Streaks in Earnings Surprises and the Cross-section of Stock Returns*

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Abstract

The gambler's fallacy (Rabin, 2002) predicts that trends bias investor expectations. Consistent with this prediction, we find that investors underreact to streaks of consecutive earnings surprises with the same sign. When the most recent earnings surprise extends a streak, post-earnings announcement drift is strong and significant. In contrast, the drift is negligible following the termination of a streak. Indeed, streaks explain the majority of post-earnings announcement drift in our sample. Our results are robust to more general definitions of trends than streaks and a battery of control variables including the magnitude of earnings surprises and their autocorrelation. Overall, the cross-sectional post-earnings announcement drift anomaly has a significant time-series component that is consistent with the gambler's fallacy.

Keywords: Trends, Streaks, Gambler's Fallacy, Post-Earnings Announcement Drift

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1 Introduction

The quasi-Bayesian model of Rabin (2002) demonstrates that the order in which prior information is received can influence investor expectations. In particular, Rabin predicts that investors underreact to trends as a result of the gambler's fallacy. A classic example of this fallacy is when gamblers at a roulette wheel incorrectly believe that black is more likely to occur than red following a string of red draws. Intuitively, the gambler's fallacy is the belief that trends require immediate "balancing" by the opposite outcome. The justification for such balancing is to ensure the distribution of prior outcomes reverts towards a more symmetric distribution that conforms to one's prior beliefs.

Durham, Hertzel, and Martin (2005) report evidence of the gambler's fallacy in their study of college football wagers. In an experimental setting, Asparouhova, Hertzel, and Lemmon (2009) find stronger support for Rabin's gambler's fallacy than the representativeness bias assumed by Barberis, Shleifer, and Vishny (1998), abbreviated BSV hereafter. While the gambler's fallacy predicts an underreaction to trends, the representativeness bias results in the incorrect belief that trends will continue, with this extrapolation resulting in an overreaction to trends. To our knowledge, we are the first to test the conflicting predictions of the gambler's fallacy and representativeness using quarterly firm-level earnings surprises. The frequency and salience of quarterly earnings surprises provides an ideal setting to test whether trends bias investor expectations. Indeed, BSV illustrate their model by conditioning investor expectations on prior earnings surprises.

Our main definition for a trend is a streak of consecutive earnings surprises with the same sign.[1] Our first trading strategy ignores the magnitude of earnings surprises and buys stocks with positive streaks while selling stocks with negative streaks. This strategy is also implemented for reversals, which occur when the most recent earnings surprise is of the opposite sign as the preceding streak. Thus, reversals signify the termination of streaks. Over a six-month holding period, a four-factor alpha of 0.603% per month is obtained from buying stocks with positive streaks and selling stocks with negative streaks where the respective streak lengths are at least

[1] A robustness test examines a more general definition of trends involving the imbalance between positive and negative prior earnings surprises. This alternative trend definition produces similar empirical results. Therefore, we focus our exposition on streaks for ease of interpretation and brevity.

two. In contrast, the returns from conditioning on reversals are insignificant. The economically and statistically significant risk-adjusted return from conditioning on streaks is available despite our sample consisting of relatively large stocks with analyst coverage. Furthermore, the positive risk-adjusted return from this trading strategy supports the gambler's fallacy as investors appear to underreact to streaks. Underreaction coefficients that compare announcement period returns with returns over a longer subsequent horizon (Cohen and Frazzini, 2008; DellaVigna and Pollet, 2009) provide further evidence that investors underreact to streaks.

Our second trading strategy accounts for the magnitude of the most recent earnings surprise. After sorting firms into quintiles according to the magnitude of their most recent earnings surprise, we further subdivide these quintiles into subportfolios of streaks and reversals. We then buy stocks with positive streaks in the highest quintile and sell stocks with negative streaks in the lowest quintile. This strategy yields a four-factor adjusted return of 0.882% per month. Once again, an insignificant return is obtained from conditioning on reversals (0.044%). The return difference between conditioning on streaks and reversals is 0.838% ($t = 5.75$). Fama-MacBeth regressions confirm the marginal return predictability of streaks after accounting for a battery of control variables that include lagged earnings surprises. Therefore, the greater return predictability of streaks relative to reversals is not attributable to the return continuation induced by similar-signed earnings surprises before the most recent quarter.

We also examine conditional sorts to determine whether the magnitude of earnings surprises within streaks and reversals have different return implications. After forming streak and reversal portfolios, we sort stocks into quintiles according to the magnitude of their most recent earnings surprise. This conditional double-sort reveals that post-earnings announcement drift (PEAD) is concentrated within streaks. We find no evidence that PEAD is significant within the reversal portfolio. Indeed, when we construct a streak "factor" from the monthly long minus short return of our first trading strategy, this factor reduces PEAD's four-factor alpha by over 70% and highlights the significant time series component underlying this cross-sectional anomaly.

The existing literature has examined the contemporaneous impact of streaks on stock prices. Barth, Elliot, and Finn (1999) as well as Myers, Myers, and Skinner (2007) document that firms with increasing earnings have higher valuations but large price reversals following the termination of earnings increases. Ke, Huddart, and Petroni (2003) report that insiders and institutions

anticipate the termination of streaks. However, these studies focus on the contemporaneous implications of streaks. In contrast, our investigation focuses on future returns by implementing calendar-time trading strategies that capture return predictability. Moreover, prior results that find greater contemporaneous price reactions to reversals than streaks are consistent with the gambler's fallacy. Indeed, investor underreactions have the opposite implications for contemporaneous versus future price movements; a muted contemporaneous price reaction followed by a larger delayed reaction. Our paper is further distinguished from the existing literature given our focus on analyst-based earnings surprises that account for earnings predictability. Chan, Frankel, and Kothari (2004) confine their study to streaks consisting of four consecutive quarters of above-median (below-median) earnings growth relative to the entire cross-section of firms. In contrast, our use of analyst-based earnings surprises better conforms to the assumptions underlying the theories of BSV and Rabin. Another related branch of literature explores the relationship between streaks and order flow. Frieder (2008) concludes that positive earnings streaks lead to the initiation of small buy trades. However, Battalio and Mendenhall (2005) report limited success at explaining PEAD using small trades while Shanthikumar (2009) reports that large trades are not initiated by streaks. Instead of examining the microstructure implications of streaks, our paper examines their implications for return predictability.

An alternative interpretation of our findings is that earnings surprises are positively autocorrelated and investors underestimate this autocorrelation. Bernard and Thomas (1990) hypothesize that PEAD is caused by investors underestimating the autocorrelation in realized earnings changes. Our analyst-based earnings surprises are less autocorrelated than earnings surprises defined by realized earnings changes since analysts can incorporate earnings predictability into their forecasts. Nonetheless, we test this alternative explanation by examining whether streaks predict returns better than reversals for firms that have autocorrelated earnings surprises. Autocorrelation is assessed using the runs test as well as an autoregressive model with four lags. After classifying firms into subsamples depending on whether their earnings surprises are autocorrelated or independent, we find that investors underreact more to streaks than reversals in both subsets. Thus, the gambler's fallacy, rather than autocorrelation, is driving the return predictability of streaks. This result is also consistent with Rabin and Vayanos (2010) who show that the gambler's fallacy can induce underreaction to trends even within autocorrelated signals.

Besides streaks, we also examine a more general definition of trends that relies on consistency within the sign of prior earnings surprises. Under the consistency criteria, a trend occurs when the most recent quarterly earnings surprise has the same sign as the majority of prior earnings surprises. Thus, when the majority of a firm's prior earnings surprises are positive, a positive earnings surprise produces a positive trend while a negative earnings surprise produces a negative reversal. We examine imbalances defined by the majority (50%) of earnings surprises over 2, 3, and 5 year horizons as well as a firm's entire history of earnings surprises. Imbalances proxy for the likelihood functions underlying the quasi-Bayesian theories that motivate our empirical tests.[2] We continue to find that trends predict returns significantly better than reversals using the consistency-based definition of trends.

Finally, we also examine whether the gambler's fallacy is unconditionally weaker for long streaks. Rabin predicts the gambler's fallacy is undermined by the hot-hands phenomena when investors update their beliefs after observing a long streak. However, we find no unconditional evidence of the hot-hands phenomena. Intuitively, investors do not appear to update their beliefs regarding future earnings growth after observing long streaks. This property is consistent with investors having strong prior beliefs that earnings growth will mean-revert in the long-term. We further examine whether the gambler's fallacy is conditionally weaker for long streaks when investors have diffuse priors regarding future earnings. In our empirical setting, we proxy for such diffuse priors using high earnings volatility and high analyst forecast dispersion. Consistent with Rabin's prediction, we find weaker evidence of the gambler's fallacy following long streaks in the subset of firms with high earnings volatility and high forecast dispersion.

The remainder of this paper begins in Section 2 with a discussion of the relevant theory. Section 3 then describes the data underlying our empirical tests. The results of these empirical tests are contained in Section 4 while Section 5 details their robustness. Section 6 contains our conclusions.

[2]Note that this consistency definition encompass streaks as a special case. For example, a streak of four consecutive positive surprises requires the most recent surprise to be positive while also requiring the positive imbalance in the prior three surprises to equal its maximum of 100%.

2 Motivation

Rabin and BSV assume that the interpretation of a signal is influenced by the sign of previous signals. In our empirical study, an underreaction to a trend has investors discounting the most recent earnings surprise's importance to future earnings, while an overreaction to a trend has investors magnifying its importance to future earnings.

The gambler's fallacy in Rabin posits an underreaction to trends. This fallacy arises from an informative prior regarding the likelihood of positive and negative signals, such as the belief that the long-term distribution is 50% positive and 50% negative.[3] The gambler's fallacy causes Rabin's investor to expect a trend to reverse. Intuitively, Rabin's investor believes that trends require immediate "balancing" by future signals of the opposite sign. While this belief is correct when the number of signals is large, it does not necessarily hold true for a small number of signals. Indeed, the gambler's fallacy is also known as the law of small numbers. The resulting underreaction to trends yields the empirical prediction of more pronounced drifts after trends than after reversals.

In contrast to Rabin, BSV assume that representativeness causes investors to expect a continuation of trends. This extrapolation induces an overreaction to trends that differs from Rabin's prediction. To ensure that stock prices eventually converge to their true value, the return implications of trends and reversals are equal in absolute magnitude but of the opposite sign in BSV's model. In contrast, long-term returns reversals are not required to correct mispricings attributable to investors underreactions. Asparouhova, Hertzel, and Lemmon (2009) emphasize the disparity between the empirical predictions of the gambler's fallacy and representativeness. Although the empirical market in Bloomfield and Hales (2002) provides empirical support for BSV's predictions, Asparouhova, Hertzel, and Lemmon's (2009) revised experiment supports the predictions of Rabin.

Quarterly earnings surprises provide an ideal proxy for public signals. Indeed, these signals motivate BSV's theoretical model. Furthermore, earnings surprises defined by analyst forecasts are less autocorrelated than earnings surprises defined by realized earnings since earnings pre-

[3]Active institutional investors are expected to have strong prior beliefs regarding the future earnings of individual firms since these priors determine their deviations from a benchmark portfolio.

dictability can be incorporated into analyst forecasts.

3 Data

Our sample of quarterly earnings forecasts is from Thomson Financial's Institutional Brokers Estimate System (I/B/E/S) from 1984 to 2009. For I/B/E/S, the U.S. Summary unadjusted file is used to mitigate the problem of imprecise forecasts caused by I/B/E/S' practice of rounding to the nearest cent when adjusting historical consensus forecasts after stock splits (Diether, Malloy, and Scherbina, 2002).

Monthly returns are obtained from CRSP for stocks classified as ordinary shares (share codes 10 or 11). Delisting returns are added from the CRSP delisting file. When the delisting return is missing, we adopt the convention in Shumway (1997) and use -30% if the corresponding delisting code is performance-related. Firms in the sample are required to have a non-negative book-to-market (BM) ratio. Book equity is calculated following Fama and French (2006). A firm's BM ratio is updated every 12 months beginning in July where B denotes its book equity for the fiscal year ending in the preceding calendar year and M denotes its December-end market capitalization from the preceding calendar year. Earnings surprises denoted SURP are computed as actual quarterly earnings minus the most recent mean consensus forecast of analysts for that quarter. This difference is then normalized by the firm's stock price at the end of the prior month. Actual earnings are from I/B/E/S. Our primary definition for a trend is a streak of at least two consecutive earnings surprises with the same sign while a reversal occurs upon the termination of a streak of at least two. A more general definition for trends involving the imbalance between positive and negative prior earnings surprises is evaluated in a later robustness test.

Panel A of Table 1 describes our sample. The average SURP in our 1984 to 2009 sample period is -0.052. When classifying SURPs as a streak or reversal, our sample begins in 1987 to obtain three years of prior earnings surprises. Differences in the book-to-market, size, and past returns (PRET) between streaks and reversals are reported in Panel B. PRET denotes buy-and-hold returns over the past twelve months after omitting the most recent month. Additional firm characteristics include Amihud's (2002) illiquidity measure (Amihud), percentage of institutional ownership (IO) defined by a firm's most recent quarterly 13f filing, and turnover. Amihud's

illiquidity measure is computed in the month prior to portfolio formation as a firm's average daily absolute return divided by the dollar volume (in millions). Turnover is defined as the average daily number of shares traded normalized by the number of shares outstanding, and is also computed in the month before portfolio formation. For NASDAQ firms, volume is adjusted to account for inter-dealer double-counting as in Gao and Ritter (2010). The firm characteristics are computed as Fama-MacBeth averages. Specifically, the characteristics within each portfolio are averaged each month before computing the time-series averages of each portfolio. Although differences between the firm characteristics of streaks and reversals are statistically significant, several of these differences are unlikely to have economic consequences. Nonetheless, for completeness, we control for the firm characteristics in Panel B of Table 1 in later cross-sectional regressions.

After sorting stocks into quintiles according the magnitude of their most recent earnings surprise, stocks are then separated into subportfolios containing streaks and reversals. For each subportfolio, Panel A of Table 2 reports the number of positive versus negative SURPs while Panel B reports on the average SURP magnitude within each quintile. In general, positive streaks (reversals) occur more frequently than negative streaks (reversals) according to Panel A. However, Panel B indicates that negative SURPs are larger in absolute value than positive SURPs, a property that is consistent with the average SURP in Panel A of Table 1 being negative.

To benchmark the returns from our trading strategies, we compute risk-adjusted returns using the three-factor (Fama and French, 1993) and four-factor models as well as the characteristic portfolio prodcedure of Daniel, Grinblatt, Titman, and Wermers (1997) abbreviated DGTW.[4]

[4]Every July, firms are first sorted into quintiles based on their market capitalization on June 30^{th} of each year using NYSE break-points. Second, within each size portfolio, firms are then sorted into quintiles according to their BM ratios. Third, firms within each double-sorted size-BM portfolio are sorted once more into momentum quintiles every month based on their buy-and-hold return over the prior twelve months while omitting the most recent month (Jegadeesh and Titman, 1993). Therefore, the size and BM rankings are updated annually while the momentum rankings are updated monthly. Finally, equally-weighted monthly returns are computed within each characteristic portfolio.

4 Empirical Results

This section reports on the calendar-time returns from two trading strategies. The first is derived exclusively from the sign of prior earnings surprises while the second also conditions on the magnitude of the most recent earnings surprise. Fama-MacBeth (1973) regressions involving individual firm returns and characteristics then re-examine the portfolio-level results from these trading strategies.

4.1 Streaks

We begin by examining the returns following streaks in earnings surprises of various lengths and their subsequent reversals. A streak is defined by earnings surprises having the same sign in consecutive quarters.[5] Equally-weighted monthly returns following positive streaks and negative streaks are first computed over six-month holding periods. The time-series averages of these returns are then recorded along with the returns following positive reversals and negative reversals that occur when the most recent earnings surprise is of the opposite sign as the prevailing streak. As in the existing literature, our trading strategies exclude firms whose lagged stock prices are below five dollars to guard against micro-structure complications such as bid-ask bounce.

The main results of our paper are summarized in Table 3. Panel A reports a cross-sectional four-factor alpha of 0.322% ($t = 4.32$) per month from buying stocks with positive streaks and a negligible 0.080% ($t = 1.21$) from buying stocks with positive reversals. The difference of 0.242% is statistically significant ($t = 3.97$). Similarly, the four-factor alpha following negative streaks exceeds that of negative reversals by -0.362% ($t = 6.34$).[6] Taken together, a trading strategy that is long positive streaks and short negative streaks earns a four-factor alpha of 0.603% per month while applying the same strategy to reversals earns -0.001%. This difference in return predictability is statistically significant with a t-statistic of 5.66. Similar risk-adjusted returns are reported for the three-factor model and the DGTW risk-adjustment. This evidence

[5]When an earnings surprise is zero, the earnings surprise is classified as negative. An alternative threshold using the median SURP to sign surprises yields similar results and is discussed in the next section.

[6]Excluding firms that are delisted during the holding period results in a negligible reduction in the number of stocks contained in the short portfolio as well as the long portfolio, and does not alter their risk-adjusted returns. Therefore, delistings are not driving the return predictability of negative streaks.

strongly supports the gambler's fallacy, which predicts that investors underreact to trends but not to reversals. This result is also consistent with Chan, Jegadeesh, and Lakonishok's (1996) conclusion that earnings momentum is the result of investor underreaction.

The return difference between portfolios containing stocks with extremely high and extremely low earnings surprises is usually referred to as PEAD. To evaluate the contribution of streaks to PEAD, we first sort stocks into quintiles according to the magnitude of their most recent SURP. Streak and reversal subportfolios within each earnings surprise quintile are then formed. The risk-adjusted returns of these calendar-time portfolios are reported in Panel B of Table 3. A trading strategy that buys stocks with positive streaks in the largest SURP quintile and sells stocks with negative streaks in the smallest SURP quintile yields a four-factor alpha of 0.882% per month. In contrast, conditioning on reversals leads to an insignificant risk-adjusted return of 0.044% ($t = 0.48$). The difference in return predictability between streaks and reversals is large and significant (0.838%, $t = 5.75$). Panel B indicates that differences in the three-factor and four-factor alphas of streaks and reversals are significant in every SURP quintile except for the middle quintile.[7] These risk-adjusted returns are also symmetric (in absolute value) across the SURP quintiles, although negative streaks are generally associated with slightly stronger return predictability. In summary, the results from Table 3 are consistent with the gambler's fallacy since investors appear to underreact more to streaks than reversals.

To complement our study of monthly holding period returns, we examine the immediate reaction of investors to earnings announcements by estimating underreaction coefficients. These coefficients are also estimated by Cohen and Frazzini (2008) and DellaVigna and Pollet (2009). Underreaction coefficients involve cumulative abnormal returns over a three-day horizon (CAR) and risk-adjusted returns over a longer six-month horizon (Drift). These returns yield an underreaction coefficient defined as

$$R = \frac{\text{CAR}}{\text{CAR} + \text{Drift}}, \tag{1}$$

[7]Another procedure matched the magnitude of the most recent SURP within streaks and reversals. This procedure also ensured the streak and reversal portfolios contain an equal number of stocks. In unreported results, the results from this procedure were nearly identical to those in Table 3. Therefore, the greater return predictability of streaks in comparison to reversals is not attributable to differences in the magnitude of earnings surprises.

for an individual firm's quarterly earnings announcement. Provided the CAR and Drift following an earnings announcement have the same sign, a ratio $R < 1$ is evidence of investor underreaction, while $R > 1$ is evidence of investor overreaction. Moreover, a lower R ratio indicates a greater underreaction by investors as less information is immediately incorporated into prices.

Figure 1 reports the underreaction coefficient for streaks as well as reversals. We compute Fama-MacBeth averages for the CAR and Drift variables for firms within a specific portfolio and then graph R using these averages. For positive SURPs, the R coefficient for streaks is 68%, compared to 88% for reversals. By implication, there is greater underreaction to streaks than to reversals. We find similar evidence for negative SURPs as well as for stocks in the lowest and highest SURP quintiles. Hence, the evidence in Figure 1 supports our earlier finding that streaks induce a greater underreaction than reversals.

4.2 Streak Length

According to Rabin, if investors are uncertain about the distribution of future signals, the hot-hands phenomena can undermine the gambler's fallacy. The hot hands effect implies that investors overinfer after observing a long streak and expect their continuation. However, we show in Table 4 that longer streaks induce stronger rather than weaker underreaction.[8] These results are consistent with investors having strong prior beliefs regarding the long-term distribution of earnings surprises that prevent the gambler's fallacy from being undermined by the hot-hands phenomena. Indeed, after observing the continuation of a streak, investors appear to remain confident in its subsequent reversal.

The lack of empirical support for the hot-hands phenomena may stem from competition between firms as the entrance and exit of firms from a competitive industry leads to mean-reversion in long-term earnings growth at the firm level. The empirical evidence in Chan, Karceski, and Lakonishok (2003) confirms that high long-term earnings growth is unlikely to persist. Therefore, informative priors regarding long-term earnings growth are justified by the belief that a firm's competitive advantage is temporary. Moreover, analysts can adjust their earnings forecasts to

[8] In comparison to streaks whose length is between six and nine quarters, the slightly weaker return predictability following streaks longer than ten consecutive quarters is driven by relatively few stocks.

mitigate predictability in SURPs and therefore limit the continuation of streaks.[9]

Although the hot-hands phenomena is not detected in our study, it may explain flows into funds that outperform their peers provided investors chase fund performance. Jagannathan, Malakhov, and Novikov (2010) find evidence of persistence among superior hedge funds. Intuitively, if the long-term investment skill of fund managers is believed to be more persistent than the long-term earnings growth of individual firms, then the hot-hands phenomena is more likely to be detected in fund flows than stock returns.[10]

4.3 Streaks versus the Magnitude of Earnings Surprises

This subsection alters the double-sort underlying the extended PEAD strategy to investigate the return predictability of large earnings surprises within streaks and reversals. Within the streak and reversal portfolios, we sort stocks in quintiles according to the magnitude of their most recent earnings SURP. As reported in Panel A of Table 5, after controlling for streaks in prior earnings surprises, cross-sectional differences across the magnitude of the most recent quarter's SURP generate cross-sectional return variation in all quintiles except the middle (third) quintile. The significant four-factor alphas in the second and fourth quintiles indicate that the magnitude of the most recent SURP is relatively less important than streaks.

We also show that the ability of large earnings surprises to influence future returns is limited to streaks. In particular, within the reversal portfolio, the magnitude of a firm's most recent SURP does not impact future returns as neither the smallest nor largest earnings surprises are associated with risk-adjusted holding period returns.

To further examine the influence of streaks on PEAD, we construct a streak factor. The streak factor is defined as the monthly long-short return of our first trading strategy that ignores cross-sectional variation in the magnitude of earnings surprises and focuses exclusively on the

[9]Analysts may issue forecasts that are too low in order to allow firms to beat their forecasts. A later robustness test uses the cross-sectional median SURP rather than zero to sign earnings surprises. This alternative characterization accounts for such analyst biases when defining streaks.

[10]Dorsey-Palmer and Smith (2004) find evidence of hot-hands in bowling and argue that Tversky and Gilovich (1989a, 1989b) fail to find hot-hands in basketball because of competitive reactions to recent success. In particular, unlike bowling, opposing players in basketball can alter their defensive strategy against "hot" players. Similarly, firms can alter their competitive strategies against successful firms.

sign of prior firm-level SURPs. Unlike factors constructed from cross-sectional comparisons of firm characteristics, the long portfolio and short portfolio underlying our streak factor contain a different number of stocks.

Panel B of Table 5 reports a risk-adjusted PEAD of 0.649% per month over a six-month holding period after accounting for market (MKT), size (SMB), value (HML), and momentum (UMD) factors. However, the inclusion of our streak factor reduces the four-factor alpha by over 70%, from 0.649% per month to 0.196% per month. The streak factor also eliminates the return predictability corresponding to the smallest SURPs. Recall that the negative SURPs in the smallest quintile are larger in absolute value than the positive SURPs in the largest quintile. The coefficient on the streak factor is large and significant in every specification, especially for the long-short PEAD strategy where the importance of the market return is mitigated.

Overall, PEAD contains an important time series component arising from consistency within the sign of prior earnings surprises. A streak minus reversal factor denoted S-R also reduces risk-adjusted PEAD. However, despite the insignificant return predictability of reversals, the noise introduced by subtracting their returns from streaks results in a smaller reduction in PEAD's four-factor alpha.

4.4 Alternative Trend Definition

Besides streaks of consecutive earnings surprises with the same sign, we also examine trends that arise from *consistency* within the sign of prior earnings surprises. A trend occurs when the sign of the most recent quarterly earnings surprise is the same sign as the majority (50%) of prior earnings surprises.[11] These imbalances proxy for the likelihood functions underlying the quasi-Bayesian theories that motivate our empirical tests. Intuitively, when the majority of a firm's prior earnings surprises are positive, a positive earnings surprise produces a positive trend while a negative earnings surprise produces a negative reversal. The following diagrams illustrate a positive trend

[11] In instances where an earnings surprise is zero, the earnings surprise is classified as negative. When exactly half a firm's prior earnings surprises are non-positive, its imbalance is also classified as negative.

$$\overbrace{++-++++++-++}^{\text{Positive Imbalance}} \quad \underbrace{+}_{\text{Most Recent}} \quad \longrightarrow \text{Positive Trend}$$

and a negative reversal

$$\overbrace{++-++++++-++}^{\text{Positive Imbalance}} \quad \underbrace{-}_{\text{Most Recent}} \quad \longrightarrow \text{Negative Reversal}\,.$$

This general definition of trends defined by consistency encompass streaks as a special case. For example, a streak of four consecutive positive surprises requires the most recent surprise to be positive while also requiring the positive imbalance in a firm's prior three surprises to equal its maximum of 100%. In contrast, according to the gambler's fallacy, if nine of the last ten draws at a roulette wheel are red, then black is perceived to be more likely for the next draw than red regardless of when the black draw occurred. Unlike streaks, the imbalances that define trends do not depend on the exact sequencing of prior earnings surprises. Indeed, trends based on consistency can be defined over a firm's entire history of prior earnings surprises while streaks longer than ten quarters occur infrequently in our sample.

The exact number of prior earnings surprises that investors condition on when forming their expectations is unknown. Using a large number of prior earnings surprises may obscure the distinction between trends and reversals. For example, suppose 20 positive earnings surprises follow 30 negative earnings surprises. Although the majority of the past 50 earnings surprises are negative, investors may focus on the most recent 20 earnings surprises that are positive. Therefore, we examine imbalances over 2, 3, and 5 year horizons as well as a firm's entire history of earnings surprises. In order for firms to be included in the long or short portfolio of our trading strategies, they are required to have earnings announcements in the specified prior horizon for the 2, 3, and 5 year histories.

As with streaks, the results in Table 6 indicate that trends predict returns while reversals are usually associated with insignificant return predictability. Using the whole history of prior surprises to define imbalances, the trends minus reversals strategy yields a four-factor alpha of 0.481% (t =3.89). Using a 2-year history of prior surprises, the same strategy yields 0.798% (t =5.91). These results show that the stronger return predictability of trends compared to reversals is robust to different horizons over which imbalances in past SURPs are computed.

4.5 Fama-MacBeth Regressions

Fama and MacBeth (1973) regressions confirm our earlier portfolio-level results with additional control variables. Several specifications of the following cross-sectional regressions are estimated whose dependent variable $R_{t+1,t+6}$ denotes six-month buy-and-hold returns of individual stocks

$$\begin{aligned} R_{t+1,t+6} &= \gamma_0 + \gamma_1 \,\mathrm{Beta}_t + \gamma_2 \,\log \mathrm{BM}_t + \gamma_3 \,\log \mathrm{Size}_t + \gamma_4 \,\mathrm{PRET}_t + \gamma_5 \,\mathrm{SURP}_t \\ &\quad + \gamma_6 \,\mathrm{SURP}_t^P + \gamma_7 \,\mathrm{SURP}_t^N + \gamma_8 \,\mathrm{Streak}_t + \gamma_9 \,\mathrm{Streak}_t^P + \gamma_{10} \,\mathrm{Streak}_t^N + \gamma_{11} \,\mathrm{Consistency}_t \\ &\quad + \gamma_{12} \,\mathrm{LagSURP}_t + \gamma_{13} \,\mathrm{Lag2SURP}_t + \gamma_{14} \sum \mathrm{LagSURP}_t + \alpha \, X + \varepsilon \,. \end{aligned} \tag{2}$$

A firm's market beta is estimated using monthly returns over the prior three calendar years while book-to-market ratios (BM) and size, which represents a firm's market capitalization, are measured according to Fama and French (2006). PRET denotes past returns over the prior twelve months after omitting the most recent month. The most recent earnings surprise is also divided into SURP Positive and SURP Negative. The variable SURP^P (SURP^N) equals SURP when SURP is positive (negative), and zero otherwise. The Streak variable is defined as

$$\begin{cases} +1 & \text{for positive streaks} \\ \;\;0 & \text{otherwise} \\ -1 & \text{for negative streaks} \end{cases}$$

for streaks of at least two consecutive quarters. The positive and negative components of the Streak variable denoted Streak^P and Streak^N are dummy variables that equal one when the Streak variable is positive and negative, respectively, and zero otherwise. The Consistency variable is defined as

$$\begin{cases} +1 & \text{the majority of prior earnings surprises and the most recent SURP are positive} \\ \;\;0 & \text{otherwise} \\ -1 & \text{the majority of prior earnings surprises and the most recent SURP are negative} \end{cases}$$

This variable is defined over the entire history of a firm's prior earnings surprises. We also control for the magnitude of prior earnings surprises because returns may capture the cumulative return continuation following earnings surprises before the most recent quarter. Lagged earnings surprises denoted LagSURP and Lag2SURP over the previous three-to-six-month and six-to-nine-month horizons, respectively, are included to address this possibility. We also include the sum

of all a firm's prior earnings surprises denoted $\sum$ LagSURP excluding the most recent quarterly earnings surprise.[12] All SURP variables are winsorized at the 0.1 percentiles to mitigate the effects of outliers. The X vector contains an array of control variables that account for cross-sectional differences in firm characteristics pertaining to liquidity, information transmission, and uncertainty. These variables include Amihud's (2002) illiquidity measure, idiosyncratic volatility, log of turnover, analyst forecast dispersion, log of one plus analyst coverage, and institutional ownership.

Table 7 reports the time-series averages of the monthly Fama-MacBeth coefficients (multiplied by 100). The standard errors associated with the t-statistics are Newey-West adjusted with six lags since the returns are generated from overlapping six-month horizons. The premium for exposure to market-level return fluctuations, the size premium, and the value premium are captured by the γ_1, γ_2, and γ_3 coefficients while the γ_4 coefficient for PRET is consistent with price momentum. The positive γ_5 coefficients for SURP are consistent with the existing PEAD literature. Furthermore, with the γ_6 coefficient being slightly smaller than the γ_7 coefficient, negative earnings surprises exert a slightly larger impact on future returns although their impact is only marginally significant.

The positive γ_8 coefficients indicate that streaks predict returns. This is the most important finding in Table 7. In particular, consistent with the returns from our first trading strategy, a positive γ_8 coefficient implies that positive streaks and negative streaks result in higher returns and lower returns, respectively. The positive γ_9 and γ_{10} coefficients confirm that both positive and negative streaks predict returns. Nonetheless, the Consistency variable also predicts returns since its γ_{11} coefficients are positive, even after controlling for streaks. Thus, investors do not appear to focus exclusively on the most recent sequence of consecutively positive or negative earnings surprises. Moreover, the magnitude of earnings surprises during the prior six-to-nine months (LagSURP and Lag2SURP) have insignificant γ_{12} and γ_{13} coefficients. The insignificant γ_{14} coefficient that pertains to the sum of all lagged earnings surprises is also insignificant. This shows that the return predictability of streaks is not driven by the same-signed earnings surprises prior to the most recent earnings surprise.

[12]Excluding LagSURP and Lag2SURP from this sum does not alter our results.

5 Robustness Tests

This section demonstrates the robustness of our results to various alternative specifications and competing hypotheses. It also discusses and tests additional predictions of the gambler's fallacy.

5.1 Prior Literature

Barth, Elliot, and Finn (1999) as well as Myers, Myers, and Skinner (2007) document that firms with increasing earnings have higher valuations but large price decreases following the termination of earnings increases. However, these studies examine contemporaneous returns in the quarter in which earnings are announced. In contrast, we examine returns after earnings are reported using calendar-time trading strategies to evaluate the return predictability of trends.

We replicate the estimation in Barth, Elliot, and Finn (1999). These authors examine annual changes in accounting net income using a panel regression. Despite our use of quarterly SURPs and a different time period, we are able to replicate the essence of their findings using a Fama-MacBeth regression. Beginning with Table 7, we define the next quarter's future return as the three-month buy-and-hold return starting one-month after the most recent SURP while the contemporaneous quarter's return is defined using the three-month return *ending* in the month of the most recent SURP announcement. Following Barth, Elliot, and Finn's specification (their Table 5B), we interact SURP with a dummy variable that equals one when there is a positive streak whose length is at least two. We also interact SURP with a dummy variable for negative reversals that equals one when a positive streak is ended by the most recent SURP being negative.

Using contemporaneous returns as the dependent variable, Barth, Elliot, and Finn (1999) report that coefficients for the streak and reversal interactions are positive and negative, respectively. In unreported results, we obtain similar evidence. However, when we investigate future returns, the reversal interaction is no longer economically nor statistically significant. This finding implies that the market does not underreact to reversals. In contrast to reversals, the coefficient for the streak interaction remains significantly positive when future returns are examined. Overall, the market appears to underreact less to reversals than streaks since reversals exert a larger (smaller) impact on contemporaneous (future) returns than streaks. Therefore, consistent with the results in Table 7, this evidence suggests that investors underreact to streaks.

Our paper is further distinguished from the existing accounting literature given its focus on analyst-based earnings surprises that account for earnings predictability. Our more recent sample period and the use of quarterly earnings surprises rather than annual earnings announcements also differ from the existing literature.

5.2 Earnings Surprise Autocorrelation

Analyst-based earnings surprises are not highly autocorrelated since analysts are able to adjust their expectations for firms that repeatedly beat or miss earnings.[13] However, Chan, Karceski, and Lakonishok (2007) document that in recent years, analyst incentives caused analysts to systematically underestimate earnings, thereby allowing management to beat the consensus forecast. The implication of this bias is that firms reporting earnings that marginally exceed consensus forecasts should not be classified as having positive earnings surprises. To address this issue, we repeat our tests by classifying SURPs as positive only if they exceed the cross-sectional median SURP among the firms that reported earnings in the past 90 days, and negative otherwise. We find nearly identical results (unreported) compared to those in Table 3. This provides assurance that our results are insensitive to any potential misclassification of small positive surprises.

The second test we conduct directly relates to the autocorrelation in SURPs. Positive autocorrelation within earnings surprises would increase the likelihood of streaks. Although Rabin and Vayanos (2010) demonstrate that the underreaction to streaks predicted by the gambler's fallacy applies to autocorrelated sequences, Bernard and Thomas (1990) hypothesize that PEAD is caused by investors underestimating the positive autocorrelation in earnings surprises. Bernard and Thomas hypothesize that streaks are informative about autocorrelation and investors ignore this informativeness. To test this hypothesis, we examine a subset of firms whose earnings surprises are independent according to the runs test (Campbell, Lo, and MacKinlay, 1996) as well as a four-lag autoregressive model.

The first subset of independent quarterly SURPs is obtained by applying the runs test at the 10% significance level to firm-level earnings surprises. The runs test begins in January 1987

[13]Our main results hold for earning surprises defined relative to realized earnings (SUEs), as in Chordia and Shivakumar (2006). Besides being more autocorrelated at the firm-level, SUEs are skewed towards positive earnings surprises.

for firms with at least 12 quarterly earnings surprises. According to the runs test at the ten-percent significance level, the subset of observations whose earnings surprises defined by analyst forecasts are autocorrelated comprises only 22.28% of our sample. Thus, the majority of firms have analyst-based earnings surprises that are not autocorrelated.

The second subset of stocks with independent earnings surprises is defined by the following autoregressive model:

$$SURP_t = \alpha_0 + \alpha_1 SURP_{t-1} + \alpha_2 SURP_{t-2} + \alpha_3 SURP_{t-3} + \alpha_4 SURP_{t-4} + \epsilon_t . \quad (3)$$

This regression accounts for regularities in consecutive firm-level earnings surprises that may arise from earnings management or analyst forecast biases. Firms having an R^2 from equation (3) below 0.25 are placed in the independent subset. A low R^2 indicates that the magnitude, hence sign, of a firm's earnings surprise next quarter is difficult to predict. We replicate our results in Panel B of Table 3 using the independent and autocorrelated subsets.

In unreported results, streaks continue to induce significantly stronger return predictability than reversals in the independent subset as well as the autocorrelated subset. This finding applies to independent SURPs defined by the runs test and the autoregressive model. Indeed, reversals are not associated with significant return predictability while streaks yield significant risk-adjusted returns in all but the middle quintile. Returns predictability from streaks also exceeds that from reversals. Thus, the results for independent and autocorrelated SURPs parallel our earlier results in Panel B of Table 3.

We conclude that the return implications of streaks is not driven by the positive autocorrelation in earnings surprises. Instead, our results suggest that investors condition on uninformative streaks in earnings surprises rather than underestimate the autocorrelation in earnings surprises.

5.3 Short-Sale Constraints and Limited Attention

To determine if short-sale constraints explain our results, we proxy for short-sale constraints using low institutional ownership since investors cannot easily borrow shares in these firms. Unreported results confirm that short-sale constraints cannot explain the return predictability of streaks since the stronger return predictability of streaks relative to reversals is equally apparent

for firms with high or low institutional ownership. Therefore, short-sale constraints do not appear to drive the return predictability of streaks.

Instead of short-sale constraints, limited attention provides an alternative characterization of our results. Hirshleifer, Lim, and Teoh (2009) and DellaVigna and Pollet (2009) find that investors are less attentive on days with more earnings announcements and on Fridays, respectively. To test this alternative explanation, we check whether streaks tend to occur more on low attention days compared to reversals. We find that the percentage of Friday announcements for streaks and reversals is almost identical, at 11.43% and 11.45%, respectively. The average number of firms making announcements is also nearly identical for earnings announcements classified as streaks (133.7) or reversals (133.0). Hence, limited attention is unlikely to be an explanation for the stronger return predictability of streaks.

5.4 Earnings Uncertainty and Diffuse Priors

According to Rabin, the gambler's fallacy is predicted to be weaker for longer streaks when investors have more diffuse priors regarding the underlying long-term distribution of signals. Specifically, diffuse investor beliefs allow the hot-hands phenomena to undermine the gambler's fallacy following long streaks. We proxy for a diffuse prior regarding future earnings with high realized volatility and high analyst forecast dispersion. We then test whether the return predictability of long streaks is weaker for firms with high realized earnings uncertainty and high analyst forecast dispersion. This exercise essentially replicates Table 4 for these subsets of firms.

Unreported results confirm that the return predictability following streaks of at least ten is weaker for firms with high earnings variability or high forecast dispersion. Thus, consistent with Rabin's prediction in our empirical setting, the gambler's fallacy appears to be weaker when investors have more diffuse prior beliefs regarding future earnings.

5.5 Abnormal Turnover

Provided investors condition on different information sets, Rabin and Vayanos (2010) predict that trading volume would be higher in portfolios containing streaks than reversals. We test this hypothesis using the average abnormal turnover during the six-month holding period. Abnormal

turnover is defined as turnover in a particular month divided by the portfolio's average turnover in the prior six months, minus one. Unreported results reveal that the average abnormal holding-period turnover is higher for firms in the streak portfolio than for firms in the reversal portfolio. This evidence is consistent with an initial underreaction to streaks that leads to greater trading volume in the subsequent holding period. Consequently, abnormal turnover is consistent with the gambler's fallacy.

6 Conclusions

We find that streaks consisting of consecutive quarterly earnings surprises with the same sign have important return implications. A trading strategy that conditions on streaks defined by at least two prior earnings surprises yields a significant four-factor adjusted return of 0.603% per month. This strategy buys stocks with positive streaks and sells stocks with negative streaks while ignoring the magnitude of earnings surprises. Conversely, the four-factor adjusted return from conditioning on reversals, which correspond to the termination of streaks, is insignificant. The difference between the return on the streaks strategy and the reversals strategy is also economically and statistically significant.

We also assess the return predictability of streaks after accounting for the magnitude of the most recent earnings surprises. After sorting firms into quintiles according to the magnitude of their most recent earnings surprise, we divide these quintiles into portfolios of streaks and reversals. We then buy stocks with positive streaks in the highest quintile and sell stocks with negative streaks in the lowest quintile. A four-factor alpha of 0.882% per month is obtained from this trading strategy. Again, this strategy's return is significantly higher than that of a similar strategy that conditions on reversals.

Our results show that PEAD is limited to streaks. Indeed, a streak factor from the returns of our first trading strategy explains 70% of PEAD's four-factor alpha. Therefore, despite being a cross-sectional anomaly, PEAD has a significant time series component. Fama-MacBeth regressions confirm the return predictability of streaks after controlling for a variety of firm characteristics that include earnings surprises before the most recent quarter. We also confirm that the autocorrelation in quarterly earnings surprises is not driving our results.

In summary, our results indicate that investor expectations are influenced by trends in prior quarterly earnings surprises. Our evidence supports the gambler's fallacy in Rabin (2002) because investors appear to underreact to trends in earnings surprises. One interesting avenue for future research is to examine the link between the gambler's fallacy and price momentum. Preliminary evidence from our Fama-MacBeth regressions indicate that price momentum is insignificant after controlling for trends in earnings surprises.

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Table 1: Summary Statistics for Earnings Surprises

This table describes our sample of earnings surprises as well as the streaks defined by these surprises. SURP is the firm's quarterly earnings surprise defined as I/B/E/S actual earnings minus the most recent mean consensus estimate, scaled by the stock price. Streaks occur when the two most recent quarterly SURPs are of the same sign. Reversals occur when such a streak has ended. For each year in our 1984 to 2009 sample period, the average SURP is reported in Panel A along with the average market beta, book-to-market ratio (BM), and size (millions of dollars) of the firms in our sample. The number and percentage of streaks are also reported in Panel A. Streaks are defined beginning in 1987 to obtain an initial history of prior SURPs. An extended set of firm characteristics are summarized in Panel B for streaks and reversals. These characteristics include returns over the past twelve months while omitting the most recent month (PRET), institutional ownership (IO), Amihud's illiquidity measure, and turnover.

Panel A: Average firm characteristics by year

Year	Number of firms	Number of firm-months	SURP	Beta	BM	Size	Number of streaks	Percentage of streaks
1984	941	1675	-0.014	1.09	0.79	1045	-	-
1985	1364	12813	-0.049	1.14	0.84	1086	-	-
1986	1472	14304	-0.054	1.23	0.79	1331	-	-
1987	1689	15635	-0.043	1.11	0.71	1564	8982	0.57
1988	1761	15590	-0.028	1.14	0.74	1614	8958	0.57
1989	2144	19633	-0.069	1.15	0.77	1374	11297	0.58
1990	2220	20463	-0.028	1.14	0.71	1508	12159	0.59
1991	2278	21674	-0.062	1.19	0.79	1555	12899	0.60
1992	2500	23825	-0.053	1.20	0.82	1579	14418	0.61
1993	2872	26642	-0.072	1.30	0.66	1649	16375	0.61
1994	3406	31021	-0.056	1.25	0.58	1555	18910	0.61
1995	3724	34603	-0.030	1.17	0.59	1572	21565	0.62
1996	4048	37588	-0.003	1.09	0.58	1818	22875	0.61
1997	4435	40167	-0.027	1.12	0.53	2197	24997	0.62
1998	4463	39942	-0.021	1.01	0.49	2831	24442	0.61
1999	4202	37939	-0.023	1.14	0.51	3647	23900	0.63
2000	4075	35049	0.016	1.10	0.55	4590	22121	0.63
2001	3426	30785	0.019	1.02	0.63	5155	18537	0.60
2002	3175	29439	-0.001	0.92	0.64	4622	17834	0.61
2003	3105	29772	-0.081	1.03	0.65	4153	18154	0.61
2004	3258	32133	-0.025	1.14	0.61	4247	19288	0.60
2005	3250	31885	-0.001	1.16	0.49	4725	18810	0.59
2006	3325	32742	0.000	1.45	0.49	4899	19535	0.60
2007	3313	32509	-0.598	1.51	0.48	5480	19235	0.59
2008	3055	29229	-0.003	1.25	0.52	5975	17435	0.60
2009	2732	25849	-0.004	1.10	0.76	5114	15567	0.60
Overall	9706	702906	-0.052	1.16	0.61	3245	408293	0.61

Panel B: Average firm characteristics for streaks and reversals

	SURP	Size	BM	PRET	IO	Amihud	Turnover
Streaks	-0.037	3304	0.61	0.185	0.531	0.50	0.561
Reversals	-0.003	3023	0.63	0.164	0.512	0.63	0.535
Difference	-0.034***	281***	-0.02***	0.021***	0.019***	-0.13***	0.026***

Table 2: Summary Statistics for Streaks and Reversals

This table reports on the frequency of streaks and reversals during our 1987 to 2009 sample period. Firms are sorted into quintiles each month based on their most recent SURP. A quarterly SURP denotes a firm's quarterly earnings surprise, defined as I/B/E/S actual earnings minus the most recent mean consensus estimate of analysts, scaled by its stock price. Streaks occur when the two most recent quarterly SURPs are of the same sign. Reversals occur when such a streak has ended. Panel A reports the number of observations and Panel B the average SURP (multiplied by 100). All SURPs are winsorized at the extreme 0.1 percentiles for each monthly cross-section. SURPs greater than zero are classified as positive while values equaling zero or below zero are classified as negative.

Panel A: Number of observations

	SURP sign		SURP quintile				
Streak length	Negative	Positive	Smallest	2	3	4	Largest
2	72760	74533	29625	24488	33846	28983	30351
3	43477	44507	19013	13993	19362	17825	17791
4	26750	27677	12221	8196	11936	11362	10712
5	17398	18905	7911	5441	8001	7693	7257
6	11592	12898	5228	3542	5620	5584	4516
7	7584	8917	3345	2398	3784	3848	3126
8	5017	5992	2195	1525	2815	2551	1923
9	3363	4273	1525	937	1935	1861	1378
≥ 10	8326	11255	3316	2460	5683	4676	3446
All Streaks	196267	208957	84379	62980	92982	84383	80500
Reversals	72113	75823	23881	26796	38271	28305	30683

Panel B: Average SURP magnitude ($\times$ 100)

	SURP sign		SURP quintile				
Streak length	Negative	Positive	Smallest	2	3	4	Largest
2	-1.31	0.53	-3.13	-0.10	0.02	0.13	1.16
3	-1.97	0.44	-4.44	-0.10	0.02	0.13	0.94
4	-1.65	0.44	-3.55	-0.10	0.02	0.13	0.97
5	-3.21	0.44	-6.99	-0.10	0.02	0.13	0.99
6	-4.28	0.35	-9.43	-0.10	0.02	0.13	0.81
7	-2.27	0.34	-5.07	-0.10	0.02	0.13	0.78
8	-2.43	0.31	-5.49	-0.10	0.02	0.13	0.75
9	-1.45	0.30	-3.14	-0.10	0.02	0.13	0.74
≥ 10	-1.63	0.27	-4.03	-0.09	0.02	0.13	0.68
All Streaks	-1.93	0.45	-4.41	-0.10	0.02	0.13	1.00
Reversals	-1.15	0.65	-3.36	-0.10	0.02	0.13	1.48

Table 3: Trading Strategies using Streaks and Reversals

This table reports the returns from calendar-time trading strategies involving streaks and reversals in earnings surprises from 1987 to 2009. SURP is the firm's quarterly earnings surprise defined as I/B/E/S actual earnings minus the most recent mean consensus estimate, scaled by its stock price. Each month, based on the most recent SURP, firms are sorted into SURP portfolios according to the sign (Panel A) of its SURP or its quintile rank (Panel B). Stocks having streaks whose length is at least two are also independently separated into streak portfolios and reversal portfolios. Stocks remain in the relevant portfolio for six months, although stocks with lagged prices below five dollars are excluded from our trading strategies that buy stocks with positive streaks and sell stocks with negative streaks. Equally-weighted returns are computed each month and the time-series of these monthly returns less the risk-free rate are regressed on the three-factor or four-factor models to obtain alpha estimates that are reported as a percentage. DGTW-adjusted returns are also reported using the methodology in Daniel, Grinblatt, Titman, and Wermers (1997). *, **, and *** denote statistical significance of the abnormal returns at the 10%, 5%, and 1% levels, respectively, with the associated t-statistics in parentheses.

	Panel A: SURP Signs			Panel B: SURP Quintiles					
	Negative	Positive	Spread	Smallest	2	3	4	Largest	Spread
Four-factor alphas									
Streaks	-0.280***	0.322***	0.603***	-0.444***	-0.157*	0.071	0.263***	0.438***	0.882***
	(-3.78)	(4.32)	(8.12)	(-5.23)	(-1.79)	(0.88)	(2.95)	(5.41)	(8.92)
Reversals	0.081	0.080	-0.001	0.056	0.097	0.118	0.068	0.101	0.044
	(1.14)	(1.21)	(-0.01)	(0.72)	(1.20)	(1.28)	(0.78)	(1.19)	(0.48)
Difference	-0.362***	0.242***	0.603***	-0.500***	-0.254***	-0.047	0.194**	0.337***	0.838***
	(-6.34)	(3.97)	(5.66)	(-5.83)	(-3.66)	(-0.86)	(2.57)	(3.99)	(5.75)
Fama-French 3-factor alphas									
Streaks	-0.375***	0.287***	0.663***	-0.561***	-0.242***	0.036	0.224**	0.397***	0.957***
	(-4.69)	(3.86)	(8.73)	(-6.05)	(-2.65)	(0.45)	(2.54)	(4.91)	(9.51)
Reversals	-0.020	0.059	0.078	-0.070	0.028	0.052	0.032	0.087	0.158
	(-0.25)	(0.89)	(1.26)	(-0.79)	(0.34)	(0.56)	(0.37)	(1.05)	(1.59)
Difference	-0.356***	0.229***	0.584***	-0.491***	-0.270***	-0.016	0.192**	0.309***	0.800***
	(-6.34)	(3.81)	(5.56)	(-5.81)	(-3.95)	(-0.29)	(2.58)	(3.70)	(5.56)
DGTW-adjusted average returns									
Streaks	-0.239***	0.144***	0.383***	-0.391***	-0.129**	0.011	0.078	0.236***	0.627***
	(-3.87)	(3.01)	(5.74)	(-4.86)	(-2.16)	(0.21)	(1.46)	(3.46)	(6.52)
Reversals	-0.033	0.035	0.068	-0.064	-0.011	0.021	0.013	0.056	0.120
	(-0.66)	(0.64)	(1.28)	(-0.91)	(-0.20)	(0.35)	(0.19)	(0.72)	(1.39)
Difference	-0.206***	0.109**	0.315***	-0.328***	-0.118**	-0.010	0.065	0.179**	0.507***
	(-3.98)	(1.98)	(3.28)	(-4.12)	(-1.98)	(-0.21)	(0.97)	(2.17)	(3.70)
Average number of stocks per month									
Streaks	1132	1202		572	478	704	624	546	
Reversals	664	654		197	251	342	249	273	

Table 4: Returns based on Streak Length

This table reports the returns from calendar-time trading strategies involving streaks and reversals in earnings surprises from 1987 to 2009 are reported. Streak length is defined as short, medium, and long where consecutive same-signed quarterly SURPs are between 2 to 3, 4 to 5, 6 to 9, and 10 or greater, respectively. A reversal occurs when a streak whose length is at least two ends. SURP denotes a firm's quarterly earnings surprise defined as the I/B/E/S actual earnings minus the most recent mean consensus estimate, scaled by its stock price. Each month, based on the most recent SURP, firms are sorted into SURP portfolios according to the sign (Panel A) of their most recent SURP or its quintile rank (Panel B). Stocks are also independently separated into streak portfolios based on their length and reversal portfolios. The stock remains in the relevant portfolio for six months and stocks with lagged prices below five dollars are excluded from the holding-period returns. Equally-weighted returns are computed each month and the time-series of these monthly returns less the risk-free rate are regressed on the four-factor model to obtain alpha estimates that are reported as a percentage. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively, with the associated t-statistics in parentheses.

	SURP Quintiles					
	Smallest	2	3	4	Largest	Spread
Abnormal returns based on streak length						
Streaks of 2 to 3	-0.325***	-0.095	0.105	0.197**	0.454***	0.780***
	(-3.70)	(-1.06)	(1.22)	(2.28)	(5.91)	(8.53)
Streaks of 4 to 5	-0.537***	-0.302***	-0.026	0.254**	0.383***	0.920***
	(-4.93)	(-2.74)	(-0.26)	(2.38)	(3.51)	(6.29)
Streaks of 6 to 9	-0.760***	-0.190	0.053	0.358***	0.426***	1.186***
	(-5.62)	(-1.35)	(0.50)	(2.67)	(2.86)	(5.58)
Streaks $\geq$ 10	-0.670***	-0.274	0.127	0.654***	0.450*	1.120***
	(-2.99)	(-1.36)	(0.85)	(3.22)	(1.76)	(3.49)
Reversals	0.056	0.098	0.118	0.068	0.101	0.044
	(0.72)	(1.21)	(1.28)	(0.78)	(1.19)	(0.48)
Difference between streaks and reversals						
Streaks of 2 to 3	-0.382***	-0.193***	-0.013	0.129*	0.354***	0.735***
	(-4.45)	(-2.88)	(-0.23)	(1.80)	(4.80)	(5.54)
Streaks of 4 to 5	-0.593***	-0.400***	-0.144*	0.186*	0.283**	0.876***
	(-5.36)	(-3.93)	(-1.75)	(1.90)	(2.41)	(4.71)
Streaks of 6 to 9	-0.816***	-0.288**	-0.065	0.290**	0.326**	1.142***
	(-5.88)	(-2.15)	(-0.71)	(2.37)	(2.13)	(4.69)
Streaks $\geq$ 10	-0.727***	-0.372*	0.009	0.586***	0.349	1.076***
	(-2.33)	(-1.52)	(-0.88)	(1.64)	(2.46)	(3.32)
Average number of stocks per month						
Streaks of 2 to 3	363	320	433	373	363	
Streaks of 4 to 5	164	117	175	167	144	
Streaks of 6 to 9	94	66	117	112	81	
Streaks $\geq$ 10	26	18	45	41	25	
Reversals	197	251	342	249	273	

Table 5: Magnitude of Earnings Surprises within Streaks and Reversals

This table reports the returns associated with the magnitude of earnings surprises within streaks and reversals over the 1987 to 2009 sample period. SURP denotes a firm's quarterly earnings surprise defined as I/B/E/S actual earnings minus the most recent mean consensus estimate, scaled by its stock price. Stocks are first separated into streaks whose length is at least two while reversals occur when a streak ends. Second, within each streak or reversal portfolio, firms are further sorted into SURP quintiles every month based on the magnitude of their most recent SURP. The stock remains in the relevant portfolio for six months and stocks with lagged prices below five dollars are excluded from our trading strategies. Equally-weighted returns are computed each month and the time-series of these monthly returns less the risk-free rate are regressed on the four-factor model to obtain alpha estimates that are reported as a percentage in Panel A. *, **, and *** denote statistical significance of the abnormal returns at the 10%, 5%, and 1% levels, respectively, with the associated t-statistics in parentheses. In Panel B, the time-series of monthly portfolio returns from various SURP quintiles are regressed on excess market returns (MKT), size (SMB), value (HML), and momentum (UMD) factors as well as a streak factor and a streak minus reversal factor denoted S-R. The streak factor is defined as the monthly returns from the trading strategy in Panel A of Table 3. The S-R factor is defined as the return spread from the positive minus negative streak strategy minus the return spread from the positive minus negative reversal strategy.

Panel A: Four-factor alphas

	SURP Quintiles sorted within streaks or reversals					
	Smallest	2	3	4	Largest	Spread
Streaks	-0.500***	-0.180**	0.027	0.224**	0.433***	0.934***
	(-6.01)	(-2.23)	(0.33)	(2.57)	(5.53)	(9.37)
Reversals	0.042	0.105	0.128	0.043	0.103	0.061
	(0.61)	(1.20)	(1.38)	(0.55)	(1.23)	(0.68)
Difference	-0.543***	-0.284***	-0.100	0.181**	0.330***	0.873***
	(-6.56)	(-3.95)	(-1.40)	(2.58)	(4.00)	(6.21)
Average number of stocks per month						
Streaks	564	618	652	625	567	
Reversals	269	275	309	282	269	

Panel B: Time-series regressions

SURP Quintile	Intercept	MKTRF	SMB	HML	UMD	S-R factor	Streak factor	Adj. R^2
Smallest	-0.312***	1.012***	0.784***	0.354***	-0.133***			0.959
	(-4.29)	(59.11)	(35.16)	(14.30)	(-9.04)			
Smallest	-0.137*	1.030***	0.730***	0.253***	-0.139***	-0.291***		0.967
	(-1.96)	(65.62)	(34.12)	(9.70)	(-10.44)	(-7.72)		
Smallest	-0.001	1.052***	0.713***	0.231***	-0.096***		-0.516***	0.971
	(-0.01)	(69.70)	(35.22)	(9.50)	(-7.42)		(-10.17)	
Largest	0.337***	1.078***	0.655***	0.275***	-0.045***			0.963
	(4.87)	(66.25)	(30.93)	(11.68)	(-3.22)			
Largest	0.272***	1.071***	0.675***	0.312***	-0.042***	0.107***		0.964
	(3.77)	(65.88)	(30.47)	(11.58)	(-3.07)	(2.74)		
Largest	0.195***	1.060***	0.687***	0.331***	-0.061***		0.235***	0.965
	(2.61)	(64.94)	(31.41)	(12.57)	(-4.36)		(4.28)	
Spread	0.649***	0.065***	-0.129***	-0.080***	0.088***			0.243
	(9.35)	(4.01)	(-6.07)	(-3.37)	(6.28)			
Spread	0.409***	0.041***	-0.055***	0.060***	0.097***	0.397***		0.523
	(7.03)	(3.10)	(-3.09)	(2.74)	(8.70)	(12.65)		
Spread	0.196***	0.008	-0.025*	0.100***	0.035***		0.751***	0.731
	(4.25)	(0.79)	(-1.87)	(6.15)	(4.05)		(22.18)	

Table 6: Using Consistency to Define Trends

This table reports the returns from calendar-time trading strategies during our 1987 to 2009 sample period. A trend is defined by the consistency between the sign of prior SURPs with the most recent SURP. A trend (reversal) occurs when the sign of the sign of most recent SURP is the same (opposite) sign as the majority of a firm's prior SURPs. Each panel shows consistency based on different prior horizons. For the 2, 3, and 5-year horizons, stocks must have at least the relevant horizon's history of past SURPs to be included. As the analyst forecasts underlying SURPs become available in 1984, portfolio formation for the 5-year window starts in 1989. SURP denotes a firm's quarterly earnings surprise defined as I/B/E/S actual earnings minus the most recent mean consensus estimate, scaled by its stock price. Each month, firms are sorted into portfolios according the quintile rank of their most recent SURP. The stock remains in the relevant portfolio for six months and stocks with lagged prices below five dollars are excluded from each portfolio's holding-period return. Equally-weighted returns are computed each month and the time-series of these monthly returns less the risk-free rate are regressed on the four-factor model to obtain alpha estimates that are reported as a percentage. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively, with the associated t-statistics in parentheses.

	SURP Quintiles					
	Smallest	2	3	4	Largest	Spread
All past SURPs used to define consistency						
Trends	-0.414***	-0.145	0.056	0.275***	0.417***	0.830***
	(-4.95)	(-1.62)	(0.68)	(3.09)	(4.98)	(8.29)
Reversals	-0.094	0.046	0.115	0.137	0.256***	0.350***
	(-1.10)	(0.56)	(1.34)	(1.53)	(3.28)	(4.17)
Difference	-0.320***	-0.191***	-0.058	0.138**	0.161**	0.481***
	(-4.10)	(-2.98)	(-1.21)	(2.13)	(2.10)	(3.89)
Average number of stocks per month						
Trends	302	358	533	485	493	
Reversals	568	488	691	517	419	
5 years of past SURPs used to define consistency						
Trends	-0.250**	-0.041	0.217**	0.305***	0.358***	0.608***
	(-2.44)	(-0.40)	(2.21)	(3.25)	(3.58)	(5.21)
Reversals	0.174*	0.211**	0.228**	0.212**	0.036	-0.138
	(1.66)	(2.26)	(2.35)	(2.08)	(0.27)	(-1.01)
Difference	-0.424***	-0.252***	-0.011	0.093	0.322**	0.746***
	(-4.29)	(-3.20)	(-0.20)	(1.30)	(2.58)	(4.22)
Average number of stocks per month						
Trends	181	247	360	306	287	
Reversals	306	311	474	354	267	
3 years of past SURPs used to define consistency						
Trends	-0.474***	-0.046	0.115	0.271***	0.355***	0.828***
	(-4.98)	(-0.41)	(1.36)	(3.00)	(3.96)	(7.56)
Reversals	0.067	0.126	0.139	0.170	0.133	0.066
	(0.68)	(1.48)	(1.43)	(1.54)	(1.34)	(0.66)
Difference	-0.541***	-0.172*	-0.024	0.101	0.221**	0.762***
	(-5.79)	(-1.86)	(-0.36)	(1.08)	(2.31)	(5.42)
Average number of stocks per month						
Trends	213	277	409	374	376	
Reversals	415	383	551	406	313	
2 years of past SURPs used to define consistency						
Trends	-0.418***	-0.154*	0.089	0.280***	0.455***	0.873***
	(-4.89)	(-1.70)	(1.06)	(3.07)	(5.09)	(8.25)
Reversals	0.164*	0.130	0.131	0.165*	0.238***	0.074
	(1.95)	(1.50)	(1.49)	(1.95)	(3.06)	(0.86)
Difference	-0.582***	-0.284***	-0.042	0.115*	0.217***	0.798***
	(-7.08)	(-3.84)	(-0.83)	(1.86)	(2.68)	(5.91)
Average number of stocks per month						
Trends	231	295	455	440	449	
Reversals	515	457	626	446	350	

Table 7: Fama-MacBeth Regressions

This table reports the coefficients from the Fama-MacBeth regression specifications in equation (2). Each month, six-month buy-and-hold returns are regressed on firm characteristics and SURP-related variables. The time-series average of the monthly coefficients (multiplied by 100) from 1987 to 2009 are reported and their associated Newey-West t-statistics with six lags are also reported in parentheses. An intercept is estimated but not reported. A firm's market beta is estimated using monthly returns over the prior three years, size is last June's market capitalization, BM is book equity divided by market equity, and PRET denotes buy-and-hold returns over the prior twelve months while omitting the most recent month. Streak is an indicator variable that is +1 for positive streaks (more than two consecutive positive SURPs), -1 for negative streaks, and 0 otherwise. The consistency variable is +1 (-1) whenever the sign of the majority of a firm's prior earnings surprises is positive (negative) and the most recent SURP is also positive (negative) and 0 otherwise. SURP denotes a firm's most recent quarterly earnings surprise defined as I/B/E/S actual earnings minus the mean consensus estimate of analysts, scaled by its stock price. SURP^P=SURP for positive values and zero otherwise. Streak^P is a dummy varible for positive streaks. Other control variables include lagged SURPs, the sum of all lagged SURPs, Amihud's (2002) illiquidity measure, idiosyncratic volatility, log of turnover, analyst forecast dispersion, log of one plus analyst coverage, and institutional ownership. All SURP variables are winsorized at the extreme 0.1 percentiles. Stocks with lagged prices below five dollars are excluded from the regression specifications. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively, with the associated t-statistics in parentheses.

	Regression Specifications						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Beta	0.292	0.259	0.255	0.231	0.237	0.242	0.206
	(0.35)	(0.31)	(0.31)	(0.28)	(0.29)	(0.29)	(0.33)
Log(BM)	1.115**	1.065**	1.045**	1.133**	1.091**	1.093**	0.800*
	(2.18)	(2.09)	(2.05)	(2.23)	(2.15)	(2.16)	(1.74)
Log(Size)	-0.066	-0.124	-0.125	-0.138	-0.141	-0.143	-0.623**
	(-0.28)	(-0.54)	(-0.56)	(-0.60)	(-0.61)	(-0.63)	(-2.41)
PRET	2.203**	1.506	1.499	1.737	1.477	1.448	1.731
	(2.04)	(1.43)	(1.41)	(1.62)	(1.40)	(1.36)	(1.48)
SURP	25.581***	18.693***		21.252***	18.773***	22.046***	13.031**
	(4.57)	(4.05)		(3.82)	(3.77)	(4.80)	(2.55)
SURP^P			23.866***				
			(2.95)				
SURP^N			31.468*				
			(1.84)				
Streak		1.454***			0.983***	0.949***	0.816***
		(9.23)			(5.75)	(5.80)	(4.95)
Streak^P Dummy			1.062***				
			(4.64)				
Streak^N Dummy			-1.795***				
			(-11.02)				
Consistency				1.368***	0.706***	0.698***	0.602***
				(6.71)	(2.94)	(3.00)	(2.74)
LagSURP						4.441	3.735
						(0.86)	(0.59)
Lag2SURP						4.989	7.140
						(0.85)	(1.21)
Sum of all lagged SURPs						0.109	-0.335
						(0.69)	(-1.08)
Amihud's Measure							-0.167
							(-0.95)
Idiosyncratic Volatility							-62.510***
							(-3.30)
Log(turnover)							-0.179
							(-0.52)
Dispersion							-0.150
							(-0.70)
Log(1+Analyst Coverage)							1.183***
							(2.85)
Institutional Ownership							-0.613
							(-0.53)
Number of months	276	276	276	276	276	276	276
Number of firm-months	2277	2277	2277	2277	2277	2277	1944

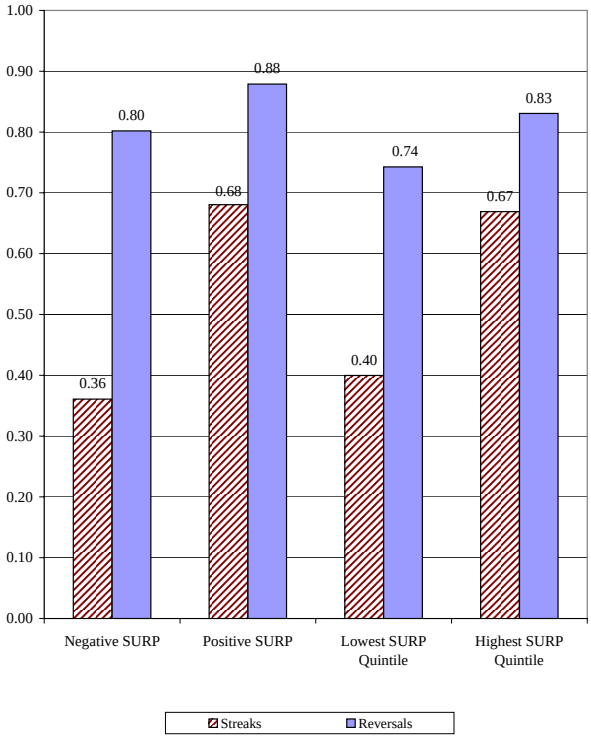

Figure 1: This figure plots the underreaction coefficients for streaks and reversals. These average coefficients are specified in terms of the sign and magnitude of a firms most recent earnings surprise denoted SURP. A quarterly SURP is defined as the I/B/E/S actual earnings for a particular quarter minus the mean consensus analyst earnnigs forecast for that quarter, scaled by the stock price. Each month from 1987 to 2009, based on the most recent SURP, firms are sorted into SURP quintiles as well as positive SURP and negative SURP portfolios. The underreaction coefficients are defined using cumulative abnormal returns following a three-day horizon (CAR) following quarterly earnings announcements and risk-adjusted returns over a longer six-month horizon (Drift) as follows $R = \frac{\text{CAR}}{\text{CAR+Drift}}$. The averages are computed using a Fama-MacBeth approach. First, quarterly cross-sectional average CARs and Drifts are computed, with the time-series averages of these cross-sectional averages defined as the underreaction coefficient R. A lower R ratio is evidence of a greater underreaction by investors as less information is immediately incorporated into prices.