stocks jointly ranked lowest. For example, using past return in conjunction with earnings surprise measured as the abnormal announcement return, the highest-ranking portfolio outperforms the lowest-ranked portfolio by 7.9 percent in the first six months. Similarly, the six-month spread is 8.1 percent using prior return together with SUE, and 8.8 percent using prior return with analyst revisions.

Each variable (prior return or earnings surprise) contributes some incremental predictive power for future returns, given the other variable. In Panel A, holding prior return fixed, stocks with high past announcement return earn in the first six months following portfolio formation 2.8 percent more on

Table V

Mean Returns and Characteristics for Portfolios Classified by Revision in Analyst Forecasts

At the beginning of every month from January 1977 to January 1993, all stocks are ranked by their moving average of the last six months' revisions in mean I/B/E/S estimates of current fiscal-year earnings per share, relative to beginning-of-month stock price, and assigned to one of ten portfolios. The assignment uses breakpoints based on New York Stock Exchange (NYSE) issues only. All stocks are equally-weighted in a portfolio. The sample includes all NYSE, American Stock Exchange (AMEX), and Nasdaq domestic primary issues with coverage on the Center for Research in Security Prices (CRSP) and COMPUSTAT. Panel A reports the average past six-month return for each portfolio, and buy-and-hold returns over periods following portfolio formation (in the following six months and in the first, second, and third subsequent years). Panel B reports accounting characteristics for each portfolio: book value of common equity relative to market value, and cash flow (earnings plus depreciation) relative to market value. Panel C reports each portfolio's most recent past and subsequent values of quarterly standardized unexpected earnings (the change in quarterly earnings per share from its value four quarters ago, divided by the standard deviation of unexpected earnings over the last eight quarters). Panel D reports abnormal returns around earnings announcement dates. Abnormal returns are relative to the equally-weighted market index and are cumulated from two days before the one day after the date of earnings announcement. In Panel E, averages of percentage revisions relative to the beginning-of-month stock price in monthly mean I/B/E/S estimates of current fiscal-year earnings per share are reported.

	1 (Low)	2	3	4	5	6	7	8	9	10 (High)
Panel A: Returns										
Past 6-month return	−0.066	0.002	0.032	0.058	0.083	0.099	0.116	0.156	0.191	0.248
Return 6 months after portfolio formation	0.046	0.070	0.072	0.079	0.083	0.082	0.087	0.106	0.116	0.123
Return first year after portfolio formation	0.132	0.159	0.164	0.171	0.177	0.174	0.177	0.203	0.216	0.229
Return second year after portfolio formation	0.159	0.180	0.178	0.187	0.180	0.171	0.178	0.175	0.188	0.214
Return third year after portfolio formation	0.177	0.182	0.174	0.173	0.186	0.179	0.176	0.189	0.194	0.202
Panel B: Characteristics										
Book-to-market ratio	1.232	0.986	0.877	0.803	0.740	0.681	0.669	0.694	0.752	0.881
Cash flow-to-price ratio	0.093	0.152	0.156	0.151	0.146	0.132	0.131	0.141	0.155	0.165
Panel C: Standardized Unexpected Earnings										
Most recent quarter	−1.507	−0.809	−0.383	−0.036	0.323	0.566	0.855	1.014	1.155	1.122
Next quarter	−1.098	−0.721	−0.342	−0.030	0.213	0.507	0.792	0.878	0.950	0.889
Panel D: Abnormal Return Around Earnings Announcements										
Most recent announcement	−0.017	−0.010	−0.007	−0.004	−0.001	0.002	0.003	0.007	0.012	0.021
First announcement after portfolio formation	−0.006	−0.004	−0.002	−0.001	−0.001	0.000	0.002	0.003	0.005	0.009
Second announcement after portfolio formation	−0.002	0.000	0.000	0.000	−0.001	0.002	0.002	0.001	0.003	0.004

Table V—*Continued*

	1 (Low)	2	3	4	5	6	7	8	9	10 (High)
Panel D: *Continued*										
Third announcement after portfolio formation	0.003	0.000	0.000	0.003	0.000	0.000	0.000	0.003	0.000	0.000
Fourth announcement after portfolio formation	0.002	0.002	0.001	0.000	−0.002	0.001	0.000	0.000	0.000	−0.001
Panel E: Revision in Analyst Forecasts (%)										
Most recent revision	−3.453	−0.540	−0.275	−0.156	−0.073	−0.027	0.011	0.050	0.126	0.813
Average over next 6 months	−2.027	−0.529	−0.323	−0.231	−0.158	−0.158	−0.116	−0.057	−0.037	−0.321
Average from months 7 to 12	−1.994	−0.516	−0.320	−0.237	−0.190	−0.181	−0.153	−0.135	−0.156	−0.332

average than stocks with low past announcement return.[9] In comparison, the returns on stocks with high and low past prior return, but similar levels of announcement return, differ on average by 4.6 percent. Using measures of longer-term earnings news, as given by either standardized unexpected earnings or revisions in consensus estimates, turns out to place earnings momentum on a more equal footing with price momentum. The six-month spreads induced by past SUE or past revision, conditional on prior return, are 4.3 percent and 3.8 percent, respectively. Sorting on past return, conditional on past earnings news, produces average spreads in six-month returns of 3.1 percent (Panel B) and 4.5 percent (Panel C). The bottom line is that although the ranking by prior return generally gives rise to larger differences in future returns, neither momentum strategy subsumes the other. Instead, they each exploit underreaction to different pieces of information.

As in the earlier tables, however, there are signs in Table VI that the component of superior performance associated with earnings surprise is more short-lived than the component associated with prior return. As shown in Panel A, ranking stocks by past announcement return, conditional on prior return generates average spreads in returns of 2.8 percent during the first six months and spreads of 3.8 percent in the first year. On the other hand, the sort by prior return, holding announcement return fixed, produces average spreads of 4.6 and 8.6 percent over six and twelve months, respectively. The corresponding average spreads in Panel B using sorts by SUE are 4.3 percent (3.8 percent) for six months (one year), and using sorts by prior return are 3.1 percent (7.0 percent). Similarly, sorts in Panel C using REV6 give spreads of 3.8 percent (3.5 percent) for six months (one year), while sorts by prior return give spreads of 4.5 percent (9.2 percent). Apparently, the component of prior

[9] In each of the three categories of prior return, we take the difference in returns between portfolios 3 and 1 when stocks are ranked by prior announcement return. The reported number is the simple mean of the three differences.

Table VI

Postformation Returns and Earnings Surprises for Portfolios Ranked by 2-Way Classifications

In Panels A to C, at the beginning of every month from January 1977 to January 1993, all stocks are ranked by their compound return over the prior six months and assigned to one of three equal-sized portfolios. All stocks are also independently ranked by a measure of earnings surprise and assigned to one of three equally-sized portfolios. The assignments use breakpoints based on New York Stock Exchange (NYSE) issues only. The intersections of the sort by prior return and the sort by earnings surprise give three sets of nine portfolios each. All stocks are equally-weighted in a portfolio. The sample includes all NYSE, American Stock Exchange (AMEX), and Nasdaq domestic primary issues with coverage on Center for Research in Security Prices (CRSP) and COMPUSTAT. In Panel A, earnings surprise is measured as the abnormal return relative to the equally-weighted market index, cumulated from two days before to one day after the date of the most recent past earnings announcement. In Panel B, earnings surprise is measured as the most recent past unexpected earnings (the change in quarterly earnings per share from its value four quarters ago) divided by the standard deviation of unexpected earnings over the last eight quarters. In Panel C, earnings surprise is a moving average of the past six months' revisions in mean I/B/E/S estimates of current fiscal-year earnings per share, relative to the beginning-of-month stock price. In Panels D and E, the independent rankings are by revisions in analyst forecasts and by either past standardized unexpected earnings or by abnormal return around past earnings announcement. For each portfolio, the table shows the average buy-and-hold returns for the first six months and the first through third years following portfolio formation. Means are also given for the cumulative abnormal return around the first four announcements of quarterly earnings after portfolio formation, the first four quarterly standardized unexpected earnings after portfolio formation, and percentage revisions relative to the beginning-of-month stock price in monthly mean I/B/E/S estimates of current fiscal-year earnings per share.

Panel A: Abnormal Return Around Earnings Announcement and Prior 6-Month Return

Abnormal Announcement Return	1 (Low)	2	3	1	2	3	1	2	3 (High)
Prior 6-Month Return	1 (Low)	1	1	2	2	2	3	3	3 (High)
First six months	0.056	0.077	0.079	0.086	0.098	0.111	0.100	0.115	0.135
First year	0.138	0.165	0.159	0.190	0.205	0.225	0.213	0.237	0.270
Second year	0.185	0.194	0.199	0.192	0.199	0.213	0.183	0.199	0.199
Third year	0.179	0.187	0.196	0.194	0.196	0.207	0.188	0.205	0.204
Average return around next 4 earnings announcements	−0.008	0.000	0.009	−0.004	0.001	0.008	−0.003	0.003	0.012
Average of next 4 standardized unexpected earnings	−0.494	−0.251	−0.191	0.040	0.265	0.302	0.359	0.598	0.651
Average of next 12 revisions in analyst forecasts	−1.319	−0.599	−0.967	−0.306	−0.168	−0.203	−0.180	−0.078	−0.067

Panel B: Standardized Unexpected Earnings and Prior 6-Month Return

Standardized Unexpected Earnings	1 (Low)	2	3	1	2	3	1	2	3 (High)
Prior 6-Month Return	1 (Low)	1	1	2	2	2	3	3	3 (High)
First six months	0.055	0.094	0.085	0.076	0.106	0.113	0.074	0.118	0.136
First year	0.142	0.190	0.157	0.183	0.224	0.216	0.190	0.253	0.257
Second year	0.178	0.212	0.199	0.188	0.219	0.200	0.181	0.213	0.199
Third year	0.188	0.202	0.184	0.190	0.214	0.196	0.207	0.216	0.200
Average return around next 4 earnings announcements	−0.003	0.001	0.000	−0.001	0.002	0.003	0.002	0.006	0.006

Table VI—*Continued*

Panel B: *Continued*									
Standardized Unexpected Earnings	1 (Low)	2	3	1	2	3	1	2	3 (High)
Prior 6-Month Return	1 (Low)	1	1	2	2	2	3	3	3 (High)
Average of next 4 standardized unexpected earnings	−0.731	−0.103	0.257	−0.293	0.182	0.763	−0.090	0.385	1.048
Average of next 12 revisions in analyst forecasts	−1.549	−0.645	−0.457	−0.380	−0.184	−0.092	−0.294	−0.096	−0.013
Panel C: Revision in Analyst Forecasts and Prior 6-Month Return									
Revision in Analyst Forecasts	1 (Low)	2	3	1	2	3	1	2	3 (High)
Prior 6-Month Return	1 (Low)	1	1	2	2	2	3	3	3 (High)
First six months	0.042	0.063	0.085	0.077	0.088	0.112	0.093	0.103	0.130
First year	0.113	0.134	0.152	0.180	0.186	0.214	0.214	0.215	0.246
Second year	0.169	0.178	0.184	0.181	0.189	0.202	0.164	0.179	0.192
Third year	0.164	0.174	0.182	0.187	0.188	0.198	0.202	0.184	0.198
Average return around next 4 earnings announcements	−0.003	−0.002	−0.003	0.001	0.000	0.002	0.005	0.003	0.004
Average of next 4 standardized unexpected earnings	−0.589	−0.189	−0.057	−0.090	0.316	0.448	0.236	0.607	0.843
Average of next 12 revisions in analyst forecasts	−1.526	−0.376	−0.753	−0.440	−0.135	−0.130	−0.297	−0.07	−0.031
Panel D: Revision in Analyst Forecasts and Standardized Unexpected Earnings									
Revision in Analyst Forecasts	1 (Low)	2	3	1	2	3	1	2	3 (High)
Standardized Unexpected Earnings	1 (Low)	1	1	2	2	2	3	3	3 (High)
First six months	0.051	0.065	0.093	0.084	0.093	0.111	0.093	0.096	0.121
First year	0.137	0.153	0.190	0.184	0.196	0.224	0.185	0.187	0.220
Second year	0.161	0.185	0.194	0.193	0.205	0.208	0.190	0.178	0.192
Third year	0.173	0.185	0.185	0.187	0.207	0.216	0.195	0.178	0.189
Average return around next 4 earnings announcements	−0.003	−0.001	−0.001	0.002	0.001	0.002	0.002	0.001	0.004
Average of next 4 standardized unexpected earnings	−0.618	−0.348	−0.281	0.023	0.189	0.256	0.345	0.812	0.995
Average of next 12 revisions in analyst forecasts	−1.281	−0.302	−0.672	−0.622	−0.157	−0.180	−0.519	−0.085	−0.064
Panel E: Revision in Analyst Forecasts and Abnormal Return Around Earnings Announcement									
First six months	0.048	0.067	0.097	0.070	0.086	0.113	0.071	0.096	0.126
First year	0.128	0.153	0.189	0.163	0.183	0.214	0.166	0.192	0.237
Second year	0.165	0.176	0.184	0.178	0.186	0.195	0.175	0.188	0.200
Third year	0.170	0.180	0.176	0.175	0.188	0.200	0.191	0.185	0.200
Average return around next 4 earnings announcements	−0.007	−0.005	−0.006	0.000	0.000	0.001	0.008	0.007	0.008

Table VI—*Continued*

Panel E: *Continued*									
Revision in Analyst Forecasts	1 (Low)	2	3	1	2	3	1	2	3 (High)
Abnormal Announcement Return	1 (Low)	1	1	2	2	2	3	3	3 (High)
Average of next 4 standardized unexpected earnings	−0.503	0.010	0.316	−0.228	0.310	0.544	−0.099	0.418	0.691
Average of next 12 revisions in analyst forecasts	−1.366	−0.271	−0.359	−0.612	−0.136	−0.099	−0.796	−0.144	−0.140

return not associated with earnings news is associated with more persistent drifts in future returns.

One possible explanation for the larger return spreads associated with price momentum, compared with earnings momentum, is as follows. Our earnings momentum strategies are based on the performance of near-term income: the innovations in quarterly earnings, or analysts' forecasts of earnings for the current fiscal year. In comparison, when we select a stock on the basis of high or low prior returns, we isolate cases where the market has made very large revisions in its expectations of the firm's future outlook. Table II confirms that the highest-ranked portfolio in our price momentum strategy rose in price by roughly 70 percent on average, while the lowest-ranked portfolio fell in price by about 30 percent on average, over the previous six months. It is unlikely that changes of this magnitude arise solely from quarter-to-quarter news in earnings. The corresponding past six-month returns of the portfolio ranked highest (lowest) by analyst revisions, for example, is about 25 percent (−7 percent). Since there has been a larger reappraisal of market beliefs for the price momentum portfolios, and given that the market's adjustment is not immediate, it is perhaps not surprising that the spread in future returns continues to be larger for the price momentum strategy.

In a similar vein, the difference in the persistence of the two strategies has some intuitive basis. The uncertainty underlying the short-horizon measures of profitability used in the earnings momentum strategies is resolved relatively quickly. Prior returns, on the other hand, reflect a broad set of market expectations not limited to near-term profitability. On this basis, we conjecture that it may take longer for the new information to be played out in stock prices for the price momentum strategy.

Panels D and E pit our measures of earnings surprise against each other. In general, each measure of surprise has incremental predictive power for returns and they give rise to similar spreads in average returns. Holding SUE fixed, for example, portfolios sorted by analyst revisions generate average spreads in six-month returns of 3.23 percent; classifying by SUE while holding fixed analyst revisions yields average spreads of 3.37 percent in six-month returns. Similarly, in Panel E, the sorts by REV6 and ABR yield average spreads of 4.90 and 2.70 percent, respectively, in six-month returns. No single measure of the

news in earnings wins the contest; instead, they each add separate pieces of information, as noted in our introduction.

B. Cross-Sectional Regressions

We use Fama-MacBeth (1973) cross-sectional regressions as another way to disentangle price and earnings momentum. Every month, we fit a cross-sectional regression of individual stock returns on the prior six-month return and various measures of the most recent past earnings surprise (SUE, ABR, and REV6). We also include firm size as a catch-all variable for other influences on the cross-section of returns. To account for possible nonlinearities in the relation, in the monthly regressions we first express each explanatory variable in terms of its ordinal ranking and then scale it to lie between zero and one. This has the added benefit of expressing all the explanatory variables on a common scale, so that their coefficients can be directly compared. The dependent variable is either the buy-and-hold return over the subsequent six months or over the first postformation year. Table VII reports the time-series averages of the slope coefficients, and their t-statistics. Since the dependent variable in each monthly regression is a return measured over overlapping intervals, the t-statistics are corrected for autocorrelation. The standard error of the time series of coefficients from the regression for six-month (twelve-month) returns is adjusted for a fifth-order (eleventh-order) moving average process.

Prior return and earnings surprise, taken separately, are each strongly and positively related to future six-month returns (Panel A). The average slope from the regressions of returns on prior return alone is 5.7 percent, which is 4.1 times its standard error. In comparison, using either SUE or REV6 as the predictor variable gives very similar average slopes (6 percent), while the average slope for ABR is smaller (3.7 percent). In all cases, the coefficients are large relative to their standard errors.

The regression with all three measures of earnings surprise yields average slopes that are reliably different from zero, confirming our earlier impression that each adds information not contained in the other two. All four momentum variables are considered simultaneously in the last regression. Earnings surprises rob past return of some, but not all, of its predictive power. The coefficient for prior return falls from 5.7 percent when it is the only momentum variable to 2.9 percent in the full regression model. In this latter equation, past standardized unexpected earnings and revisions in analyst forecasts, with average coefficients of 3.2 and 3.1 percent, respectively, are just as important as prior return in predicting returns over the following six months.

The results from regressions for twelve-month returns are reported in Panel B of Table VII. When past return is the only momentum variable, its average slope is 10.3 percent. Introducing earnings surprises into the equation knocks the estimated effect down to 7.6 percent. Nonetheless, the average slope on past return is large not only relative to its standard error, but also compared to the slopes on the other earnings surprise variables in the last regression.

Table VII

Monthly Cross-Sectional Regressions of Returns on Prior Return and Prior Earnings Surprises

Cross-sectional regressions are estimated each month from January 1977 to January 1993 of individual stock returns on size, compound return over the prior six months (R6), the abnormal return relative to the equally-weighted market index cumulated from two days before to one day after the most recent past announcement date of quarterly earnings (ABR), unexpected earnings (the change in the most recent past quarterly earnings per share from its value four quarters ago) scaled by the standard deviation of unexpected earnings over the past eight quarters (SUE), and a moving average of the past six months' revisions in I/B/E/S mean analyst earnings forecasts relative to beginning-of-month stock price (REV6). In the regression each explanatory variable is expressed in terms of its percentile rank and scaled to fall between zero and one. The dependent variable is the stock's buy-and-hold return either over the subsequent six months (Panel A), or over the next year (Panel B). The reported statistics are the means of the time series of coefficients from the month-by-month regressions, and in parentheses the *t*-statistics relative to the autocorrelation-adjusted standard error of the mean. The sample includes all domestic primary firms on New York Stock Exchange (NYSE), American Stock Exchange (AMEX), and Nasdaq with coverage on the Center for Research in Security Prices (CRSP) and COMPUSTAT.

Intercept	Size	R6	ABR	SUE	REV6
		Panel A: Dependent Variable: Six-Month Return			
0.085	−0.037	0.057			
(2.50)	(−1.42)	(4.07)			
0.093	−0.033		0.037		
(2.82)	(−1.22)		(9.25)		
0.085	−0.041			0.060	
(2.50)	(−1.52)			(6.00)	
0.086	−0.042				0.060
(2.46)	(−1.62)				(5.45)
0.067	−0.044		0.022	0.037	0.040
(1.97)	(−1.69)		(4.40)	(4.63)	(4.00)
0.062	−0.044	0.029	0.017	0.032	0.031
(1.82)	(−1.69)	(2.07)	(4.25)	(4.00)	(3.10)
		Panel B: Dependent Variable: One-Year Return			
0.190	−0.084	0.103			
(2.88)	(−1.33)	(3.96)			
0.209	−0.075		0.055		
(3.22)	(−1.14)		(7.86)		
0.206	−0.084			0.071	
(3.12)	(−1.27)			(4.18)	
0.205	−0.085				0.076
(3.01)	(−1.33)				(3.80)
0.179	−0.087		0.038	0.037	0.054
(2.63)	(−1.36)		(5.43)	(2.64)	(3.00)
0.166	−0.089	0.076	0.026	0.026	0.031
(2.44)	(−1.41)	(3.17)	(3.71)	(2.00)	(1.94)

The continuation in stock price movements over the intermediate term includes a component unrelated to the news in near-term earnings. Finally, a comparison of the results in the two panels reinforces the impression from the

earlier sections that price momentum tends to have longer-lasting effects than earnings momentum.

IV. Are Price and Earnings Momentum Subsequently Corrected?

One way to distinguish between some of the competing explanations for continuations in price movements is to examine whether there is a subsequent correction in the stock price.

In the one-way classifications by prior return (Table II), it is hard to find direct evidence of return reversals in the years following portfolio formation. The raw returns in the second and third following years are not very different across portfolios. There is, however, some tendency for the extreme decile portfolios to concentrate on smaller stocks. The stocks in portfolios 1 and 10 have an average size decile ranking of 2.9, while the average size decile ranking of the stocks in the other portfolios lie between 3.7 and 4.4. The size rankings are based on the breakpoints from the distribution of market capitalization for NYSE stocks. The smaller average capitalization of stocks in the winner portfolio pulls their average return in one direction, but at the same time their lower book-to-market ratio pulls the return in the other direction. All in all, the picture with respect to reversals in the return on the winner portfolio is muddy. On the other hand, the raw returns on the loser portfolio in the following years tend to stay low (the more so taking into account the smaller average capitalization and higher book-to-market ratio of portfolio 1). The lack of direct evidence on reversals tends to call into question the hypothesis that the continuation in prices is induced by positive feedback trading.

Similarly, the one-way sorts by prior earnings surprise (Tables III to V) also fail to turn up signs of subsequent return reversals. Future returns to stocks with bad news about earnings tend to stay relatively low. For both price and earnings momentum, therefore, there do not seem to be any price corrections in subsequent years.

The two-way classifications in Table VI give a sharper verdict on whether the movement in prices is permanent or transitory. Although the portfolios that are ranked highest by both prior return and earnings surprise always have the largest return in the first following year, their returns are not much different from average in the second and third following years. For example, portfolio (3,3) in Panel B of the table has a return of 19.9 percent in the second year, compared to the overall mean return that year of 19.6 percent for all stocks in the sample; its return in the third year is 20 percent compared to 19.5 percent for the entire sample.

At the other end of the scale, the persistence in poor performance is striking. In particular, the doubly-afflicted portfolio (1, 1), with poor past price performance and bad earnings news, continues to suffer a drawn-out decline. Even two and three years after portfolio formation, the portfolio's returns in Panels A to C continue to fall below the average. In Panel C, for instance, the returns for portfolio (1, 1) are 16.9 percent and 16.4 percent in the second and third years respectively, which are the lowest returns in each year across the nine

portfolios in the panel. The shortfall in returns would be even more dramatic if the small size and high book-to-market ratio of the loser portfolio were to be taken into account. It might be argued that a more rapid adjustment in the prices of these poorly performing stocks runs up against several obstacles: it is more difficult to enter into short positions than long positions, and security analysts, as we have noted above, tend to acknowledge only gradually the negative prospects for these firms.

In the case of stocks that are ranked highest by prior return, an interesting dichotomy emerges when we condition on whether the past returns are confirmed by earnings news. For example, for those cases in Panel A where the stock is ranked highest by prior return and, in addition, the high past returns are validated by high announcement returns (portfolio (3, 3)), the average first-year return is 27 percent. When the earnings news does not confirm the past returns (portfolio (1, 3)), however, the average first-year return is 21.3 percent, which is only slightly higher than the overall mean first-year return of 20 percent across all stocks in the sample. By the second year, the return on portfolio (1, 3) is 18.3 percent, which is below the overall average of 19.6 percent, while the return on the twice-favored portfolio (3, 3) is about 20 percent. In the same fashion, the results in Panels B and C confirm a reversal in returns in the second year for those cases where high past returns are not supported by similarly favorable news about earnings. Much of the performance of stocks with high price momentum thus occurs when high prior returns are accompanied by favorable news about earnings.

V. Other Tests

A. Price and Earnings Momentum for Large Stocks

In this section, we apply our momentum strategies to a sample composed of larger stocks only. Limiting attention to the larger stocks helps to alleviate potential problems of survivor bias in the sample, and problems with low-priced stocks.[10] Stocks with higher market capitalization are also of more interest to institutional investors.

In Tables VIII and IX, the sample comprises stocks whose market capitalization as of the portfolio formation date exceeds the median market value of NYSE stocks. In order to minimize repetition, we report results only for returns in the first year following portfolio formation. Even for this set of large firms, which are more widely followed and for which timely information should be more readily available, there is still evidence that the market adjusts only gradually to the information in past returns or past earnings news. Notably, the one-way sorts in Panel A of Table VIII continue to deliver sizable differences in returns. This is particularly true when stocks are ranked by prior return; the spread in future one-year returns is 14 percent, which is almost as large as the spread for the entire sample in Table II (15.4 percent). A large

[10] In the last portfolio formation period, there are only two stocks in our large-stock sample (out of about a thousand eligible stocks) that have prices below five dollars.

difference in returns is also obtained when sorting on past analyst revisions. The one-year spread in this case is 7.6 percent (compared to 9.7 percent for the entire sample in Table V). When past SUE or past announcement return is the ranking variable, the one-year spreads are 2.9 and 4.3 percent, respectively (the corresponding spreads based on the entire sample are 7.5 and 8.3 percent).

Panel B of Table VIII replicates our two-way sorts on the larger stocks. Compared to the entire sample, the large-stock sample displays smaller differences in returns between the highest-ranked and lowest-ranked portfolios. Nonetheless, the spreads remain large: 8.4 percent for the two-way classification based on prior return and announcement return, 7.7 percent based on prior return and SUE, and 8.5 percent based on prior return and revisions in consensus estimates. Although sorting by prior return conditional on past earnings news gives rise to larger differences in subsequent returns, earnings surprises still have some marginal explanatory power. For example, the average one-year spread across prior return ranks, holding fixed the rank by standardized unexpected earnings, is 5.7 percent. The average spread associated with standardized unexpected earnings, conditional on prior return, is 2.1 percent. Earnings news have a lesser impact on the returns of large companies because there are numerous additional sources of information about the outlook for these companies.

Table IX fits cross-sectional regressions to future twelve-month returns for the large-stock sample. The regressions support the results from the earlier panels in the table. In the univariate regressions, for example, each momentum variable is statistically significant. When they are considered together in the last regression, the most important variable is the prior six-month return; its average coefficient is 6.4 percent which is more than two standard errors away from zero.

B. Adjusting for Size and Book-to-Market Factors

Our earlier results in Tables II to V raise the possibility that the predictive power of prior returns or prior earnings surprises may be confounded with the effects of book-to-market or firm size. In this section we investigate whether the behavior of returns on our different momentum portfolios can be explained by factors related to size and book-to-market. This is done in the context of the Fama-French (1993) three-factor model, given by time series regressions of the form

$$r_{pt} - r_{ft} = \alpha_p + b_p(r_{mt} - r_{ft}) + s_p\text{SMB}_t + h_p\text{HML}_t + \varepsilon_{pt}. \qquad (4)$$

Here r_{pt} is the return on portfolio p in month t; r_{ft} and r_{mt} are the Treasury bill rate and the return on the value-weighted market index, respectively; SMB_t is the return on the mimicking portfolio for size; and HML_t is the return on the mimicking portfolio for book-to-market.[11] If the momentum strategies'

[11] We thank Eugene Fama for providing the data on the mimicking portfolio returns.

Table VIII

Mean Returns for Portfolios Based on Large Firms

The sample includes all New York Stock Exchange (NYSE), American Stock Exchange (AMEX), and Nasdaq domestic primary issues with coverage on the Center for Research in Security Prices (CRSP) and COMPUSTAT, and with beginning-of-month market value of equity above the median market capitalization of NYSE issues. Eligible stocks are ranked and grouped into portfolios on the basis of one classification variable (Panel A) or two classification variables (Panel B). Portfolios are formed at the beginning of every month from January 1977 to January 1993. The assignment of stocks to portfolios uses breakpoints based on NYSE issues only. All stocks are equally-weighted in a portfolio, and average buy-and-hold returns are reported for the first year after portfolio formation. In Panel A the classification variable is either the stock's compound return over the prior six months (R6), standardized unexpected earnings (SUE, the change in most recently announced quarterly earnings per share from its value four quarters ago, divided by the standard deviation of unexpected earnings over the last eight quarters), abnormal returns relative to the equally-weighted market index cumulated from two days before to one day after the date of the most recent past earnings announcement (ABR), or a moving average of the prior six months' percentage revisions relative to the beginning-of-month stock price in mean I/B/E/S estimates of current fiscal-year earnings per share (REV6). In Panel B, portfolios are formed from the intersections of independent sorts by prior return and by one measure of earnings surprise (standardized unexpected earnings, cumulative abnormal return around earnings announcement or moving average of analysts' revisions).

Panel A: Mean Return in First Postformation Year from One-Way Classifications

Ranked by:	1 (Low)	2	3	4	5	6	7	8	9	10 (High)
Prior 6-month return	0.086	0.145	0.156	0.170	0.176	0.176	0.182	0.188	0.202	0.226
Standardized unexpected earnings	0.147	0.147	0.168	0.171	0.183	0.187	0.183	0.190	0.192	0.176
Abnormal announcement return	0.140	0.163	0.171	0.173	0.177	0.183	0.175	0.187	0.180	0.183
Revision in analyst forecasts	0.134	0.154	0.163	0.162	0.163	0.174	0.177	0.181	0.191	0.210

Panel B: Mean Return in First Postformation Year from Two-Way Classifications

Earnings surprise rank	1 (Low)	2	3	1	2	3	1	2	3 (High)
Prior 6-month return rank	1 (Low)	1	1	2	2	2	3	3	3 (High)
Standardized unexpected earnings and prior return	0.133	0.154	0.136	0.162	0.180	0.186	0.175	0.209	0.210
Abnormal announcement return and prior return	0.135	0.143	0.125	0.168	0.181	0.179	0.190	0.197	0.219
Revision in analyst forecasts and prior return	0.128	0.139	0.131	0.164	0.175	0.190	0.200	0.191	0.213

performance is just a manifestation of size and book-to-market effects, then the intercept of the equation, α_p, should not be significantly different from zero.

Fama and French (1996) use equation (4) to analyze the performance of portfolios sorted by prior return. Here we examine the evidence when earnings momentum is brought into the picture as well.[12] In particular, we focus on the double-sort portfolios based on prior return and revisions in consensus esti-

[12] Fama and French (1994) report that the portfolio of losers, compared to the portfolio of winners, loads more heavily on the size and book-to-market factors. The difference in intercepts between the top and bottom deciles is 1.74 percent per month. We find quite similar results.

Table IX

Monthly Cross-Sectional Regressions of Returns on Prior Return and Prior Earnings Surprises, Using Large Firms Only

The sample includes all New York Stock Exchange (NYSE), American Stock Exchange (AMEX), and Nasdaq domestic primary issues with coverage on the Center for Research in Security Prices (CRSP) and COMPUSTAT, and with beginning-of-month market value of equity above the median market capitalization of NYSE issues. Cross-sectional regressions are estimated each month from January 1977 to January 1993. The dependent variable is each stock's one-year buy-and-hold return. The explanatory variables are firm size and the following. R6 is the stock's compound return over the prior six months, SUE is the change in most recently announced quarterly earnings per share from its value four quarters ago, divided by the standard deviation of unexpected earnings over the last eight quarters, ABR is the abnormal return relative to the equally-weighted market index cumulated from two days before to one day after the date of the most recent past earnings announcement, and REV6 is a moving average of the prior six months' percentage revisions relative to the beginning-of-month stock price in mean I/B/E/S estimates of current fiscal-year earnings per share. The reported statistics are the means of the time series of coefficients from the month-by-month regressions, and in parentheses the *t*-statistics relative to the autocorrelation-adjusted standard error of the mean.

Intercept	Size	R6	ABR	SUE	REV6
0.207	−0.093	0.084			
(3.23)	(−1.50)	(2.90)			
0.232	−0.093		0.036		
(3.52)	(−1.45)		(3.60)		
0.230	−0.097			0.044	
(3.33)	(−1.49)			(2.20)	
0.222	−0.096				0.058
(3.08)	(−1.50)				(2.07)
0.207	−0.097		0.026	0.020	0.043
(2.88)	(−1.54)		(2.89)	(1.33)	(1.65)
0.191	−0.094	0.064	0.015	0.015	0.023
(2.77)	(−1.54)	(2.21)	(1.67)	(1.07)	(0.92)

mates. Table X reports summary statistics of the time series regressions for the highest- and lowest-ranked portfolios (portfolios (3,3) and (1,1) respectively in Panel C of Table VI). We track the monthly returns from a strategy of buying each portfolio and holding it for six months, when a new portfolio is formed and the process repeated. Table X also reports results for the arbitrage portfolio formed by buying the highest-ranked portfolio, or the winners, and selling the lowest-ranked portfolio, or the losers.

The portfolios of winners and losers have very similar market risk exposures (b_p). In other respects, the results in Table X generally confirm our earlier findings. Both portfolios load significantly on size. The portfolio of winners concentrates more heavily on glamour stocks, so it loads negatively on the book-to-market factor, while the portfolio of losers is more oriented towards value stocks, and so loads positively on the book-to-market factor. The main conclusion from Table X is that adjusting for size and book-to-market does not change the observed pattern in returns. The intercept for the loser portfolio (−0.953 percent per month) is especially eye-catching. This poor performance

Table X

Three-Factor Time Series Regressions Based on Monthly Excess Returns (in Percent) on Portfolios from Two-Way Classification by Prior Return and Analyst Revisions

The regression is estimated over monthly observations from January 1977 to December 1993. The dependent variable is the monthly return in excess of the Treasury bill rate from a strategy of buying a portfolio of stocks ranked highest or lowest (winners and losers respectively) from an independent sort on two classification variables. The classification variables are: the stock's compound return over the past six months, and a moving average of the past six months' percentage revisions relative to the beginning-of-month stock price in the mean I/B/E/S estimate of current fiscal-year earnings per share. The portfolio is held for six months, at which time the portfolio is reformed and the strategy repeated. The explanatory variables are the monthly returns from the Fama and French (1993) mimicking portfolios for size and book-to-market factors, and the monthly return in excess of the Treasury bill rate on the value-weighted market portfolio of all the component stocks from the mimicking portfolios. Results are also presented for the difference between the two portfolios, i.e., the zero-cost portfolio of buying past winners and selling past losers. The regression R^2 is adjusted for degrees of freedom, and t-statistics are shown in parentheses below the coefficient estimates.

Portfolio	Intercept	Market	Size	Book-to-Market	R^2
Winners	0.478	1.041	0.782	−0.180	0.95
	(4.11)	(36.50)	(16.78)	(−3.47)	
Losers	−0.953	1.062	0.783	0.254	0.90
	(−6.08)	(27.55)	(12.43)	(3.61)	
Difference	1.431	−0.021	−0.001	−0.434	0.12
	(5.91)	(−0.35)	(−0.01)	(−4.00)	

stems from the fact that the loser portfolio has persistently low returns, even though it is tilted toward small stocks with high book-to-market ratios (which would tend to raise average returns). The intercept for the arbitrage portfolio is 1.43 percent, with a t-statistic of 5.91.

Past winners, if they are riskier than past losers, should have worse (better) performance in bad (good) states of the world, irrespective of the identity of the underlying risk factors. To the extent that bad and good states correspond to low and high excess returns, respectively, on a broad stock market index, we can check if this is the case. In particular, during months where the return on the CRSP value-weighted market index falls below the monthly Treasury bill rate, riskier stocks should earn lower returns. As it turns out, during such down-market months the difference between the returns of the winner and loser portfolios from our two-way sort on prior return and analyst revisions is positive (0.60 percent per month). Conversely, in up-market months (where the return on the value weighted index exceeds the Treasury bill rate) the average difference between the returns of the winner and loser portfolios is 1.79 percent. Strategies exploiting high momentum in stock prices thus seem to do especially well in up-markets. In any event, there is no evidence that the winner portfolio is exposed to larger downside risk.

VI. Conclusions

Unless we understand why a particular investment strategy works, we should be skeptical about its out-of-sample performance. There are several competing hypotheses concerning the profitability of contrarian strategies for short- or long-horizon returns. However, there is a glaring lack of explanations for the continuation in stock prices over intermediate horizons (short of sweeping the issue under the rug by relabeling the phenomenon as part of the "normal" cross-section of expected returns). This paper fills in some of the gaps in our understanding of two major unresolved puzzles in the empirical finance literature: why two pieces of publicly available information—a stock's prior six-month return and the most recent earnings surprise—help to predict future returns. The drift in future returns is economically meaningful and lasts for at least six months. For example, sorting stocks by prior six-month return yields spreads in returns of 8.8 percent over the subsequent six months. Similarly, ranking stocks by a moving average of past revisions in consensus estimates of earnings produces spreads of 7.7 percent over the next six months. Our results are robust with respect to how we measure earnings surprise: as standardized unexpected earnings, abnormal returns around announcements of earnings, or revisions in analysts' forecasts of earnings. In general, the price momentum effect tends to be stronger and longer-lived than the earnings momentum effect.

The bulk of the evidence suggests that the drifts in future returns are not subsequently reversed, so momentum does not appear to be entirely driven by positive feedback trading. The price continuations are particularly notable for stocks with the worst past earnings performance, whose returns are below average for up to three years afterwards. There is stronger evidence of subsequent correction in prices when large, positive prior returns are not validated by good news about earnings. In the first year following portfolio formation, stocks ranked highest by prior return but lowest by abnormal announcement return earn a rate of return (21.3 percent) that is not very different from the average of 20 percent. The fact that returns for the past winners are high only in the first subsequent year, but are not much different from the average in the second or third years, poses a challenge for risk-based explanations of the profitability of momentum strategies. More direct evidence from a three-factor model also suggests that the profitability cannot be explained by size and book-to-market effects.

An alternative explanation is that the market responds gradually to new information. Since earnings provide an ongoing source of information about a firm's prospects, we focus on the market's reaction when earnings are released. Indeed, a substantial portion of the momentum effect is concentrated around subsequent earnings announcements. For example, about 41 percent of the superior performance in the first six months of the price momentum strategy occurs around the announcement dates of earnings. More generally, if the market is surprised by good or bad earnings news, then on average the market continues to be surprised in the same direction at least over the next two

subsequent announcements. Clearly, however, the return on a stock also incorporates numerous other sources of news that are not directly related to near-term earnings: stock buybacks, insider trading, and new equity issues, for example. The large drifts in future returns thus paint a picture of a market which underreacts.

Another piece of evidence compatible with the sluggish response of market participants is the prolonged adjustment of analyst forecasts. The inertia in revising forecasts may not be helping the market to assimilate new information in a timely fashion. In particular, analysts are especially slow in revising their estimates in the case of companies with the worst performance. This may possibly be due to their reluctance to alienate management.

When we disentangle the sources of the momentum strategies' performance, we find that each of the variables we analyze—prior return, as well as each of the earnings surprise variables considered— has marginal predictive power for the postformation drifts in returns. In cross-sectional regressions of future six-month returns on past returns, the coefficient on prior return is 5.7 percent. Introducing past earnings surprises lowers the coefficient to 2.9 percent, although it is still reliably nonzero. Each momentum strategy thus draws upon the market's underreaction to different pieces of information.

Our evidence that the market's response to news takes time is not an entirely negative verdict on the informational efficiency of the stock market. Note that prior news has already caused a substantial realignment in stock prices over the preceding six months. In Table II, for instance, the past adjustment produces differences in returns of roughly 100 percent between the most favorably and least favorably affected stocks. Put in this perspective, the remaining adjustment that is left on the table for investors, as measured by the spread in future one-year returns of about 15 percent, becomes less striking.

A note of caution is necessary. The spreads we document here for momentum strategies may not be fully capturable. Given the constraints many investors face, it may not be feasible to establish short positions in stocks with low momentum. A momentum strategy is trading-intensive, and stocks with high momentum tend to be smaller issues whose trading costs tend to be relatively high. These implementation issues will reduce the benefits from pursuing momentum strategies. To illustrate the point, suppose an investor wishes to exploit price momentum by buying the top two deciles of stocks ranked by prior return in Table II (so as to have a relatively well-diversified portfolio). This would yield an average annual return of about 27 percent. If the relevant benchmark is the average return across all the eligible stocks in Table II, roughly 22 percent, this investor earns an extra 5 percent. Chan and Lakonishok (1995) report average trading costs for small firms of about 3 percent (combining a purchase and sale), so the extra returns for a momentum strategy are substantially reduced after accounting for trading costs.

Finally, our evidence of underreaction over intermediate horizons suggests that a stock with low past returns will on average experience low subsequent returns. It might be argued that a contrarian overreaction story would instead predict high subsequent returns for such a stock. Is there any contradiction

between the two stories? A full reconciliation of these two bodies of evidence is beyond the scope of this article, but we suggest that they may not be incompatible. The common element is the market's tendency to anchor too heavily on past trends. Investors discount new information that is at odds with their mindsets and change their perceptions gradually.

Stocks selected under a momentum strategy, however, carry along a very different set of investor perceptions from stocks selected under a contrarian strategy. Our price momentum strategy identifies low-momentum stocks, for example, on the basis of poor returns over the immediate past (the prior six months). On looking at their experience over a more extended past period, however, these stocks are on average not much different from other stocks, so investors extrapolate from the past and perceive them as "normal" stocks. For example, the compound rate of return beginning three years and ending six months before portfolio formation is about 61 percent for the portfolio with the lowest past six-month price momentum, compared to the average of 62 percent over all stocks. Given this mindset, when disappointing news arrives, investors initially discount the information. This gives rise to a subsequent downward drift in prices.

In contrast, a contrarian strategy focuses on stocks that have extremely poor returns over a prolonged past period. The history of disappointments creates an investor mindset of excessive pessimism. This may be reinforced by money managers' unwillingness to be regarded as holding an "imprudent" investment that might fall into distress. These companies, however, are not as poor investment prospects as the market perceives them to be. Rather, it takes time for these stocks to shake off the unfavorable opinions that investors have accumulated. LaPorta, Lakonishok, Shleifer, and Vishny (1995) study such stocks and find that the market's learning about future earnings prospects is a long and very drawn-out process, lasting for a few years. This sets the stage for subsequent reversals in prices that may persist for several years. As in the case of low-momentum stocks, the reversals are a result of investors' tendency to over-weight the past and extrapolate too far into the future. This line of thinking is, admittedly, only suggestive. Spelling out the links between momentum strategies and contrarian strategies remains an important open area of research.

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