Myopic Extrapolation, Price Momentum, and Price Reversal

Long Chen*
Washington University in St. Louis

Claudia Moise†
Case Western Reserve University

Xinlei Zhao‡
Kent State University

First version: March 2008
This version: June 2009§

Abstract

The momentum profits are realized through price adjustments reflecting shocks to firm fundamentals after portfolio formation. In particular, there is a consistent cross-sectional trend, from short-term momentum to long-term reversal, that happens to earnings shocks, to revisions to expected future cash flows at all horizons, and to prices. The evidence suggests that investors myopically extrapolate current earnings shocks as if they were long lasting, which are then incorporated into prices and cash flow forecasts. Accordingly, the realized momentum profits can be completely explained by the cross-sectional variation of contemporaneous earnings shocks or revisions to future cash flows. Importantly, these cash flow variables dominate the lagged returns in explaining the realized momentum profits. As a result, the realized momentum profits represent cash flow news that has little to do with the ex ante expected returns. In fact, the ex ante expected momentum profits are significantly negative.

JEL Classification : *G12, G14*

Keywords *: Momentum, reversal, analyst forecast, earnings, expected return, realized return.*

*Olin School of Business, Washington University in St. Louis, 212 Simon Hall, 1 Olympian Way, St. Louis, MO 63130-4899, tel: (314) 935-8374, email: lchen29@wustl.edu

†Weatherhead School of Management, Case Western Reserve University, Cleveland, OH 44106, tel: (216)-368-4778, fax: (216)-368-6249, e-mail: claudia.moise@case.edu

‡Department of Finance, Kent State University, Kent, OH 44242, tel: (330)-672-1213, fax: (330)-672-9806, e-mail: xzhao@kent.edu

§We are grateful to Phil Dybvig, Mark Grinblatt, Harrison Hong, CNV Krishnan, Ajai Singh and seminar participants at Case Western University and Washington University in St. Louis for useful comments. Usual disclaimer applies.

1 Introduction

Stocks that experienced superior returns in the past year continue to earn significantly higher returns than stocks that experienced poor returns over the same period. The resulting momentum profits, first identified by Jegadeesh and Titman (1993), continue to exist after the initial publication of this investment strategy (Jegadeesh and Titman (2001) and Schwert (2003)), and are pervasive in the international markets (Rouwenhorst (1998), Griffin, Ji, and Martin (2003), and Asness, Moskowitz, and Pedersen (2009)). However, momentum profits only exist for up to one year. In the long run they reverse the course: stocks with superior returns in the past five years underperform stocks with poor returns over the same period (De Bondt and Thaler (1985)).

It is difficult to rationalize price momentum and reversal together. If the financial market were efficient, investors should not be able to make excess profits based on past return information. If momentum profits were to represent rational compensation for systematic risk, then the risk of momentum winners should increase after a price run-up, challenging common sense. In addition, it is not clear why investment strategies based on past short-term or long-term returns could lead to opposite profits. In an important review, Fama (1998) calls price momentum the "granddaddy" of anomalies that challenge rational pricing models.

To understand price momentum and reversal, two questions are indispensable. The first is whether momentum winners have higher expected returns than momentum losers. Asset pricing theory predicts a tradeoff between expected risk premium and risk. To rationalize price momentum, it is natural to ask whether the expected momentum profits are positive. This question is not trivial because the realized momentum profits are not the same as the expected momentum profits. Specifically, momentum profits can emerge either (i) as the rational realization of expected momentum profits, or (ii) through a sequence of price surprises. Only the former is meaningful for the standard risk-return tradeoff interpretation. Surprisingly, despite the large literature on momentum, few studies have asked whether the expected momentum profits are actually positive.

The second question is how price momentum and reversal are realized. Several influential behavioral models (e.g., Barberis, Shleifer, and Vishny (1998), Daniel, Hirshleifer, and Subrahmanyam (1998), Hong and Stein (1999), and Grinblatt and Han (2005)) make very different assumptions, ranging from underreaction to overreaction, to explain momentum and reversal[1]. Fama (1998), instead, dismisses the equally likely underreaction and overreaction as "chance" rather than le-

[1]See a detailed survey on the relation between investor psychology and asset pricing in Hirshleifer (2001).

gitimate interpretations. The wide range of interpretations reflect the lack of concrete knowledge on how price momentum and reversal are realized. In particular, are these patterns rational realizations of expected returns? Are they responses to prior returns or prior earnings news without major changes in firm fundamentals after portfolio formation? Or are they triggered by changes in firm fundamentals after portfolio formation?

The purpose of this paper is to explore empirical answers to these two questions. It is evident that such evidence helps separate rational and behavioral interpretations and distinguish numerous behavioral stories. It seem inconceivable that a proper understanding on price momentum and reversal can be reached without a proper understanding on these two issues.

Our focus also distinguishes this study from a deep literature. Most studies in that literature focus on other important aspects of *realized* momentum profits, such as their robustness under various scenarios, their relation to the macroeconomy, risk factors, and firm characteristics, etc.[2]

Main results We first ask whether momentum winners have higher or lower ex ante expected returns than momentum losers. Specifically, given stock prices, we use the market prevailing forecasts for future cash flows (from I/B/E/S) for each firm and at each point in time, to back out the firm-specific discount rates (e.g., Gerhardt, Lee, and Swaminathan (2001) and Pastor, Sinha, and Swaminathan (2008)). We find that momentum winners have significantly lower ex ante expected returns than momentum losers. That is, the ex ante expected momentum profits are significantly negative.

We proceed to reconcile the seemingly puzzling fact that the ex ante expected momentum profits are significantly negative but the ex post realized momentum profits are significantly positive. This reconciliation takes the following steps.

In the first step we show that almost all momentum profits are realized as price changes. Why does this matter? Expected returns can be earned through two channels: (i) dividends can be earned given initial prices (i.e., dividend yields), and (ii) given expected future cash flows,

[2]The empirical literature on the realized momentum profits can be roughly divided into the following categories: (i) the robustness of realized momentum profits under different scenarios (e.g., Rouwenhorst (1998), Chui, Titman, and Wei (2000), Griffin, Ji, and Martin (2003), George and Hwang (2004), and Avramov, Chordia, Jostova, and Philipov (2007)); (ii) the relation to macroeconomy and risk factors (e.g., Fama and French (1996), Conrad and Kaul (1998), Moskowitz and Grinblatt (1999), Lewellen (2002), Grundy and Martin (2001), Chordia and Shivakumar (2002), Ahn, Conrad, and Dittmar (2003), Avramov and Chordia (2005), Bansal, Dittmar, and Landblad (2005), Liu and Zhang (2008), and Chen and Zhang (2009)); (iii) the relation to earnings, delegated portfolio management, information, learning, tax-loss selling, trading volume and other firm characteristics (e.g., Chan, Jegadeesh, and Lakonishok (1996), Chordia and Shivakumar (2006), Daniel and Titman (1999), Fama and French (2008), Grinblatt and Moskowitz (2004), Hong, Lim, and Stein (2000), Hong and Stein (2007), Hong, Stein, Yu (2007), Lee and Swaminathan (2000), Zhang (2006), and Sagi and Seasholes (2007), Vayanos and Woolley (2008), Verardo (2007)).

prices can go up reflecting the expected returns (like the prices of a zero-coupon bond). The first channel is unimportant since dividend yields are negligible in momentum profits. Regarding the second channel, since momentum winners are found to have lower expected returns than momentum losers, their prices are expected to grow at a slower rate. Therefore, the fact that price momentum is realized through price changes indicates that the realized momentum profits are unlikely to represent the expected returns. This point seems obvious, but is underappreciated in the current literature.

What do the realized momentum profits represent then? They could represent surprises caused by revisions to the expected future cash flows (i.e., cash flow news) or to the discount rates (i.e., discount rate news) that are not reflective of the initial expected returns.

In the second step, based on the above finding, we examine whether it is the cash flow news or the discount rate news that has caused the price changes. To this end, we examine the changes in firm fundamentals before and after momentum sorting, including sales growth, operating cost growth, earnings, and profit margin. The results are remarkably consistent. For example, momentum winners experience significantly more positive earnings shocks than momentum losers for at least two quarters after sorting, during which period the momentum profits are known to be the highest (Jegadeesh and Titman (1993)). However, the earnings shocks are only temporary. After nine months post sorting, winners gradually experience significantly more negative shocks than losers, and the gaining of losers on winners is persistent in the long run. There is thus a cross-sectional pattern from short-term momentum to long-term reversal in firm fundamentals, which roughly matches the momentum and reversal in prices.

In our third step, we provide further evidence suggesting that the financial market responds to the *current* earnings shocks as if they represented shocks not only to current, but also to long horizons. In particular, the consensus forecasts on future earnings, from one-year, two-year, to long horizons, are all revised following the same trend from short-term momentum to long-term reversal. Momentum losers experience significantly more negative revisions to future cash flows in the several quarters after portfolio formation. This trend, however, reverses to the opposite and is significant three years after momentum sorting. Most notably, the trend from the short-term momentum to long-term reversal in forecast revisions even shows up in the outlook of long-term growth rate. Therefore, the financial market does not fully understand the predictable trend in earnings changes and overweights the current earnings shocks as if they were long-lasting.[3]

[3]Being aware of the potential biases in analyst forecasts caused by optimism or conflict of interest related to

All evidence thus points to a consistent story. For portfolios sorted using last year's returns, there exists a pattern from short-term momentum to long-term reversal that happens to firms fundamentals (e.g., earnings, profit margins, etc.). Despite this predictable trend, post-sorting earnings shocks still surprise the market and the expected future cash flows are revised period by period as if the current earnings shocks were to last for a long time. The revisions to expected future cash flows are accompanied by price momentum in the short run and price reversal in the long run. Therefore, the realized price momentum represents price "surprises" that have little to do with the expected momentum. In fact, the expected momentum is significantly negative.

Consistent with this interpretation, the realized momentum profits – the alpha across twenty momentum portfolios – can be completely explained away by the cross-sectional variation in contemporaneous earnings shocks, or by the forecast revisions to future cash flows at all horizons. Importantly, when doing so, these shocks to firm fundamentals completely dominate the lagged returns. In other words, it is not the past returns, but rather the cash flow news after portfolio formation that leads investors to adjust prices and expectations on future cash flows .

The key ingredient of our argument is myopic extrapolation: investors overweight *current* earnings shocks but underweight their predictable trends. Such a behavior can arise due to cognitive biases such as representativeness (Kahneman and Tversky (1974)) and the "law of small numbers" (Rabin (2002)).

A natural question is why sophisticated institutional investors do not arbitrage away these predictable price trends. We show that institutional investors indeed adjust their holdings to conduct momentum and reversal trades. The timing of their holdings matches very well the trend from short-term momentum to long-term reversal. Individual investors, on the other hand, act suboptimally on the receiving end of the trades initiated by institutional investors (see also Hvidkjaer (2006)). Limitations to arbitrage, such as transaction costs (Lesmond, Schill, and Zhou (2004)), noise trader risk (De Long, Shleifer, Summers, Waldmann (1990) and Shleifer and Vishny (1997)), etc., could have prevented the profits from disappearing.

Link to the literature Our findings build upon a voluminous literature. We discuss below the relation and the distinction.

We provide one of the first estimates of expected momentum profits and find them to be negative, which contrasts with the conjecture by Conrad and Kaul (1998). Campello, Chen, and

investment banking business, we conduct robustness checks in Section 4.

Zhang (2008) also estimate the expected momentum profits using the forward-looking information from the corporate bond yields and find them to be negative. But they do not explain the relation between the negative expected momentum profits and the positive realized profits. In contrast, the bulk of this study is to build such a reconciliation, which is necessary if one wants to understand price momentum.

Rational asset pricing models emphasize the tradeoff between expected returns and systematic risks. The finding that the ex ante momentum profits are negative suggests that the right question to ask is what risks would lead to the higher (not lower) expected returns for losers. Separating ex ante from ex post momentum profits is also intuitive in the sense that one does not have to assume that the risks of winners increase after the price run-ups.

Many studies have found that the cross-sectional returns of portfolios sorted by past returns are related to those of portfolios sorted by past earnings (e.g., Chan, Jegadeesh, and Lakonishok (1996), Chordia and Shivakumar (2006), and Chen and Zhang (2009)). As such, a return factor sorted by past earnings can absorb the momentum profits (Chordia and Shivakumar (2006) and Chen and Zhang (2009)). While related, it is important to note that these studies are mainly interested in the association between portfolios sorted by *past* returns and *past* earnings. In comparison, we show that *contemporaneous* earnings shocks and analyst forecast revisions dominate past returns in explaining momentum.[4]

Our findings are thus fundamentally different from previous studies on the relation between momentum and earnings. In fact, the association between momentum and earnings has led to interpretations favoring systematic risk and risk factors. We have a different angle. We focus on the relation between price adjustments, earnings shocks, and analyst forecast revisions. The rationale is the present value formula: if earnings shocks propel investors to revise their expectations on future cash flows, stock prices must change. Since such price adjustments (i.e., realized momentum) reflect cash flow news, they do not reflect the ex ante expected returns.

Our myopic extrapolation interpretation is reminiscent of the post-earnings drift puzzle (Bernard and Thomas (1989, 1990)). We differ in at least two ways. First, we study momentum profits, not post-earnings drift. More important, studying price momentum and reversal together sheds fresh light on our understanding of momentum. In particular, momentum and post-earnings drift have

[4]Jackson and Johnson (2006) show that past returns predict analyst forecast revisions, and this predictable component explains momentum. The gist of their paper, then, is to link past returns to the realized momentum profits. In comparison, we do not emphasize on past returns. Rather, we show that contemporaneous earnings shocks and forecast revisions dominate past returns in explaining momentum profits. Past returns thus play a secondary role in our interpretation.

been taken as the ultimate examples of underreaction (Fama (1998)). However, since momentum changes course, the cumulative momentum profits beyond several years are negative. This means that the prices of prior winners should not have gone up more than the losers had the investors understood the predictable pattern in earnings. Put differently, the nature of momentum profits is not underreaction once one thinks beyond the short horizon. Our alternative interpretation is period-by-period myopic extrapolation.

The most influential interpretations of price momentum and reversal are provided by behavioral models (e.g., Barberis, Shleifer, and Vishny (1998), Daniel, Hirshleifer, and Subrahmanyam (1998), Hong and Stein (1999), and Grinblatt and Han (2005)). We discuss in the article how our findings help distinguish these stories. In particular, presumably due to the lack of empirical evidence at their time, few stories emphasize on what happens to firm fundamentals. One exception is Barberis, Shleifer, and Vishny (1998). They develop a model in which earnings follow a random walk. Not knowing the true properties of earnings, investors in their model assume that there are "trends" and "mean reversions" in earnings. Interestingly, our findings suggest that there are indeed predictable "trends" and "mean reversions" in earnings. Price momentum and price reversal may actually result from the failure to incorporate these predictable patterns into prices.

The rest of the paper proceeds as follows. In section 2 we estimate the expected momentum profits. In section 3 we investigate how momentum profits are realized and how they are related to cash flow news. In Section 4 we explore institutional trading and provide robustness checks to analyst forecast measures. We provide concluding remarks in section 5.

2 Expected momentum profits

Rational asset pricing models tradeoff expected risk premium and systematic risk. Therefore, to understand the role momentum plays in a rational pricing model, a first question to ask is, do past winners have higher expected returns than losers? This question is relevant because realized returns are noisy measures of expected returns (e.g., Elton (1999)). Realized momentum profits are not the same as expected momentum profits.

2.1 Models of implied cost of equity

We first use the model in Pastor, Sinha, and Swaminathan (2008) to back out the ex ante cost of equity. In particular, we define the equity value as the present value of future "dividends" plus a

terminal value:

$$P_t = \sum_{k=1}^{T} \frac{FE_{t+k}\left(1 - b_{t+k}\right)}{\left(1 + q_t\right)^k} + \frac{FE_{t+T+1}}{q_t\left(1 + q_t\right)^T}, \tag{1}$$

where P_t is the stock price, FE_{t+k} is the earnings forecast k years ahead, b_{t+k} is the plowback rate (i.e., $1 - b_{t+k}$ is the payout ratio), and q_t is the cost of equity. T is set to 15 years.

For each firm, the earnings forecasts for $t+1$, $t+2$, $t+3$ are the consensus analyst forecasts for the first three years respectively, and are obtained from the I/B/E/S database. It is then assumed that the earnings growth, from year $t+4$ to $t+T+1$, gradually converges to the nominal GDP growth. For the first two years, the plowback rate is calculated from the most recent net payout ratio for each firm. The plowback rate then mean reverts between year $t+3$ and $t+T+1$ to a steady-state rate. For further details see Pastor, Sinha, and Swaminathan (2008).

For robustness, we also consider an alternative residual earnings model based on Gerhardt, Lee, and Swaminathan (2001). It has the following present value formula

$$P_t = bv_t + \sum_{i=1}^{T+1} \frac{ae_{t+i}}{\left(1 + q_t\right)^i} + \frac{ae_{t+T+1}}{q_t\left(1 + q_t\right)^T}, \tag{2}$$

where bv_t is book equity, T is equal to 15 years, ae_t is the abnormal earnings, and q_t is the implied cost of equity.[5] The forecasts on earnings between year $t+1$ and $t+3$ are based on analyst forecasts, and the forecasts for year $t+4$ to $t+T+1$ are based on the assumption that the year $t+3$ earnings growth rate mean reverts exponentially to its steady-state value by year $t+T+2$, and the growth rate is equal to the industry median forecast of long-run growth rate. This approach differs from Pastor, Sinha, and Swaminathan (2008) in two major dimensions: (i) it introduces book equity into the formula; and (ii) it uses the long-term industry median growth rate rather than the GDP growth rate. It thus provides a good case for robustness purposes.

For each firm at each point in time, given the stock price and the expected cash flows, we can back out the ex ante cost of equity using Equations (1) and (2). One potential concern for such an exercise is that the analyst forecasts are usually biased upwards, leading to similar biases in the estimated cost of equity. Fortunately, what we care about is the cross-sectional difference in the cost of equity rather than the magnitude of the cost of equity per se. Presumably the bias is likely to be much smaller for the difference. We also provide robustness checks in Section 4 to ensure

[5]The abnormal earnings variable is defined as

$$ae_t = e_t - q_t \times bv_{t-1}.$$

It is the difference between the expected earnings and the lagged book equity that has grown for one period at the rate of the cost of equity.

that our conclusions are not driven by potential biases in analyst forecasts.

The present value of a stock can be written using either a term structure of discount rates or a single discount rate (just like a bond yield); the single discount rate is a function of the term structure of the discount rates. Here we can only estimate a single discount rate that applies to all horizons. While this provides no information on the term structure of expected returns, it still captures the relevant information on the expected return. See Pastor, Sinha, and Swaminathan (2008) for further discussions on the issue.

2.2 Data and empirical finding

We retrieve monthly return data on stocks traded on NYSE, AMEX and NASDAQ from the CRSP database. We keep those stocks for which we have quarterly accounting information from the merged COMPUSTAT database, and earnings forecasts information from the I/B/E/S database. To calculate the cost of equity, we match analyst forecasts with the accounting variables from the previous quarter so that the accounting variables represent public information when analyst forecasts are released. Besides earnings forecasts, we also collect from I/B/E/S share prices and the number of shares outstanding. To be included in the sample, we require data of earnings forecasts for the next four quarters and for one year, two years, and long term. We also require that the firm has prior year's dividends in COMPUSTAT. Our sample starts in 1985 because I/B/E/S covers too few firms before that.

For each firm and month, we calculate the implied cost of equity. We then assign stocks to five momentum portfolios based on their returns from month $t-12$ to $t-2$; and to five reversal portfolios based on their returns from month $t-60$ to $t-13$. The portfolios are sorted in each month. Table 1 reports the average equally-weighted cost of equity for each portfolio using the model in Pastor, Sinha, and Swaminathan (2008), from month $t-12$ (i.e., 12 months prior to the formation month) to month $t+36$ for the momentum portfolios, and from month $t-36$ to month $t+36$ for the reversal portfolios.

For the momentum portfolios, winners always have lower costs of equity than losers. For example, the difference in the cost of equity between losers and winners is 0.92% at $t-9$, 1.66% at $t-3$, and 1.34% at t (i.e., right at formation). This difference decreases to 0.77% at $t+3$, and to 0.50% at $t+6$. All these numbers are significant at the 5% level.

For the reversal portfolios, winners also have a lower cost of equity than losers. In particular, the difference in the cost of equity between losers and winners is 0.72% at $t-36$, 0.63% at $t-6$,

0.53% at t, 0.66% at $t+6$, and 0.71% at $t+36$. This difference is significant at the 5% level at all horizons.

Table 2 reports the results using the model in Gerhardt, Lee, and Swaminathan (2001). This method yields estimates for the cost of equity that are about 2% higher than those using the model in Pastor, Sinha, and Swaminathan (2008). The difference is due to the fact that the industry median long-term growth rate forecast is usually very optimistic and much higher than the long-term GDP growth rate that is used in Pastor, Sinha, and Swaminathan (2008). Nevertheless, the cross-sectional differences in the costs of equity are similar across the two tables. For example, the expected momentum profits for the three quarters leading to the sorting time are -1.31%, -1.48%, and -1.09% respectively in Table 2; the corresponding numbers in Table 1 are -1.36%, -1.66% and -1.34%, respectively. The expected momentum profits for the two quarters after sorting are -0.57% and -0.35%, respectively in Table 2; the corresponding numbers in Table 1 are -0.77% and -0.50% respectively. The expected momentum profits are negative in both tables.

For the reversal portfolios, winners also have lower expected returns than losers in Table 2, but their difference is not significant for most horizons. While this is different from Table 1, we find no case in either table suggesting that winners have higher expected returns than losers.

Therefore, stocks that have experienced superior past returns, either in the short-term or long-term, tend to have a lower cost of equity than stocks with poor past returns. Subsequently, the ex ante expected momentum profits are significantly negative for at least two quarters after the sorting.

Discussion Conrad and Kaul (1998) argue that if the ex ante expected momentum profits are positive, then one should observe positive realized momentum profits. Limited by the data, however, they do not directly estimate the ex ante expected momentum profits. We do, and we find that the ex ante expected momentum profits are negative.

There are at least two reasons that reinforce our confidence in this finding. First, we acquire the estimates of the ex ante costs of equity by using both stock prices and forward-looking analyst forecasts on future cash flows. Campello, Chen, and Zhang (2008) estimate the ex ante equity risk premium by using information from the forward-looking corporate bond yield spreads. They also find that the ex ante expected momentum profits are significantly negative.

Second, our finding is intuitive. Firms with good past returns tend to operate well with strong earnings; firms with poor past returns tend to do the opposite. It seems natural to believe that

investors drive up the stock prices of the winners before sorting because they are more optimistic about these firms; accordingly, they are comfortable with a lower cost of equity for winners.

Rational asset pricing models emphasize the tradeoff between ex ante expected returns and systematic risks. As pointed out by Lewellen (2002), for positive ex ante momentum profits to be rational, "risk would have to increase after positive returns, contrary to the intuition that risk should actually decline." Since we find that the ex ante momentum profits are negative, this requirement is not needed anymore.

The finding that the expected momentum profits are negative suggests that an attempt to match systematic risk to the realized momentum profits is "barking on the wrong tree." Rather, the proper question for rational pricing models to address is whether momentum losers are riskier than winners so that investors demand a higher (not lower) risk premium for holding them. Our finding thus has direct implications on how asset pricing tests should be conducted regarding momentum.

3 How are momentum and reversal profits earned?

If expected momentum profits are negative ex ante, why are realized momentum profits positive ex post? This question propels us to examine how momentum profits are earned.

3.1 Return patterns

Panel A of Table 3 reports the average 6-month returns for the five momentum portfolios for 1985-2006, the period during which we have the analyst forecast data. We choose to report 6-month returns since momentum profits are the highest during the first half of the year (Jegadeesh and Titman (1993)). For the full sample, which does not require the availability of the analyst forecast data, the average half-year momentum profit is equal to 4.86%, statistically significant. This momentum profit consists of a capital gain of 4.74% and a dividend yield of 0.12%. For the restricted sample, in which case the cost of equity data are also available, the average momentum profit is a significant 3.40%. It consists of a capital gain of 3.42% and a dividend yield of -0.01%. In other words, almost all momentum profits are earned through capital gains.

Figure 1 plots the cumulative excess return of each momentum portfolio over that of the loser portfolio from the first month to 36 months after the portfolio formation for the restricted sample. The cumulative excess return of the winners over the losers (i.e., the momentum profit) steadily rises from the first month until the sixth month. It then goes down steadily; it turns negative after 18 months, and reaches -8.9% at 36 months after the portfolio formation. So these portfolio returns

show a pattern from short-term price momentum to long-term reversal. The pattern is consistent with Jegadeesh and Titman (2001).

In Panel B we report the average 6-month returns for the five reversal portfolios. Following the literature, we define the reversal profit as the average return of stocks with the lowest returns during months from $t-60$ to $t-13$ minus the average return of stocks with the highest returns for the same period.[6] For the full sample the average reversal profit is 4.15%, statistically significant. It consists of a capital gain of 4.42% and a dividend yield of -0.26%. For the restricted sample, the average reversal profit is 2.72%, again significant. It consists of a capital gain of 2.69% and a dividend yield of 0.03%.

We can draw two conclusions regarding both momentum and reversal profits. First, both realized profits are significant during 1985-2006, for both the full sample and the restricted sample. Second, essentially all profits are driven by capital gains, i.e., price adjustments. No wonder they are called price momentum and reversal.

The fact that essentially all realized momentum profits are price adjustments is not trivial. Recall that expected returns can be earned through two channels: (i) investors can earn the dividends given the initial prices (i.e., dividend yields), and (ii) given the expected cash flows, the stock prices can go up because of expected returns (like the price of a zero-coupon bond). The first channel is not the driver of momentum profits because dividend yields are negligible. The second channel is unlikely to be the driver either. This is because we have found that momentum winners have lower expected returns than losers; their prices are thus not expected to grow faster than those of the momentum losers.

Therefore, the price adjustments that cause realized momentum profits must reflect either cash flow shocks or discount rate shocks that have little to do with the ex ante expected returns. This conclusion propels us to next examine the changes in firm fundamentals and the changes in discount rates.

3.2 Changes in firm fundamentals

Earnings shocks

Following the convention (e.g., Kothari, Lewellen, and Warner (2006)), we define earnings shocks as the difference in earnings/lagged asset ratio (i.e., return on assets, ROA) between this quarter and

[6] Note that these reversal portfolios would be different from holding momentum portfolios for five years; the former are based on sorting done using months $t-60$ to $t-13$, while the latter would be based on sorting done using months $t-60$ to $t-50$.

four quarters ago. Panel A of Table 4 reports the earnings shocks from one year before momentum sorting ($t-12$) to three years after the sorting ($t+36$). In the four quarters before the sorting, the same period during which momentum winners have superior returns, the earnings shocks for winners are large and positive at 0.31%, 0.53%, 0.69%, and 0.63% respectively. In contrast, those for momentum losers are large and negative; the differences in earnings shocks between losers and winners are -0.77%, -1.31%, -1.74%, and -1.83% respectively, all statistically significant. The pattern is consistent with the notion that winners experience higher price run-ups than losers before sorting because of more positive earnings shocks.

After portfolio formation, the cross-sectional difference in earnings shocks is -1.36% in the first quarter and -0.67% in the second, both statistically significant. This difference shrinks to -0.01% in the third quarter and becomes significantly positive in the fourth quarter. It is 0.41% two years after the formation and 0.22% three years after, both significant.

Therefore, there is a momentum in earnings shocks for at least two quarters after portfolio formation, during which period the momentum profits are known to be the largest. After that, the momentum in earnings shocks disappears and gradually turns into a reversal.

We observe the same pattern for the reversal portfolios in Panel B. The cross-sectional difference in earnings shocks between long-term losers and winners is -0.74% three years before portfolio formation and -0.29% two years before, both significant. However, this difference turns to a significantly positive 0.13% one year before portfolio formation.[7] It then ranges between 0.30% and 0.77% for the four quarters after the formation, all statistically significant. The pattern is consistent with the notion that long-term losers are not losers anymore after portfolio formation, presumably because they experience more positive earnings shocks.

Sales growth rate and operating cost growth

To further break down earnings, we plot in Figure 2 the growth rates of both sales and the operating costs before depreciation for the winners and losers of the momentum and reversal portfolios. The figure is very revealing. In the upper panel for the momentum portfolios, for the full year before portfolio formation, winners have higher sales growth rates as well as higher growth rates in operating costs than losers, and the growth rate in sales outpaces the growth rate of operating costs; the opposite is true for the losers. Put differently, during the year before momentum sorting,

[7]Note that the timing from momentum to reversal does not need to be consistent between the momentum portfolios and the reversal portfolios. This is because they are sorted based on different criteria, and the sample size is very different. The reversal portfolios include fewer firms because they require long-term return data series in the past.

relatively speaking, winners are making money and losers are losing money.

During the two quarters after momentum sorting, winners continue to have a higher growth rate of sales than of operating costs, but the difference between the two shrinks to zero towards the end of the second quarter, and it becomes negative after that. In contrast, losers have a sales growth rate that is lower than the growth rate of operating costs for two quarters after the sorting, but the difference becomes positive after that. The relative changes in sales and operating costs are consistent with the results found using earnings. There is a short-term momentum in profitability that lasts for about two quarters; and then there is reversal. The patterns in the lower panel for the reversal portfolios are similar. We have also examined profit margin measures, including the operating income before depreciation divided by sales and the pre-tax income dividend by sales, and find the same patterns.

Hypothesis The fact that there is a cross-sectional pattern, from short-term momentum to long-term reversal, for both price adjustments and earnings shocks is interesting. It suggests that momentum might not be delayed response to past returns. Rather, it is triggered by contemporaneous earnings shocks. When the relative earnings shocks gradually turn negative, price momentum turns into reversal.

This hypothesis has two testable predictions. First, if earnings shocks cause price adjustments, there must also be a cross-sectional pattern, from short-term momentum to long-term reversal, for revisions to expected future cash flows. This is because, for earnings shocks to affect prices, they are likely to cause investors to revise outlooks on future cash flows, from short to long horizons. Second, contemporaneous earnings shocks and revisions to expected future cash flows should be more important than past returns in affecting price adjustments.

Our hypothesis suggests a cognitive bias: investors respond to current earnings shocks as if they will last for a long time, but ignore a predictable trend in earnings. For this reason we call it myopic extrapolation. Such a behavior can arise due to cognitive biases such as representativeness (Kahneman and Tversky (1974)) and the "law of small numbers" (Rabin (2002)).

It is important to note that this hypothesis is not a natural product of any of the leading stories in the current literature. For example, the rational story predicts that momentum represents expected returns for systematic risk. There is nothing in that story predicting that momentum is triggered by earnings shocks. In fact, if momentum is caused by earnings shocks, then it represents cash flow news and thus cannot be part of the expected return.

Among the behavioral stories, Barberis, Shleifer, and Vishny (1998) assume that earnings follow a random walk, different from our hypothesis that a predictable pattern of earnings shocks is the driver of momentum. Daniel, Hirshleifer, and Subrahmanyam (1998) predict that overreaction to public information, rather than earnings shocks, causes momentum. Hong and Stein (1999) predict that slow diffusion of private information generates momentum, which is then exacerbated by momentum traders. This interpretation is also different from our hypothesis surrounding earnings shocks.

Therefore, while our hypothesis does not invalidate other interpretations, it is distinctively different and is built on certain empirical facts that are largely ignored in other stories.

We proceed to examine the two predictions of the hypothesis.

3.3 Revisions to expected future cash flows

For current earnings shocks to be important for stock prices, such shocks must induce investors to adjust their forecasts on future cash flows. We show below that this is indeed the case.

Panel A of Table 5 reports the revisions to analyst forecasts on one-year ahead earnings per share for the five momentum portfolios. This revision is defined as the 12-month forecast change (scaled by the stock price 12 months ago), mimicking the way in which we define earnings shocks. Our primary interest is in the difference in forecast revisions between past losers and winners. This difference is significantly negative for the four quarters before portfolio formation: -0.60%, -1.80%, -3.22%, and -4.66% respectively. If we take this revision to the market consensus forecasts as indicative of the marginal investors' views, then this pattern says that there is a relatively more upward adjustment in expected futures cash flows for winners than for losers. Therefore, before portfolio formation, past winners experience more positive earnings shocks, revisions to future cash flows, and price run-ups. The pattern is consistent with the myopic extrapolation hypothesis.

The cross-sectional difference in the analyst revisions remains negative and significant for the four quarters after portfolio formation, albeit with a weakening trend: -4.49%, -3.53%, -2.22%, and -0.87% respectively. There is thus a momentum in positive revisions to one-year ahead earnings for winners relative to losers. We note that the momentum in the forecast revisions is slightly longer than the momentum in earnings shocks. This could be due to sluggish updates by analysts (e.g., Chan, Jegadeesh, and Laknonishok (1996)). It could also represent confirming evidence on investors' conservatism (e.g., Barberis, Shleifer, and Vishny (1998)).

The momentum in forecast revisions reverts, however, at the longer horizons. The cross-sectional

difference in the revisions between losers and winners is 0.62% two years after portfolio formation, and 0.51% at the three-year horizon, both significant at the 5% level. The shift from momentum to reversal roughly matches the patterns found in earnings shocks and in prices.

The same pattern is present in the reversal portfolios in Panel B. The difference in forecast revisions between past long-term losers and winners is -2.76% three years before portfolio formation, -2.15% two years before, and -1.49% one year before. However, this difference turns positive two quarters before the formation period, and continues to be so after portfolio formation. The pattern matches those found in earnings shocks and returns.

We find the same patterns in the revisions to the two-year earnings forecasts in Table 6, and the revisions to the long-run growth rates in Table 7.[8] In particular, we note that in Table 7 the revisions for most portfolios tend to be negative. It is well known that long-run growth rates are usually too optimistic, and thus the revisions are negative on average (e.g., Chan, Jegadeesh, and Laknonishok (1996)). However, what we are interested in are the difference in revisions across portfolios. In Panel A for the momentum portfolios, the difference in the forecast revisions between losers and winners is significantly negative, and increasingly more so for the four quarters before portfolio formation: -0.46%, -0.73%, -0.85%, and -0.82% respectively. This trend continues after the portfolio formation, albeit weakening: -0.50%, -0.26%, and -0.06%. However, the difference becomes and stays significantly positive one year after formation (0.10%). We also find similar evidence in Panel B for the reversal portfolios.

In sum, the market consensus revisions to future earnings, from one-year, two-year, to long-run horizons, also show a trend of momentum in the short run and reversal in the long run. This finding is consistent with our hypothesis that investors treat the current earnings shocks as if they will last for a long time. As a result, they revise forecasts on future cash flows not only for the short run, but for the long run. Such revisions lead to price adjustments, and thus price momentum and reversal. For the investors the price adjustments reflect cash flow news and thus are not part of the ex ante expected returns. This explains why it is possible for momentum winners to have lower ex ante expected returns than losers but end up with higher realized returns ex post, which then gradually revert in the long run.

We implicitly assume that the analyst revisions are reflective of the views of the marginal investors. This seems a mild assumption. There is a large literature indicating that stock prices

[8]Because there is no seasonality involved, we examine quarterly revisions for long-term forecasts, rather than 12 month changes.

respond to revision to analyst forecasts,[9] which is consistent with our assumption. Suppose we ignore this literature and emphasize on the possibility that analysts revise forecasts passively, and sometimes in a delayed fashion, to stock prices (e.g., Chan, Jegadeesh, and Laknonishok (1996) and Jackson and Johnson (2006)). Even in this case, it is clear that the analysts interpret the price changes as indictive of revisions to future cash flows. Despite the potential biases, it is difficult to imagine that the analysts and investors are far apart in this regard. For these reasons, it is reasonable to use analyst forecast revisions as a proxy for investors' revisions to expected future cash flows.

3.4 Revisions to discount rates

Price surprises could also reflect revision to discount rates. Since we have the implied cost of equity for each firm at each point in time, we can calculate the changes in discount rates and see whether the cross-sectional differences in these changes are consistent with the price momentum and reversal.[10]

Panel A of Table 8 reports the results for momentum portfolios. For the losers, the revision to the cost in equity is 0.43% four quarters before portfolio formation, 0.22% three quarters before, and 0.10% two quarters before; in contrast, the corresponding numbers for the winners are -0.49%, -0.30%, and -0.24% respectively. This suggests that investors adjust the discount rates upward for losers but downward for winners, consistent with the intuition that losers are perceived to be increasingly more risky than winners.

For the two quarters after the portfolio formation, however, the net differences in the revisions to the cost of equity between losers and winners are significantly negative. Thus the net differences in the revisions to the cost of equity do not move in a direction that would facilitate momentum, as they would have suggested a more positive price adjustment for losers. As such, the revision to the cost of equity is not the main driver of the realized momentum profits. The same conclusion can be reached from Panel B. We conclude that it is the information on cash flows, not on discount rates, that causes the price momentum and reversal.

[9] This literature includes, among others, Griffin (1976), Givoly and Lakonishok (1979), Imhoff and Lobo (1984), Elton, Martin, and Gultekin (1981), Lys and Sohn (1990), Francis and Soffer (1997), and Park and Stice (2000).

[10] In the rest of the paper, whenever the implied cost of equity model is needed, we only report the results using the model in Pastor, Sinha, and Swaminathan (2008). Using the model in Gehhardt, Lee, and Swaminathan (2001) usually yields similar results. For simplicity we do not report the results.

3.5 Regressions: contemporaneous or lagged information?

We test the second prediction of our hypothesis: contemporaneous earnings shocks and forecast revisions should be more important than the lagged returns in explaining momentum and reversal. To this end, we sort firms into 20 momentum portfolios and 20 reversal portfolios. We then run a Fama-MacBeth (1973) regression of 3-month returns on a cash flow revision variable:

$$R_{it} = \delta_t + \beta_t \times x_{it} + \varepsilon_{it}, \tag{3}$$

where R_{it} is the return for portfolio i at time t; the cash flow revision variable x_{it} is, alternatively, (i) the earnings shock, (ii) the one-year forecast revision, (iii) the two-year forecast revision, and (iv) the revision on long-run earnings growth forecast. The regressions are performed cross-sectionally, on a quarterly basis. In Table 9, alpha represents the difference in the regression residuals between the winner and the loser portfolios. We collect the alpha, the regression coefficients and the R-squared in each quarter and report their time series averages. We also report the Newey-West t-statistics (with four lags), which control for heteroskedasticity and autocorrelation.

For the momentum portfolios, the alpha is a significant 3% (for three months), without controlling for any explanatory variables.[11] Adding the earnings shock to the regression shrinks the alpha to 1%, statistically indistinguishable from zero. That is, the momentum profits can be entirely captured by contemporaneous earnings shocks, strongly supporting our hypothesis that price momentum is caused by price adjustments to earnings shocks. The average R-squared is 24%.

We find the same results when we replace the earnings shock by revision to one-year earnings forecast, two-year earnings forecast, or long-term growth rate forecast, respectively; the coefficient on all these cash flow revision variables is always significant at the 5% level. The alpha is statistically insignificant. Intuitively, earnings shocks trigger the financial market to update the forecasts on future cash flows at all horizons and to update prices such that they incorporate such information.

Cash flow news Following Chen and Zhao (2009), we can combine the separate effects of revision to future cash flows into a single term called cash flow news. In particular, we can rewrite equation (1) as

[11] Note that the "intercept" represents the average of the cross-sectional returns after regression, which is not important for our purposes.

$$
\begin{aligned}
P_t &= \sum_{k=1}^{T} \frac{FE_{t+k}\left(1-b_{t+k}\right)}{\left(1+q_t\right)^k} + \frac{FE_{t+T+1}}{q_t\left(1+q_t\right)^T} \\
&= f\left(c^t, q_t\right). \qquad (4)
\end{aligned}
$$

By construction, stock price P_t is a function of the vector of cash flow forecast variables available at time t (with superscript t), c^t, and the discount rate q_t. The proportional price difference between $t+j$ and t is then

$$
\begin{aligned}
r_t &= \frac{P_{t+j} - P_t}{P_t} \qquad (5) \\
&= \frac{f\left(c^{t+j}, q_{t+j}\right) - f\left(c^t, q_t\right)}{P_t} \qquad (6) \\
&= \frac{\left(f\left(c^{t+j}, q_{t+j}\right) - f\left(c^t, q_{t+j}\right)\right)}{P_t} + \frac{\left(f\left(c^t, q_{t+j}\right) - f\left(c^t, q_t\right)\right)}{P_t} \qquad (7) \\
&= CF_t + DR_t, \qquad (8)
\end{aligned}
$$

where

$$
CF_t = \frac{\left(f\left(c^{t+j}, q_{t+j}\right) - f\left(c^t, q_{t+j}\right)\right)}{P_t} \qquad (9)
$$

is the cash flow news; it is so because the numerator is calculated by holding the discount rate constant at $t+j$ and the difference is driven by the cash flow difference between t and $t+j$. Similarly,

$$
DR_t = \frac{\left(f\left(c^t, q_{t+j}\right) - f\left(c^t, q_t\right)\right)}{P_t} \qquad (10)
$$

is the discount rate news; it is so because cash flows do not change in the numerator, and the difference is driven by the variation of discount rates in the period.

The cash flow news thus calculated incorporates the effect of the revisions to future cash flows at all horizons. We then repeat our Fama-MacBeth regression by using cash flow news as the explanatory variable. The average coefficient is highly significant at 1%, the average R-squared is the highest among all regressions (29%), and the alpha is statistically insignificant.[12]

For the reversal portfolios, the average alpha (i.e., difference between winner and loser residuals) without control variables is a significant -4%. Adding earnings shock as the explanatory variable yields a coefficient significant at the 5% level. It also shrinks the alpha to -2%, albeit still significant at the 5% level. Since earnings shock is a variable from firm fundamentals, its ability to shrink the

[12]Consistent with our earlier finding regarding the changes in discount rates, we also find that the discount rate news is not responsible for the reduction of momentum alpha.

reversal profits by 50% is still impressive. Replacing the earnings shock by any of the other cash flow variables has a similar effect.

We repeat these regressions in Table 10 while also controlling for the lagged return. In particular, we use the lagged return from months $t-12$ and $t-2$ for the momentum portfolios, and the lagged return from months $t-60$ and $t-13$ for the reversal portfolios. The idea is to examine the explanatory power of the lagged return in comparison to the cash flow revision variables.

For the momentum portfolios, the lagged return coefficient is equal to 0.02 in the univariate regression, which is significant at the 5% level. The lagged return helps shrink the alpha from a significant 3% to a statistically indistinguishable 0.1%. Not surprisingly, price momentum says that cross-sectional differences in past returns should explain momentum. Adding earnings shock to the regression, however, makes the lagged return insignificant; in contrast, the earnings shock coefficient is highly significant at the 5% level. In other words, earnings shocks subsume the explanatory power of the lagged return in explaining the momentum profits. This evidence strongly supports our hypothesis that price momentum is triggered by contemporaneous earnings shocks.

When the earnings shock variable is replaced by either revision to one-year earnings forecast or revision to two-year earnings forecast, neither the lagged return nor the cash flow revision variable is significant. However, given that the average R-squared is more than 40% in these regressions, a natural interpretation is that multicollinearity has prevented us from estimating the coefficients precisely. Nevertheless, we note that the lagged return is a weaker variable than the cash flow revision variable in each case, judging from the standard errors relative to the coefficients. When we use the revision to long-term growth forecast or the cash flow news as the regressor, the cash flow revision variable becomes highly significant, and the lagged return is insignificant. Overall, the cash flow revision variables not only completely capture price momentum, but they also dominate the lagged return when doing so.

For the reversal portfolios, using the lagged return in the univariate regression shrinks alpha from -4% to -1.5%; the lagged return coefficient is significant at the 5% level. Interestingly, when earnings shock is added to this regression, the earnings shock coefficient is significant at the 5% level, but the lagged return coefficient becomes insignificant. When we replace earnings shock by either the revision to one-year earnings forecast, the revision to two-year earnings forecast, the revision to long-term growth forecast, or the cash flow news, the alpha shrinks to below -1% and it becomes statistically insignificant. In all regressions we find that the cash flow revision variables are much more significant than the lagged return variable.

Novy-Marx (2008) argues that momentum is completely explained by firms' lagged returns between months $t-12$ and $t-7$, and "not by a tendency of rising and falling stocks to keep rising and falling." To examine this issue, we sort twenty portfolios based on the returns between months $t-12$ and $t-7$. We find a similar transition from short-term momentum to long-term reversal that happens to firm fundamentals, analyst forecasts, and prices. Table 11 reports the cross-sectional regression results. Similar to Tables 9 and 10, 3-month momentum profits are significantly positive, but shrink to around zero and become insignificant after we include either earnings shock, analyst forecast revisions, or cash flow news. The lagged return between months $t-12$ and $t-7$ indeed explains the momentum profits away. However, in a horse race between the lagged return and any of the cash flow variables, the cash flow variable dominates the lagged return. The pattern supports our hypothesis that it is not the past returns, but rather the cash flow news after the portfolio formation that leads investors to adjust prices, which lead to momentum.

In sum, the regression analysis strongly supports our hypothesis that momentum and reversal profits are caused by price adjustments responding to new information on cash flows. We find that the cash flow revision variables are much stronger than the lagged return in explaining the profits. This is particularly so in the case of momentum, where the cash flow revision variables can completely capture the momentum profits.

3.6 Link to the literature

We have proposed a myopic extrapolation hypothesis, with supporting empirical evidence, to explain how price momentum and reversal are realized. We discuss below how our findings fit into the current literature.

Fama and French (1996) argue that the value factor (returns of high book-to-market stocks minus the returns of low book-to-market stocks, adjusting for size) can explain reversal but not momentum. This has been equivalently interpreted as that rational asset pricing models can explain reversal but not momentum (e.g., Fama and French (1996)). In other words, there seems to be some inconsistency between momentum and reversal.

According to our hypothesis, price momentum and reversal are consistent. Simply put, there is a momentum and then a reversal in cash flow shocks. If stock prices adjust according to these shocks, then what we observe is price momentum and reversal.

The value factor of Fama and French (1996) cannot explain price momentum because past losers tend to be value firms; the value factor would predict that they earn higher returns than winners.

As such, the momentum profits is larger after adjusting for the exposure to the value factor. What is missing from this picture is the intuition that the momentum profits are *not* compensation for expected returns. Our earlier results suggest that past losers indeed have higher expected returns than winners, consistent with the argument by Fama and French (1996). However, since the realized momentum profits are driven by cash flow news, they have little to do with the risk-expected return interpretation.

Our new findings also help understand why the value factor can explain reversal. The results by Fama and French (1996) say that past long-term losers behave like value firms and past long-term winners behave like growth firms. Our results show that this is because the "timing" is right. Past long-term losers (winners) have long passed the momentum stage in earnings shocks and are experiencing the reversal stage. The positive earnings shocks to losers relative to winners coincide with the improvement in the earnings performance of value stocks relative to growth stocks. This relation is picked up in the stock market, and the value factor exhibits explanatory power.

The hypothesis that investors overweight current earnings shocks but underweight a predictable trend of earnings is reminiscent of the post-earnings drift puzzle (Bernard and Thomas (1989,1990)). Bernard and Thomas find that, in spite of a predictable trend in quarterly earnings shocks, stock prices respond to earnings shocks quarter by quarter for up to three quarters. As a result, stock returns also become predictable.

We differ in at least two ways. First, we study momentum, not post-earnings drift. Second, the post-earnings drift and momentum have been regarded as the ultimate examples of underreaction (Fama (1998)). Our joint study on momentum and reversal sheds fresh light on this issue. The fact that the cumulative momentum profits are negative in the long run suggests that, if the market is rational, price momentum should not exist in the first place. Therefore, price momentum appears to be the result of underreaction (to earnings shocks) only within one year, but not so when viewed from a longer window. This suggests that the nature of price momentum is not underreaction (when the complete reversal is considered). A more plausible interpretation is myopic extrapolation.

Many studies (e.g., Chan, Jegadeesh, and Lakonishok (1996), Chordia and Shivakumar (2006), and Chen and Zhang (2009)) have attempted to use earnings information to explain momentum. While related, we note that the primary purpose of many of these papers is to show that the return patterns of portfolios sorted by past returns are related to portfolios sorted by past earnings. In comparison, we argue that contemporaneous earnings shocks drive price momentum, and are more important than past returns when doing so. In addition, linking returns to earnings has led to

interpretations favoring systematic risks (Chordia and Shivakumar (2006)). We have a different angle. We focus on the relation between price adjustments, earnings shocks, and analyst forecast revisions. The rationale is the present value formula: if earnings shocks propel investors to revise their expectations on future cash flows, stock prices must change. Since such price adjustments (i.e., realized momentum) reflect cash flow news, they do not reflect the ex ante expected returns.[13],[14]

As noted earlier, the myopic extrapolation interpretation is different from the leading behavioral stories (e.g., Barberis, Shleifer, and Vishny (1998), Daniel, Hirshleifer, and Subrahmanyam (1998), Hong and Stein (1999), and Grinblatt and Han (2005)). These stories usually rely on assumption on overreaction or underreaction to explain momentum and reversal. We do not emphasize on either over- or underreaction; rather, we emphasize on myopic extrapolation. More important, we uncover a cross-sectional trend, from short-term momentum to long-term reversal, for earnings shocks and expected cash flow revisions that roughly match the price adjustments. Such a cash flow pattern is crucial to support our hypothesis, but is largely ignored in other stories presumably because it was not known when these stories were formed. Our paper thus contributes to the literature by adding a new hypothesis and a set of empirical facts. Regardless of our interpretation, the set of empirical facts should be considered in future models, behavioral or rational, to explain momentum and reversal.

4 Other issues and robustness checks

4.1 Institutional holding

Our evidence suggests that investors respond to current earnings shocks but fail to fully incorporate the predictable trends of earnings shocks into the prices. As a result, stock price movements become predictable. A natural question is why arbitrageurs, including sophisticated institutional investors, do not trade away these predictable price trends.

To explore this issue, we extract institutional holdings data from the Thomson Financial's CDA/Spectrum Database. For each firm and quarter, institutional ownership is measured as the percentage of total number of shares of the firm held by all institutions as reported in the

[13] Jackson and Johnson (2006) show that past returns can predict analyst forecast revisions, and the predictable component can explain momentum. This angle is different from ours, in which we argue that contempraneous earnings shocks are more important than past returns in driving momentum

[14] Soffer and Walther (2000) also attempt to link momentum and reversal to earnings. But they focus on the time series correlation of earnings. As pointed out by Lewellen (2002), momentum is a cross-sectional, rather than time series, phenomenon. We show that the cross-sectional difference of earnings shocks can explain momentum. Our focus is thus different, and our analysis is more broad.

CDA/Spectrum database. If a firm does not appear in the CDA/Spectrum database in a particular quarter, the institutional ownership is deemed to be zero. Quarterly change in institutional ownership for each stock is defined as the difference in institutional ownership from the previous quarter.

The results are reported in Table 12. In Panel A, for the four quarters before momentum sorting, the change in the institutional holding of losers is 0.26%, -0.59%, -0.75%, and -0.84% respectively; in contrast, the change in the institutional holding of winners is 1.27%, 1.92%, 2.04%, and 1.92% respectively. As a result, the change of the institutional holding of losers (net of winners) is -1.01%, -2.50%, -2.79%, and -2.76%, all statistically significant. This pattern indicates that, on a net basis, institutional investors are conducting momentum trades during the sorting period – selling losers and buying winners. Individual investors, on the other hand, appear to act suboptimally – they are on the losing end of the momentum trades.

The rest of the quarters are entirely consistent with this pattern. The change in the holding of losers (net of winners) is -1.07%, -0.11%, 0.46%, 0.58%, and 0.51% respectively for the five quarters after sorting, most of them being statistically significant. That is, institutional investors buy more winners than losers for at most two quarters after sorting; after that they buy more losers than winners. It appears that institutional investors as a whole execute momentum trades, and individual investors become the receiving end of the transactions.

In Panel B for the reversal portfolios, institutional investors buy significantly more losers than winners during the period from two quarters before sorting to two quarters after sorting. After that, the difference between losers and winners become insignificant. Again, institutional investors appear to execute reversal trades, and individual investors, as a whole, are on the receiving end of these transactions.

We note that the lack of response to the predictable earnings shocks cannot be fully explained as the difference between institutional investors and individual investors. After all, analyst forecasts, which also suffer from the failure to fully incorporate the predictable information, are provided by analysts who serve large institutions. What we can conclude from Table 12 is that at least some institutional investors take advantage of the price inefficiency to rebalance portfolios, and that at least some individual investors are on the losing end of the deals. Limitations to arbitrage, such as transaction costs (Lesmond, Schill, and Zhou (2004)), noise trader risk (De Long, Shleifer, Summers, Waldmann (1990) and Shleifer and Vishny (1997)), etc., could have prevented the profits from disappearing.

These findings are consistent with those in Hvidkjaer (2006) for price momentum. We have extended his analysis by reporting the institutional holdings for long periods before and after momentum sorting, and for price reversal portfolios.

4.2 Robustness checks concerning analyst forecast bias

We have used analyst forecasts to calculate the implied costs of equity and revisions to expected future cash flows. There is ample evidence indicating that analyst forecasts are biased. As noted earlier, what we care is not the levels, but the cross-sectional differences of these variables. Presumably the biases can be mitigated in the cross-section. Still, it is possible that the forecast biases are more severe for particular types of firms, and thus affect the cross-sectional differences.

To mitigate this concern, we construct two measures of analyst forecasts that can help address the bias issue, which are then used to examine the robustness of our main conclusions. These two measures have also been used by Chava and Purnanandam (2009).

1. Forecast according to optimism: Rather than using the consensus analyst forecasts, we can use the lowest (most pessimistic) forecasts or the highest (most optimistic) forecasts. The idea is that, even if there is a cross-sectional bias when the consensus forecasts are used, this bias might not be as strong if the lowest or the highest forecasts are alternatively used.

2. Forecast adjusted by external financing: It has been documented that analyst forecasts can be overly optimistic for firms with large investment banking demand (e.g., Rajan and Servaes (1997), and Bradshaw, Richardson, and Sloan (2006)). Bradshaw, Richardson, and Sloan (2006) measure investment banking business as the amount of cash raised through external financing. We thus rank all firms, year by year, according to the amount of net external financing (equity and debt issuance) and calculate the percentile ranking, $Rank_i$, for each firm i. The external-financing-adjusted forecast is calculated as

$$EPS_i = Rank_i \times LOW\ EPS_i + (1 - Rank_i) \times HIGH\ EPS_i, \tag{11}$$

   where $LOW\ EPS_i$ is the lowest forecast and $HIGH\ EPS_i$ is the highest forecast. The idea is to rely more on the pessimistic estimate if a firm has more investment banking business in a particular year in an effort to correct the potential bias.

Table 13 reports the expected momentum and reversal profits using these forecast measures. Interestingly, the expected profits are different depending on the measure used: they are lowest

when the lowest forecasts are used, and highest when the external-financing-adjusted forecasts are used. However, the general pattern is exactly the same for both the momentum and reversal portfolios. Both prior short-term and long-term winners have lower costs of equity than prior short-term and long-term losers from several quarters before portfolio formation to several quarters after. The ex ante momentum profits are significantly negative.

Table 14 reports the Fama-MacBeth regressions of returns on the lagged return and cash flow news. Momentum profits can be completely explained by the combination of the lagged return and cash flow news. In the cases of the lowest forecast measure and the external-financing-adjusted measure, the cash flow news is strongly significant while the lagged return is not. In the case of the highest forecast measure, the cash flow news is at least as significant as the lagged return. Similarly, the reversal profits can be explained by the combination of the two variables. In all cases the cash flow news is much more significant than the lagged return.

Therefore, our main conclusions related to analyst forecasts, namely that the expected momentum profits are negative and that the contemporaneous cash flow news is more important than the lagged return in explaining momentum and reversal profits, are robust to alternative measures of analyst forecasts.

5 Concluding remarks

Price momentum represents one of the main challenges to rational asset pricing models (Fama (1998)). For momentum profits to be rational, it would require that the expected return and systematic risk of winners be higher than those for losers, after the winners' stock prices run up. Central to the understanding of this issue is how investors form different expectations regarding winners and losers. It is natural to investigate (i) whether winners have higher ex ante expected returns than losers and (ii) the channels through which momentum profits are earned and the way they relate to the ex ante expected returns.

This paper contributes to the literature by answering these questions. Our first novel result is that momentum winners actually have lower expected returns than losers; thus, the ex ante expected momentum profits are significantly negative. The current literature has studied extensively the robustness and pervasiveness of momentum profits under various scenarios, but few studies have asked whether the realized momentum profits represent expected momentum profits. Our conclusion is reached by making use of the market consensus forecasts on future cash flows. Our result seems intuitive considering the price run-up experienced by the winners in the past.

Rational asset pricing models trade off expected risk premium for systematic risks. Our finding that the ex ante expected momentum profits are negative suggests that the right question to ask is why prior short-term losers have lower (not higher) expected returns than winners.

Our second novel result reconciles the fact that the expected momentum profits are negative ex ante but the realized momentum profits are positive ex post. We show that this is because the momentum profits are realized through price adjustments reflecting cash flow shocks. Accompanying the trend of returns from short-term momentum to long-term reversal, a similar trend happens in the earnings shocks, and also in the revisions to future earnings at various horizons.

The combined, consistent evidence points to a single story: there is a predictable cross-sectional difference in earnings shocks, which varies from short-term momentum to long-term reversal. The financial market ignores this trend but responds to contemporaneous earnings shocks as if they were long lasting. As a result, earnings shocks propel financial analysts to revise their forecasts on future cash flows, and investors to adjust prices; the trend of earnings shocks, from short-term momentum to long-term reversal, leads to price momentum and reversal. Since the realized momentum and reversal profits reflect cash flow surprises, they are not part of the expected returns. This explains why it is possible to have negative momentum profits ex ante but positive momentum profits ex post.

Based on the consistent comovement among firm fundamentals, expected cash flow revisions, and price adjustments, we propose a myopic extrapolation hypothesis to explain price momentum and reversal. This hypothesis is distinctively different from the current leading stories in the literature. Regardless of our interpretation, the set of empirical facts we uncover should be incorporated into future models, behavioral or rational, to explain price momentum and reversal.

References

[1] Abarbanell, J.S., and V.L. Bernard, 1992. Tests of analysts' overreaction/underreaction to earnings information as an explanation for anomalous stock price behaviour. Journal of Finance 47, 1181-1207.

[2] Ahn, D.H., J. Conrad and R. Dittmar, 2003. Risk adjustment and trading strategies. Review of Financial Studies 16, 459-485.

[3] Asness, C.S., T.J. Moskowitz, and L.H. Pedersen, 2009. Value and momentum everywhere, Working paper.

[4] Avramov, D., and T. Chordia, 2005. Asset pricing models and financial market anomalies. Review of Financial Studies, Forthcoming.

[5] Avramov, D., T. Chordia, G. Jostova, and A. Philipov, 2007. Momentum and credit rating. Journal of Finance 62, 2503-2520.

[6] Bansal, R., R.F. Dittmar and C.T. Lundblad, 2005. Consumption, dividends, and the cross-section of equity returns. Journal of Finance.

[7] Barberis, N., A. Shleifer, and R. Vishny, 1998. A model of investor sentiment. Journal of Financial Economics 49, 307-343.

[8] Bernard, V.L., and J.K. Thomas, 1989. Post-earnings-announcement drift: delayed price response or risk premium? Journal of Accounting Research 27, 1-36.

[9] Bernard, V.L., and J.K. Thomas, 1990. Evidence that stock prices do not fully reflect the implications of current earnings for future earnings. The Journal of Accounting and Economics 13, 305-340.

[10] Campello, M., L. Chen, and L. Zhang, 2008. Expected returns, yield spreads, and asset pricing tests. Review of Financial Studies, 2008, 21(3), 1297-1338.

[11] Chan, L.K.C., N. Jegadeesh and J. Lakonishok, 1996. Momentum strategies. Journal of Finance 51, 1681-1713.

[12] Chen, L., and L. Zhang, 2009. A better three-factor model that explains more anomalies. Forthcoming, Journal of Finance.

[13] Neoclassical factors. Working paper, Washington University.

[14] Chordia, T. and L. Shivakumar, 2002. Momentum, business cycle, and time-varying expected returns. Journal of Finance 57, 985-1019.

[15] Chordia, T. and L. Shivakumar, 2006. Earnings and price momentum. Forthcoming, Journal of Financial Economics.

[16] Chui, A., S. Titman and K.C. J. Wei, 2000. Momentum, ownership structure, and financial crises: An analysis of Asian stock markets. Working paper, University of Texas at Austin.

[17] Conrad, J., and G. Kaul, 1998. An anatomy of trading strategies. Review of Financial Studies 11, 489-519.

[18] Daniel, K., D. Hirshleifer, and A. Subrahmanyam, 1998. Investor psychology and security market under- and overreactions. Journal of Finance 53, 1839-1885.

[19] Daniel, K., and S. Titman, 1999. Market efficiency in an irrational world. Financial Analysts' Journal 55, 28-40.

[20] DeBondt, W.F.M. and R. Thaler, 1985. Does the stock market overreact? Journal of Finance 40, 793-805.

[21] DeLong, J.B., A. Shleifer, L.H. Summers and R. Waldmann, 1990. Positive feedback investment strategies and destabilizing rational speculation, Journal of Finance 45, 379-395.

[22] Dittmar, R.F., G. Kaul, and Q. Lei, 2007. Momentum is not an anomaly. Working paper.

[23] Elton, E. J., 1999. Expected return, realized return, and asset pricing tests. Journal of Finance 54, 1199-1220.

[24] Fama, E.F., 1998. Market efficiency, long-term returns, and behavioral finance. Journal of Financial Economics 49(3), 283-306.

[25] Fama, E.F., and K. R. French, 1996. Multifactor explanations of asset pricing anomalies. Journal of Finance 51, 55-84.

[26] Fama, E. F., and K. R. French, 2008. Dissecting anomalies. Journal of Finance 63, 1653-1678.

[27] Fama, E.F., and J. MacBeth, 1973. Risk, return and equilibrium: empirical tests. Journal of Political Economy 81, 607-636.

[28] George, T. J. and C.Y. Hwang, 2004. The 52-week high and momentum investing, Journal of Finance, 2145-2176.

[29] Gebhardt W. R., C. M.C. Lee and B. Swaminathan, 2001. Toward an implied cost of capital. Journal of Accounting Research.

[30] Griffin, J.M., X. Ji, and J.S. Martin, 2003. Momentum investing and business cycle risk: evidence from pole to pole. Journal of Finance 58, 2515-2547.

[31] Grinblatt, M., and B. Han, 2005. Prospect theory, mental accounting, and momentum. Journal of Financial Economics 78, 311-339.

[32] Grinblatt, M., and T. J. Moskowitz, 2004. Predicting stock price movements from past returns: the role of consistency and tax-loss selling. Journal of Financial Economics 71, 541-579.

[33] Grundy, B.D., and J.S. Martin, 2001. Understanding the nature of the risks and the source of the rewards to momentum investing. Review of Financial Studies, 14, 29-78.

[34] Hirshleifer, D.A., 2001. Investor psychology and asset pricing," Journal of Finance, 56, No. 4, 1533-1598.

[35] S. Hvidkjaer, 2006. A Trade-based analysis of momentum. Review of Financial Studies 19, No. 2, 457-491.

[36] Hong, H., T. Lim, and J. Stein, 2000. Bad news travels slowly: size, analyst coverage, and the profitability of momentum strategies. Journal of Finance 55, 265-295.

[37] Hong, H., and J. Stein, 2007. Disagreement and the stock market. Journal of Economic Perspectives 21, 109-128.

[38] Hong, H., J. Stein, and J. Yu, 2007. Simple forecasts and paradigm shifts. The Journal of Finance 62, 1207-1242.

[39] Hong, H., and J. Stein, 1999. A unified theory of underreaction, momentum trading and overreaction in asset markets. Journal of Finance 54, 2143-2184.

[40] Jackson, A., and T. Johnson, 2006. Unifying undereaction anomalies. Journal of Business 79, No.1, 75-114.

[41] Jegadeesh, N., and S. Titman, 1993. Returns to buying winners and selling losers:implications for stock market efficiency. Journal of Finance 48, 35-91.

[42] Jegadeesh, N., and S. Titman, 2001. Profitability of momentum strategies: an evaluation of alternative explanations. Journal of Finance 56, 699-720.

[43] Jegadeesh, N., and S. Titman, 2002. Cross-sectional and time-series determinants of momentum returns. Review of Financial Studies 15, No 1, 143-157.

[44] Kahneman, D., and A. Tversky, 1974. Judgement under uncertainty: heuristics and biases. Science 185, 1124-1131.

[45] Kothari, S.P., J. Lewellen, and J. B. Warner, 2006. Stock returns, aggregate earnings surprises, and behavioral finance. Journal of Financial Economics.

[46] Lee, C. and B. Swaminathan, 2000. Price momentum and trading volume, Journal of Finance 55, 5, 2017-2069.

[47] Lesmond, D.A., M.J. Schill, and C. Zhou, 2004. The illusory nature of momentum profits. Journal of Financial Economics 71 (2).

[48] Lewellen, J., 2002. Momentum and autocorrelation in stock returns, Review of Financial Studies 15: 533-564.

[49] Liu, L.X., and L. Zhang, 2008. Momentum profits, factor pricing, and macroeconomic risk. Forthcoming, Review of Financial Studies.

[50] Moskowitz, T.J., and M. Grinblatt, 1999. Do industries explain momentum? Journal of Finance 54, 1249-1289.

[51] Novy-Marx, R., 2008. Momentum is not momentum, working paper, University of Chicago.

[52] Pastor, L., M. Sinha, and B. Swaminathan, 2008. Estimating the intertemporal risk-return tradeoff using the implied cost of capital, forthcoming, Journal of Finance.

[53] Rabin, M., 2000. Inference by believers in the law of small numbers. Quarterly Journal of Economics 117, 775-816.

[54] Rouwenhorst, K.G., 1998. International momentum strategies. Journal of Finance 53, 267-284.

[55] Sagi, J., and M. Seasholes, 2007, Firm-specific attributes and the cross-section of momentum, Journal of Financial Economics 84: 389-434.

[56] Schwert, G. W., 2003. Anomalies and market efficiency, in George Constantinides, Milton Harris, and Rene Stulz, eds.: Handbook of the Economics of Finance (North-Holland, Amsterdam).

[57] Shleifer, A., and R. Vishny R., 1997. The limits of arbitrage. Journal of Finance 52, 35-55.

[58] Soffer, L.C., and B.R. Walther, 2000. Returns momentum, returns reversals and earnings surprises, Working paper, Northwestern University.

[59] Vayanos, D., and P.Woolley, 2008. An institutional theory of momentum and reversal. Workign paper, London School of Economics.

[60] Verardo, M., 2007. Heterogeneous beliefs and momentum profits, Journal of Financial and Quantitative Analysis, forthcoming.

[61] Zhang, X.F., 2006. Information uncertainty and stock returns. Journal of Finance 61, 105-137.

Table 1 : Cost of Equity

This table reports cost of equity estimates, in percentage, for the price momentum and price reversal portfolios. Costs of equity are estimated following Pastor, Sinha, and Swaminathan (2008). Price momentum portfolios are formed based on returns from month t-12 to t-2. Price reversal portfolios are formed based on returns from month t-60 to t-13. P1 refers to prior short-term losers and R1 refers to prior long-term losers. The sample period is from 1985 to 2006, and the portfolios are equally-weighted. "S.E." stands for standard error. ** and * indicate statistical significance at the 5 %, and 10 % levels, respectively.

Panel A: Price Momentum											
					Month						
	t-12	t-9	t-6	t-3	t	t+3	t+6	t+9	t+12	t+24	t+36
P1	11.63	12.05	12.28	12.40	12.18	11.84	11.65	11.49	11.42	11.21	11.12
P2	11.17	11.26	11.36	11.49	11.49	11.35	11.26	11.16	11.08	10.95	10.84
P3	10.98	10.98	10.99	11.05	11.08	11.03	10.96	10.90	10.85	10.75	10.65
P4	11.10	10.94	10.89	10.86	10.90	10.93	10.91	10.86	10.84	10.73	10.61
P5	11.51	11.12	10.92	10.73	10.84	11.07	11.15	11.15	11.13	10.97	10.86
P1-P5	0.12	0.92	1.36	1.66	1.34	0.77	0.50	0.34	0.29	0.23	0.26
(S.E.)	(0.22)	(0.22)**	(0.22)**	(0.23)**	(0.23)**	(0.22)**	(0.21)**	(0.20)*	(0.20)	(0.20)	(0.20)

Panel B: Price Reversal											
					Month						
	t-36	t-24	t-12	t-6	t-3	t	t+3	t+6	t+12	t+24	t+36
R1	11.90	11.92	11.88	11.65	11.60	11.58	11.58	11.61	11.51	11.40	11.32
R2	11.44	11.45	11.48	11.34	11.34	11.31	11.30	11.24	11.10	10.98	10.86
R3	11.16	11.15	11.12	11.09	11.08	11.06	11.00	10.95	10.85	10.78	10.68
R4	10.98	10.84	10.80	10.84	10.85	10.86	10.81	10.77	10.67	10.59	10.45
R5	11.18	10.95	10.81	11.02	11.05	11.05	11.00	10.95	10.83	10.68	10.60
R1-R5	0.72	0.98	1.02	0.63	0.55	0.53	0.57	0.66	0.68	0.72	0.71
(S.E.)	(0.19)**	(0.22)**	(0.22)**	(0.22)**	(0.21)**	(0.21)**	(0.21)**	(0.20)**	(0.19)**	(0.19)**	(0.20)**

Table 2 : Cost of Equity - Robustness Check

This table reports cost of equity estimates, in percentage, for the price momentum and price reversal portfolios. Costs of equity are estimated following Gerhardt, Lee, and Swaminathan (2001), where earnings are assumed to converge to the industry median growth rate. Price momentum portfolios are formed based on returns from month t-12 to t-2. Price reversal portfolios are formed based on returns from month t-60 to t-13. P1 refers to prior short-term losers and R1 refers to prior long-term losers. The sample period is from 1985 to 2006, and the portfolios are equally-weighted. "S.E." stands for standard error. ** and * indicate statistical significance at the 5 %, and 10 % levels, respectively.

Panel A: Price Momentum											
					Month						
	t-12	t-9	t-6	t-3	t	t+3	t+6	t+9	t+12	t+24	t+36
P1	14.35	14.70	14.86	14.90	14.63	14.31	14.13	14.01	13.95	13.75	13.74
P2	13.64	13.74	13.82	13.93	13.93	13.79	13.70	13.61	13.54	13.44	13.37
P3	13.43	13.42	13.45	13.52	13.56	13.49	13.40	13.35	13.29	13.25	13.17
P4	13.58	13.44	13.41	13.40	13.43	13.45	13.41	13.36	13.33	13.27	13.17
P5	14.08	13.73	13.55	13.42	13.54	13.74	13.79	13.77	13.74	13.64	13.60
P1-P5	0.27	0.97	1.31	1.48	1.09	0.57	0.35	0.23	0.21	0.11	0.14
(S.E.)	(0.20)	(0.20)**	(0.21)**	(0.21)**	(0.21)**	(0.21)**	(0.20)*	(0.20)	(0.20)	(0.20)	(0.20)

Panel B: Price Reversal											
					Month						
	t-36	t-24	t-12	t-6	t-3	t	t+3	t+6	t+12	t+24	t+36
R1	14.44	14.35	14.19	13.99	13.94	13.90	13.89	13.90	13.83	13.74	13.69
R2	13.96	13.91	13.91	13.77	13.79	13.76	13.73	13.66	13.53	13.38	13.32
R3	13.64	13.63	13.60	13.54	13.53	13.51	13.45	13.38	13.29	13.25	13.20
R4	13.51	13.37	13.33	13.34	13.33	13.33	13.28	13.24	13.16	13.11	13.04
R5	13.93	13.71	13.58	13.75	13.79	13.79	13.72	13.67	13.56	13.50	13.44
R1-R5	0.50	0.64	0.61	0.23	0.15	0.11	0.17	0.24	0.26	0.25	0.25
(S.E.)	(0.16)**	(0.19)**	(0.21)**	(0.20)	(0.20)	(0.20)	(0.19)	(0.19)	(0.19)	(0.19)	(0.19)

Table 3 : Returns, Capital Gains Yields, and Dividend Yields

This table reports six-month returns, capital gain yields and dividend yields, in percentage, from month t to t+5 for the price momentum and price reversal portfolios. Price momentum portfolios are formed based on returns from month t-12 to t-2. Price reversal portfolios are formed based on returns from month t-60 to t-13. We sort firms into five even groups based on NYSE cutoff points. P1 refers to prior short-term losers and R1 refers to prior long-term losers. The sample period is from 1985 to 2006, and the portfolios are equally-weighted. The first three columns report results from the full sample, and the last three columns report results from the sample with analyst data available. "S.E." stands for standard error. ** indicates statistical significance at the 5 % level.

	Full Sample			Restricted Sample		
	Total Return	CG Yld	Div Yld	Total Return	CG Yld	Div Yld
Panel A: Price Momentum						
P1	3.71	3.46	0.25	6.78	6.32	0.46
P2	6.12	5.45	0.67	7.29	6.43	0.85
P3	7.16	6.31	0.85	7.90	6.95	0.95
P4	7.55	6.76	0.79	8.10	7.24	0.86
P5	8.57	8.20	0.37	10.18	9.74	0.45
P5-P1	4.86	4.74	0.12	3.40	3.42	-0.01
(S.E.)	(1.51)**	(1.50)**	(0.02)**	(1.43)**	(1.42)**	(0.03)
Panel B: Price Reversal						
R1	10.30	10.01	0.29	10.04	9.49	0.55
R2	7.78	6.96	0.82	8.46	7.48	0.98
R3	7.69	6.59	1.10	8.29	7.14	1.15
R4	7.06	6.05	1.01	7.56	6.57	0.99
R5	6.15	5.59	0.55	7.32	6.80	0.52
R1-R5	4.15	4.42	-0.26	2.72	2.69	0.03
(S.E.)	(1.49)**	(1.49)**	(0.02)**	(1.33)**	(1.33)**	(0.03)

Table 4 : Changes in ROA

This table reports 12-month changes in ROA, in percentage, for the price momentum and price reversal portfolios. ROA is measured as the ratio of income before extraordinary items (data8) to lagged total assets (data44). Price momentum portfolios are formed based on returns from month t-12 to t-2. Price reversal portfolios are formed based on returns from month t-60 to t-13. P1 refers to prior short-term losers and R1 refers to prior long-term losers. The sample period is from 1985 to 2006, and the portfolios are equally-weighted. "S.E." stands for standard error. ** indicates statistical significance at the 5 % level.

Panel A: Price Momentum											
					Month						
	t-12	t-9	t-6	t-3	t	t+3	t+6	t+9	t+12	t+24	t+36
P1	-0.46	-0.78	-1.05	-1.14	-0.93	-0.56	-0.19	0.04	0.11	0.08	-0.02
P2	-0.16	-0.23	-0.27	-0.31	-0.30	-0.25	-0.22	-0.14	-0.10	-0.01	-0.04
P3	-0.05	-0.01	-0.05	-0.03	-0.08	-0.14	-0.16	-0.18	-0.14	-0.07	-0.03
P4	0.05	0.10	0.17	0.14	0.06	-0.02	-0.12	-0.16	-0.17	-0.15	-0.08
P5	0.31	0.53	0.69	0.63	0.43	0.11	-0.19	-0.36	-0.45	-0.33	-0.24
P1-P5	-0.77	-1.31	-1.74	-1.83	-1.36	-0.67	-0.01	0.40	0.56	0.41	0.22
(S.E.)	(0.05)**	(0.03)**	(0.05)**	(0.05)**	(0.05)**	(0.04)**	(0.05)	(0.04)**	(0.04)**	(0.04)**	(0.05)**

Panel B: Price Reversal											
					Month						
	t-36	t-24	t-12	t-6	t-3	t	t+3	t+6	t+12	t+24	t+36
R1	-0.48	-0.16	0.08	0.35	0.42	0.33	0.23	0.14	0.01	-0.06	-0.05
R2	-0.23	-0.15	-0.05	0.02	0.03	0.00	0.02	-0.02	-0.02	0.01	-0.05
R3	-0.09	-0.08	-0.06	-0.05	-0.05	-0.05	-0.05	-0.08	-0.07	-0.02	-0.04
R4	0.03	0.00	-0.05	-0.11	-0.13	-0.15	-0.16	-0.13	-0.12	-0.08	-0.05
R5	0.26	0.13	-0.05	-0.29	-0.37	-0.44	-0.40	-0.38	-0.30	-0.18	-0.12
R1-R5	-0.74	-0.29	0.13	0.64	0.79	0.77	0.63	0.53	0.30	0.13	0.07
(S.E.)	(0.05)**	(0.05)**	(0.04)**	(0.04)**	(0.04)**	(0.04)**	(0.04)**	(0.04)**	(0.04)**	(0.04)**	(0.04)

Table 5 : Changes in One-year Earnings Forecast

This table reports changes in one-year ahead earnings forecast (scaled by stock price 12 months ago), in percentage, from 3 quarters ago to the beginning of next quarter for the price momentum and price reversal portfolios. Price momentum portfolios are formed based on returns from month t-12 to t-2. Price reversal portfolios are formed based on returns from month t-60 to t-13. P1 refers to prior short-term losers and R1 refers to prior long-term losers. The sample period is from 1985 to 2006, and the portfolios are equally-weighted. "S.E." stands for standard error. ** indicates statistical significance at the 5 % level.

Panel A: Price Momentum											
					Month						
	t-12	t-9	t-6	t-3	t	t+3	t+6	t+9	t+12	t+24	t+36
P1	0.64	0.01	-0.74	-1.50	-1.71	-1.29	-0.58	0.24	0.66	1.02	0.95
P2	0.61	0.41	0.17	-0.12	-0.14	-0.03	0.06	0.23	0.35	0.64	0.56
P3	0.66	0.65	0.61	0.58	0.58	0.59	0.56	0.49	0.44	0.49	0.54
P4	0.77	0.91	1.10	1.22	1.20	1.11	0.91	0.67	0.52	0.43	0.47
P5	1.25	1.81	2.48	2.97	2.78	2.25	1.64	1.11	0.75	0.41	0.46
P1-P5	-0.60	-1.80	-3.22	-4.46	-4.49	-3.53	-2.22	-0.87	-0.09	0.62	0.51
(S.E.)	(0.13)**	(0.12)**	(0.13)**	(0.14)**	(0.14)**	(0.13)**	(0.13)**	(0.12)**	(0.11)	(0.12)**	(0.14)**

Panel B: Price Reversal											
					Month						
	t-36	t-24	t-12	t-6	t-3	t	t+3	t+6	t+12	t+24	t+36
R1	-0.76	-0.38	-0.04	1.03	1.41	1.49	1.57	1.45	1.16	1.00	0.89
R2	0.10	0.16	0.32	0.52	0.61	0.60	0.71	0.70	0.73	0.71	0.60
R3	0.50	0.57	0.58	0.52	0.49	0.44	0.46	0.49	0.52	0.55	0.54
R4	0.94	0.96	0.89	0.73	0.58	0.45	0.43	0.40	0.38	0.43	0.44
R5	2.00	1.77	1.45	0.96	0.66	0.45	0.38	0.35	0.32	0.44	0.55
R1-R5	-2.76	-2.15	-1.49	0.70	0.75	1.04	1.19	1.10	0.84	0.56	0.34
(S.E.)	(0.12)**	(0.15)**	(0.14)**	(0.16)**	(0.15)**	(0.15)**	(0.15)**	(0.14)**	(0.14)**	(0.14)**	(0.12)**

Table 6 : Changes in Two-year Earnings Forecast

This table reports changes in two-year ahead earnings forecast (scaled by the stock price 12 months ago), in percentage, from three quarters ago to the beginning of next quarter for the price momentum and price reversal portfolios. Price momentum portfolios are formed based on returns from month t-12 to t-2. Price reversal portfolios are formed based on returns from month t-60 to t-13. P1 refers to prior short-term losers and R1 refers to prior long-term losers. The sample period is from 1985 to 2006, and the portfolios are equally-weighted. "S.E." stands for standard error. ** and * indicate statistical significance at the 5 % and 10 % levels, respectively.

Panel A: Price Momentum											
					Month						
	t-12	t-9	t-6	t-3	t	t+3	t+6	t+9	t+12	t+24	t+36
P1	0.66	-0.01	-0.80	-1.58	-1.80	-1.42	-0.73	0.05	0.52	0.92	0.95
P2	0.63	0.40	0.13	-0.16	-0.15	-0.03	0.10	0.29	0.43	0.64	0.63
P3	0.72	0.69	0.67	0.63	0.60	0.61	0.60	0.55	0.51	0.55	0.59
P4	0.85	1.00	1.20	1.26	1.26	1.17	0.97	0.76	0.62	0.51	0.52
P5	1.35	1.97	2.66	3.19	2.95	2.42	1.79	1.24	0.89	0.52	0.51
P1-P5	-0.69	-1.98	-3.46	-4.75	-4.75	-3.84	-2.51	-1.18	-0.37	0.40	0.44
(S.E.)	(0.12)**	(0.12)**	(0.12)**	(0.12)**	(0.12)**	(0.12)**	(0.12)**	(0.11)**	(0.11)**	(0.11)**	(0.13)**

Panel B: Price Reversal											
					Month						
	t-36	t-24	t-12	t-6	t-3	t	t+3	t+6	t+12	t+24	t+36
R1	-0.74	-0.56	-0.37	0.69	1.06	1.14	1.27	1.24	1.09	1.04	0.88
R2	0.10	0.15	0.32	0.53	0.63	0.62	0.70	0.70	0.75	0.71	0.67
R3	0.54	0.61	0.64	0.61	0.57	0.51	0.52	0.55	0.58	0.60	0.60
R4	1.02	1.06	0.99	0.82	0.68	0.55	0.51	0.48	0.47	0.52	0.49
R5	2.23	2.05	1.70	1.14	0.81	0.59	0.50	0.47	0.44	0.50	0.60
R1-R5	-2.97	-2.61	-2.59	-0.45	0.25	0.55	0.77	0.77	0.65	0.54	0.29
(S.E.)	(0.11)**	(0.13)**	(0.14)**	(0.14)**	(0.13)*	(0.13)**	(0.13)**	(0.12)**	(0.12)**	(0.13)**	(0.12)**

Table 7 : Changes in Long-Term Growth Rate Forecast

This table reports quarterly changes in long-term growth rate forecast, in percentage, for the price momentum and price reversal portfolios. Price momentum portfolios are formed based on returns from month t-12 to t-2. Price reversal portfolios are formed based on returns from month t-60 to t-13. P1 refers to prior short-term losers and R1 refers to prior long-term losers. The sample period is from 1985 to 2006, and the portfolios are equally-weighted. "S.E." stands for standard error. ** indicates statistical significance at the 5 % level.

Panel A: Price Momentum											
					Month						
	t-12	t-9	t-6	t-3	t	t+3	t+6	t+9	t+12	t+24	t+36
P1	-0.50	-0.65	-0.72	-0.71	-0.53	-0.41	-0.29	-0.22	-0.19	-0.11	-0.12
P2	-0.22	-0.25	-0.26	-0.27	-0.28	-0.24	-0.20	-0.17	-0.16	-0.08	-0.08
P3	-0.14	-0.14	-0.13	-0.17	-0.17	-0.18	-0.16	-0.15	-0.12	-0.10	-0.08
P4	-0.08	-0.06	-0.05	-0.06	-0.10	-0.14	-0.15	-0.15	-0.15	-0.13	-0.08
P5	-0.04	0.07	0.13	0.11	-0.04	-0.14	-0.23	-0.27	-0.29	-0.25	-0.21
P1-P5	-0.46	-0.73	-0.85	-0.82	-0.50	-0.26	-0.06	0.06	0.10	0.14	0.09
(S.E.)	(0.04)**	(0.04)**	(0.04)**	(0.04)**	(0.04)**	(0.04)**	(0.04)	(0.04)	(0.04)**	(0.04)**	(0.04)**

Panel B: Price Reversal											
					Month						
	t-36	t-24	t-12	t-6	t-3	t	t+3	t+6	t+12	t+24	t+36
R1	-0.48	-0.39	-0.18	-0.08	-0.08	-0.09	-0.10	-0.08	-0.10	-0.08	-0.09
R2	-0.24	-0.19	-0.13	-0.08	-0.06	-0.08	-0.09	-0.11	-0.09	-0.07	-0.04
R3	-0.13	-0.13	-0.12	-0.08	-0.10	-0.10	-0.10	-0.09	-0.08	-0.04	-0.06
R4	-0.11	-0.11	-0.10	-0.11	-0.13	-0.13	-0.13	-0.13	-0.11	-0.06	-0.07
R5	-0.03	-0.05	-0.17	-0.27	-0.30	-0.30	-0.29	-0.26	-0.24	-0.18	-0.14
R1-R5	-0.45	-0.34	-0.01	0.20	0.22	0.21	0.19	0.18	0.15	0.10	0.04
(S.E.)	(0.05)**	(0.04)**	(0.04)	(0.04)**	(0.04)**	(0.04)**	(0.04)**	(0.04)**	(0.04)**	(0.04)**	(0.04)

Table 8 : Changes in Cost of Equity

This table reports quarterly changes in cost of equity, in percentage, for the price momentum and price reversal portfolios. Price momentum portfolios are formed based on returns from month t-12 to t-2. Price reversal portfolios are formed based on returns from month t-60 to t-13. P1 refers to prior short-term losers and R1 refers to prior long-term losers. The sample period is from 1985 to 2006, and the portfolios are equally-weighted. "S.E." stands for standard error. ** indicates statistical significance at the 5 % level.

Panel A: Price Momentum

	Month										
	t-12	t-9	t-6	t-3	t	t+3	t+6	t+9	t+12	t+24	t+36
P1	0.43	0.22	0.10	-0.25	-0.36	-0.19	-0.11	-0.03	-0.01	0.02	-0.01
P2	0.07	0.07	0.11	-0.03	-0.15	-0.10	-0.10	0.07	-0.02	0.01	-0.01
P3	-0.04	-0.03	0.03	0.00	-0.06	-0.07	-0.04	-0.03	-0.02	0.01	-0.02
P4	-0.22	-0.09	-0.07	0.00	0.03	-0.02	-0.04	-0.01	-0.02	-0.03	-0.02
P5	-0.49	-0.30	-0.24	0.06	0.23	0.08	0.02	-0.01	-0.03	0.00	-0.02
P1-P5	0.91	0.51	0.34	-0.31	-0.59	-0.27	-0.13	-0.02	0.02	0.02	0.01
(S.E.)	(0.12)**	(0.12)**	(0.12)**	(0.12)**	(0.12)**	(0.12)**	(0.12)	(0.12)	(0.11)	(0.12)	(0.11)

Panel B: Price Reversal

	Month										
	t-36	t-24	t-12	t-6	t-3	t	t+3	t+6	t+12	t+24	t+36
R1	-0.03	-0.02	-0.22	-0.06	-0.03	-0.01	0.02	-0.03	-0.02	0.02	-0.03
R2	-0.02	-0.02	-0.15	-0.01	-0.05	-0.03	-0.07	-0.07	-0.05	-0.01	-0.02
R3	-0.06	-0.04	-0.08	-0.05	-0.06	-0.07	-0.05	-0.04	-0.02	0.00	-0.04
R4	-0.07	-0.07	-0.02	-0.03	-0.04	-0.04	-0.04	-0.06	-0.01	-0.01	-0.02
R5	-0.13	-0.10	0.10	0.02	-0.02	-0.03	-0.05	-0.05	-0.03	0.00	-0.02
R1-R5	0.10	-0.08	-0.32	-0.07	-0.01	0.02	0.07	0.02	0.01	0.02	-0.02
(S.E.)	(0.13)	(0.12)	(0.12)**	(0.11)	(0.11)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12))	(0.11)

Table 9 : Cross-Sectional Regression without Lagged Return

This table reports regression results of 3-month returns on changes in ROA, changes in one-year earnings forecast (scaled by the stock price 12 months ago), changes in two-year earnings forecast (scaled by the stock price 12 months ago), changes in long-term growth rate forecast, and the cash flow news respectively. See text for the definition of cash flow news. We conduct Fama-MacBeth regressions for each quarter, collect the coefficients from each period and then report the average coefficients and the New-West standard errors (four lags). Alpha is calculated as the difference of the regression residual between the winner portfolio and the loser portfolio. ** indicates statistical significance at the 5 % level.

	Price Momentum						Reversal					
Alpha	0.03**	0.01	0.00	0.00	0.01	-0.01	-0.04	-0.02	-0.02	-0.02	-0.03	-0.02
(S.E.)	(0.01)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)**	(0.01)**	(0.01)**	(0.01)**	(0.01)**	(0.01)**
ROA_t		1.12						1.41				
(S.E.)		(0.32)**						(0.35)**				
1-yr forecast			0.42						1.44			
(S.E.)			(0.16)**						(0.27)**			
2-yr forecast				0.39						1.85		
(S.E.)				(0.16)**						(0.32)**		
LT forecast					2.12						1.80	
(S.E.)					(0.62)**						(0.61)**	
CF news						0.18						0.32
(S.E.)						(0.04)**						(0.04)**
Intercept	0.04	0.04	0.03	0.03	0.04	0.04	0.04	0.04	0.03	0.03	0.04	0.04
(S.E.)	(0.01)**	(0.01)**	(0.01)**	(0.01)**	(0.01)**	(0.01)**	(0.01)**	(0.01)**	(0.01)**	(0.01)**	(0.01)**	(0.01)**
R^2		0.24	0.27	0.27	0.17	0.29	0	0.19	0.21	0.19	0.18	0.18

Table 10 : Cross-Sectional Regression with Lagged Return

This table reports regression results of 3-month returns on changes in ROA, changes in one-year earnings forecast (scaled by the stock price 12 months ago), changes in two-year earnings forecast (scaled by the stock price 12 months ago), changes in long-term growth rate forecast, and the cash flow news respectively. In each regression the lagged return is added as a control variable. For the momentum portfolios the lagged return is the return between months t-12 to t-2. For the reversal portfolios the lagged return is the return between months t-60 and t-13. We conduct Fama-MacBeth regressions for each quarter, collect the coefficients from each period and then report the average coefficients and the New-West standard errors (four lags). Alpha is calculated as the difference of the regression residual between the winner portfolio and the loser portfolio. ** and * indicate statistical significance at the 5 % and 10 % levels, respectively.

	Price Momentum						Reversal					
Alpha	0.001	-0.000	0.002	0.001	-0.002	-0.003	-0.015	-0.014	-0.009	-0.007	-0.012	-0.008
(S.E.)	(0.005)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)	(0.008)*	(0.007)**	(0.005)	(0.006)	(0.006)	(0.007)
Lag return	0.020	0.012	-0.006	-0.008	0.012	0.004	-0.004	-0.001	-0.002	-0.003	-0.003	-0.003
	(0.007)**	(0.008)	(0.018)	(0.022)	(0.007)	(0.008)	(0.002)**	(0.001)	(0.001)	(0.001)**	(0.002)**	(0.001)**
ROA_t		0.68						1.32				
(S.E.)		(0.31)**						(0.35)**				
1-yr forecast			0.61						1.39			
(S.E.)			(0.48)						(0.24)**			
2-yr forecast				0.62						1.81		
(S.E.)				(0.55)						(0.31)**		
LT forecast					1.25						1.42	
(S.E.)					(0.54)**						(0.59)**	
CF news						0.16						0.31
(S.E.)						(0.05)**						(0.04)**
Intercept	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.03	0.03	0.03	0.04
(S.E.)	(0.01)**	(0.01)**	(0.01)**	(0.01)**	(0.01)**	(0.01)**	(0.01)**	(0.01)**	(0.01)**	(0.01)**	(0.01)**	(0.01)**
R^2	0.28	0.38	0.41	0.42	0.36	0.44	0.17	0.30	0.36	0.34	0.26	0.31

Table 11 : Cross-Sectional Regression with Alternative Momentum Portfolios

This table reports regression results of 3-month returns on changes in ROA, changes in one-year earnings forecast(scaled by stock price 12 months ago), changes in two-year earnings forecast(scaled by stock price 12 months ago), changes in long-term growth rate forecast, and the cash flow news respectively for the momentum portfolios formed based on returns from month t-12 to t-7. The lagged return is the return between months t-12 to t-7. We conduct Fama-MacBeth regressions for each quarter, collect the coefficients from each period and then report the average coefficients and the New-West standard errors (four lags). Alpha is calculated as the difference of the regression residual between the winner portfolio and the loser portfolio. ** indicates statistical significance at the 5 % level.

Alpha	0.0173	0.005	-0.004	-0.004	0.008	-0.003	-0.001	-0.003	-0.003	-0.002	-0.000	0.003
(S.E.)	(0.008)**	(0.006)	(0.004)	(0.004)	(0.008)	(0.006)	(0.005)	(0.004)	(0.005)	(0.006)	(0.006)*	(0.004)
Lagged Returns							0.018	0.010	-0.010	-0.013	0.010	-0.005
							(0.009)**	(0.010)	(0.011)	(0.011)	(0.009)	(0.008)
Chg. in ROA_t		1.01						0.60				
(S.E.)		(0.36)**						(0.25)**				
Chg. in 1-yr forecast			0.52						0.61			
(S.E.)			(0.22)**						(0.29)**			
Chg. in 2-yr forecast				0.47						0.68		
(S.E.)				(0.21)**						(0.31)**		
Chg. in LT forecast					1.66						1.31	
(S.E.)					(0.49)**						(0.45)**	
CF news						0.25						0.27
(S.E.)						(0.04)**						(0.03)**
Intercept	0.04	0.04	0.04	0.04	0.04	0.04	0.03	0.04	0.03	0.03	0.04	0.04
(S.E.)	(0.01)**	(0.01)**	(0.01)**	(0.01)**	(0.01)**	(0.01)**	(0.01)**	(0.01)**	(0.01)**	(0.01)**	(0.01)**	(0.01)**
R^2	0	0.14	0.22	0.23	0.09	0.20	0.23	0.30	0.33	0.34	0.30	0.35

Table 12 : Changes in the Percentage of Shares Held by Institutional Investors

This table reports changes in the percentage of shares held by institutitional investors. Institutional holding data are from CDA/Spectrum. Price momentum portfolios are formed based on returns from month t-12 to t-2. Price reversal portfolios are formed based on returns from month t-60 to t-13. P1 refers to prior short-term losers and R1 refers to prior long-term losers. The portfolios are equally-weighted. The numbers in the table are reported in percentages. "S.E." stands for standard error. ** and * indicate statistical significance at the 5 % and 10 % levels, respectively.

Panel A: Price Momentum											
					Month						
	t-12	t-9	t-6	t-3	t	t+3	t+6	t+9	t+12	t+24	t+36
P1	0.26	-0.59	-0.75	-0.84	-0.08	0.43	0.80	0.81	0.73	0.43	0.46
P2	0.45	0.45	0.30	0.33	0.37	0.55	0.50	0.52	0.42	0.43	0.38
P3	0.58	0.63	0.56	0.57	0.56	0.45	0.44	0.41	0.39	0.37	0.31
P4	0.75	0.88	0.86	0.81	0.58	0.43	0.28	0.28	0.25	0.29	0.24
P5	1.27	1.92	2.04	1.92	1.00	0.54	0.34	0.23	0.22	0.28	0.25
P1-P5	-1.01	-2.50	-2.79	-2.76	-1.07	-0.11	0.46	0.58	0.51	0.15	0.21
(S.E.)	(0.28)**	(0.28)**	(0.28)**	(0.27)**	(0.26)**	(0.26)	(0.27)*	(0.28)**	(0.28)*	(0.30)	(0.31)

Panel B: Reversal											
					Month						
	t-36	t-24	t-12	t-6	t-3	t	t+3	t+6	t+12	t+24	t+36
R1	0.14	0.20	0.45	0.95	0.93	0.77	0.79	0.66	0.41	0.34	0.27
R2	0.41	0.55	0.61	0.62	0.58	0.43	0.38	0.44	0.43	0.31	0.24
R3	0.45	0.52	0.51	0.48	0.49	0.43	0.40	0.38	0.35	0.30	0.30
R4	0.46	0.66	0.53	0.47	0.42	0.32	0.36	0.38	0.33	0.39	0.34
R5	0.98	0.97	0.62	0.25	0.28	0.29	0.29	0.35	0.32	0.34	0.34
R1-R5	-0.84	-0.77	-0.17	0.70	0.64	0.48	0.50	0.31	0.09	0.01	-0.07
(S.E.)	(0.31)**	(0.31)**	(0.30)	(0.29)**	(0.29)**	(0.28)*	(0.28)*	(0.29)	(0.30)	(0.32)	(0.33)

Table 13 : Cost of Equity - Robustness Checks Using Lowest, Highest Analyst Earnings Forecasts, and External-Financing-Adjusted Forecasts

This table reports cost of equity estimates for the price momentum and price reversal portfolios. Costs of equity are estimated following Pastor, Sinha, and Swaminathan (2008). We use three analyst forecast measures to calculate the cost of equity. The first measure is the lowest forecast, in which case we take the lowest forecast, rather than the consensus forecast, from analysts as the measure of earnings forecast. The second measure is the highest forecast, in which case we take the highest forecast from analysts. The third measure is the external-financing-adjusted forecast, in which case the analyst forecast is adjusted according to the amount of external financing. See text for details. Price momentum portfolios are formed based on returns from month t-12 to t-2. Price reversal portfolios are formed based on returns from month t-60 to t-13. We only report the difference of cost of equity between losers and winners. The sample period is from 1985 to 2006, and the portfolios are equally-weighted. "S.E." stands for standard error. ** and * indicate statistical significance at the 5 %, and 10 % levels, respectively.

Panel A: Price Momentum											
					Month						
	t-12	t-9	t-6	t-3	t	t+3	t+6	t+9	t+12	t+24	t+36
Panel A1: Lowest Forecasts											
P1-P5	-0.12	0.49	0.91	1.24	1.03	0.59	0.39	0.27	0.22	0.19	0.24
(S.E.)	(0.22)	(0.23)**	(0.23)**	(0.23)**	(0.23)**	(0.23)**	(0.23)*	(0.22)	(0.22)	(0.21)	(0.21)
Panel A2: Highest Forecasts											
P1-P5	0.18	1.22	1.79	2.16	1.82	1.15	0.82	0.63	0.56	0.38	0.32
(S.E.)	(0.24)	(0.24)**	(0.25)**	(0.25)**	(0.25)**	(0.25)**	(0.24)*	(0.23)**	(0.23)**	(0.23)	(0.23)
Panel A3: External-Financing-Adjusted Forecasts											
P1-P5	-0.20	0.65	1.23	1.69	1.50	1.01	0.77	0.67	0.64	0.45	0.51
(S.E.)	(0.23)	(0.23)**	(0.24)**	(0.24)**	(0.24)**	(0.24)**	(0.23)*	(0.22)**	(0.22)**	(0.22)	(0.22)
Panel B: Price Reversal											
					Month						
	t-36	t-24	t-12	t-6	t-3	t	t+3	t+6	t+12	t+24	t+36
Panel B1: Lowest Forecasts											
R1-R5	0.44	0.61	0.88	0.56	0.52	0.57	0.62	0.71	0.78	0.73	0.78
(S.E.)	(0.21)**	(0.23)**	(0.23)**	(0.23)**	(0.22)**	(0.22)**	(0.23)**	(0.23)**	(0.22)**	(0.21)**	(0.21)**
Panel B2: Highest Forecasts											
R1-R5	1.32	1.68	1.72	1.08	0.91	0.81	0.88	0.99	0.97	0.93	0.87
(S.E.)	(0.22)**	(0.24)**	(0.25)**	(0.24)**	(0.23)**	(0.23)**	(0.23)**	(0.23)**	(0.22)**	(0.22)**	(0.23)**
Panel B3: Net Financing Activities Adjusted Forecasts											
R1-R5	1.67	1.37	1.23	1.12	1.08	1.14	1.22	1.22	1.18	1.02	0.86
(S.E.)	(0.25)**	(0.25)**	(0.24)**	(0.23)**	(0.23)**	(0.23)**	(0.24)**	(0.23)**	(0.22)**	(0.22)**	(0.23)**

Table 14 : Cross-Sectional Regression with Alternative Forecast Measures Forecasts

This table reports regression results of 3-month returns on the lagged return and contemporaneous cash flow news calculated using three alternative forecast measures. The first measure is the lowest forecast, in which case we take the lowest forecast, rather than the consensus forecast, from analysts as the measure of earnings forecast. The second measure is the highest forecast, in which case we take the highest forecast from analysts. The third measure is the external-financing-adjusted forecast, in which case the analyst forecast is adjusted according to the amount of external financing. See text for details. We conduct Fama-MacBeth regressions for each quarter, collect the coefficients from each period and then report the average coefficients and the New-West standard errors (four lags). Alpha is calculated as the difference of the regression residual between the winner portfolio and the loser portfolio. "S.E." stands for standard error. ** and * indicate statistical significance at the 5 % and 10 % levels, respectively.

	Price Momentum			Price Reversal		
	Lowest Forecast	Highest Forecast	External Financing Adjusted Forecast	Lowest Forecast	Highest Forecast	External Financing Adjusted Forecast
Alpha	0.001	-0.002	-0.004	-0.010	-0.007	-0.005
(S.E.)	(0.004)	(0.005)	(0.004)	(0.008)	(0.006)	(0.007)
Lagged Return	-0.000	0.016	0.010	-0.003	-0.003	-0.003
(S.E.)	(0.007)	(0.008)**	(0.007)	(0.001)**	(0.002)*	(0.002)*
CF news	0.15	0.08	0.10	0.22	0.17	0.16
(S.E.)	(0.03)**	(0.04)**	(0.03)**	(0.04)**	(0.03)**	(0.04)**
Intercept	0.04	0.04	0.04	0.04	0.05	0.05
(S.E.)	(0.01)**	(0.01)**	(0.01)**	(0.01)**	(0.01)**	(0.01)**
R2	0.41	0.43	0.40	0.29	0.31	0.30

Figure 1 : Excess Return over the Loser Portfolio

We sort stocks into five portfolios based on past returns between months t-12 and t-2. We then calculate the cumulative excess return of each portfolio over the loser portfolio, from one to 36 months after the portfolio formation. Winner refers to the portfolio with the highest past returns.

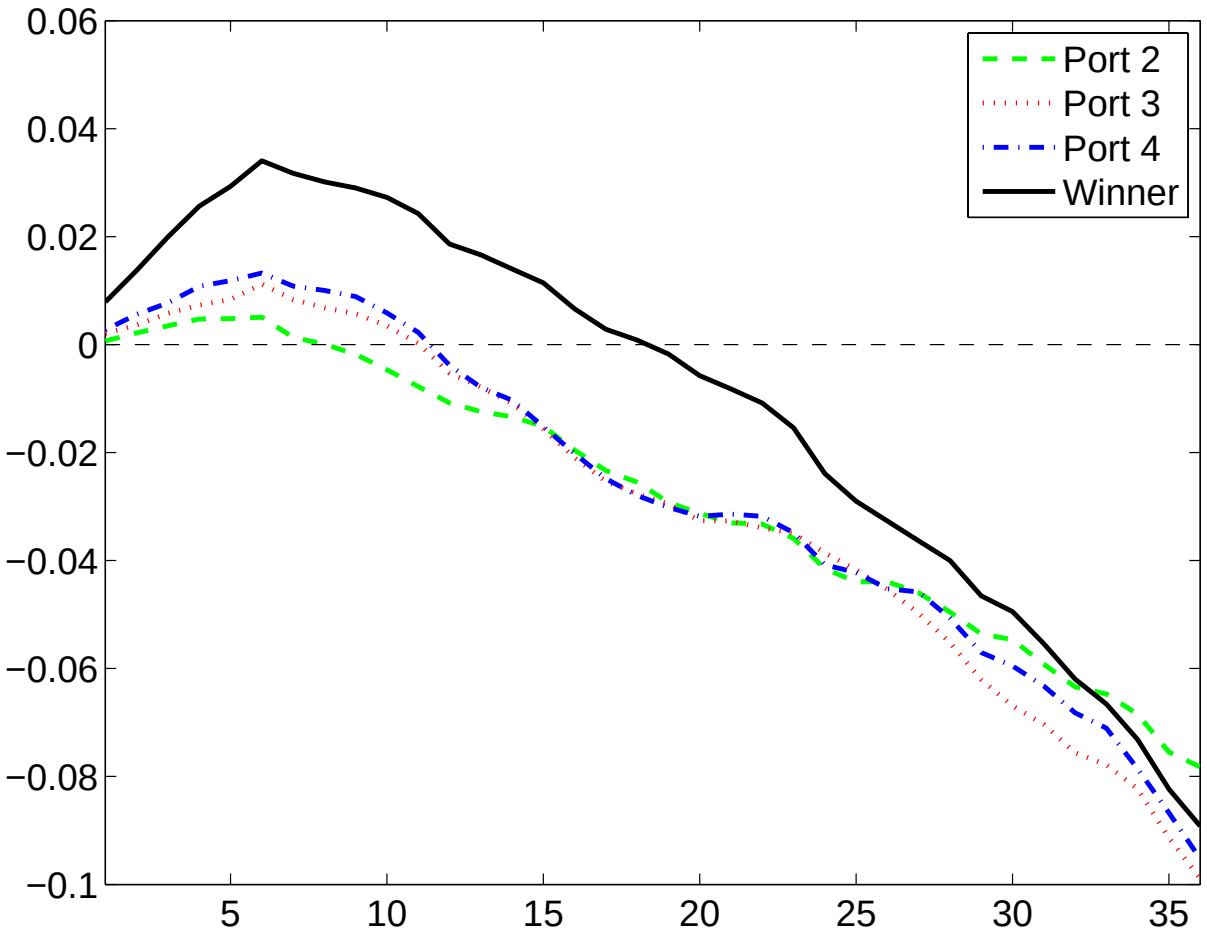

Figure 2 : Sales Growth and Operating Costs

We plot the sales growth and operating cost growth for winners and losers of the momentum and reversal portfolios. Sales growth is defined as the growth of quarterly sales compared to four quarters ago; operating cost growth is defined in a similar way. For momentum portfolios the plot ranges from quarter t-4 to t+12. For reversal portfolios the plot ranges from quarter t-12 to t+12. The numbers are in percentage.