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## Post loss/profit announcement drift

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### ABSTRACT

We document a market failure to fully respond to loss/profit quarterly announcements. The annualized post portfolio formation return spread between two portfolios formed on extreme losses and extreme profits is approximately 21 percent. This loss/profit anomaly is incremental to previously documented accounting-related anomalies, and is robust to alternative risk adjustments, distress risk, firm size, short sales constraints, transaction costs, and sample periods. In an effort to explain this finding, we show that this mispricing is related to differences between conditional and unconditional probabilities of losses/profits, as if stock prices do not fully reflect conditional probabilities in a timely fashion.

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## 1. Introduction

Market observers, academics, and regulators seem to agree that investors consider earnings releases important corporate events. Notwithstanding the attention investors seem to pay to earnings releases, academic studies have found that investors fail to *fully* incorporate the implications of earnings news into stock prices in a timely fashion. One strand of this literature (e.g., Foster et al., 1984; Bernard and Thomas, 1990; Ball and Bartov, 1996) documents predictable stock price changes around future earnings announcements (up to four quarters ahead), and attributed this finding to investors' misperception of the time-series process underlying standardized unexpected earnings (SUE). Another strand of this literature (e.g., Sloan, 1996) has documented accrual mispricing due to investors' apparent misperception of the time-series process underlying the cash flows and accruals components of earnings. Sloan (1996, p. 305), for example, concludes, "The earnings expectations embedded in stock prices consistently deviate from rational expectations in the direction predicted by naïve fixation on earnings."

Although these two earnings-related anomalies are distinct from each other (Collins and Hribar, 2000), the explanation underlying them is quite similar. The common storyline is that investors appear to use simplified time-series models to forecast earnings. The idea that humans, who are endowed with limited processing capacity, rely on simplified models, or imperfect decision-making procedures (i.e., heuristics), to solve complex problems is rooted in the field of social cognition

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(e.g., Simon, 1957; Kahneman and Tversky, 1973a, 1973b). Because individuals trade off correct inference and efficiency, they make decisions based on only a subset of the information available to them. The partial use of information may lead, in turn, to a cognitive bias (e.g., Daniel et al., 1998; Barberis et al., 1998; Hirshleifer and Teoh, 2003). According to this literature, the behavior of stock market indexes, the cross-section of average returns, and individual investors is inconsistent with the assumption that agents apply Bayes' law in their decision-making; rather, predictions underweight or even overlook distributional information.<sup>1</sup> The premise that investors make decisions based on normatively inappropriate simplifications, as well as findings in prior research showing mispricing of earnings information, motivates us to further investigate investors' assessment of quarterly earnings releases. However, unlike prior research that has focused on the pricing of earnings surprises (SUE) or earnings components (accruals and cash flows) we focus on the pricing of earnings signs, a loss versus a profit, and their magnitudes.

Our motivation to examine the market valuation of earnings signs and particularly losses follows from four strands of the literature. One strand of the literature shows that it is difficult to correctly characterize and value even simple time-series processes underlying earnings (see, e.g., Maines and Hand, 1996; Brown and Han, 2000; Bloomfield and Hales, 2002). A second strand of the literature demonstrates that losses are harder to predict. Specifically, prior studies (e.g., Basu et al., 1996; Brown, 2001) document that annual and quarterly earnings surprises (measured as reported earnings minus the most recent individual analyst forecast thereof) of loss firms are substantially larger than those of profit firms. Further, Hayn (1995) and Collins et al. (1999) find that the inclusion of losses dampens the earnings response coefficient and the  $R^2$  of the return-earnings regression. Based on this evidence both Hayn (1995) and Collins et al. (1999) conclude that losses are less informative than profits about firms' future prospects. Third, the accounting literature and the financial press assert that when firms report losses, traditional valuation models, such as the discounted residual earnings model, do not yield reliable estimates of firm value, and widely used heuristics (e.g., price-earnings ratios) are not useful. Finally, evidence from the psychological literature suggests that behavioral biases are larger when uncertainty is greater (see, e.g., Daniel et al., 1998, 2001; Hirshleifer, 2001). Thus, the difficulty market participants face in predicting and valuing quarterly earnings in general, and losses in particular, may create considerable price uncertainty particularly around loss announcements. This uncertainty, in turn, may create more opportunities for potential mispricing.

Employing a broad sample of 458,693 firm-quarters (15,143 distinct firms) that spans three decades, 1976–2005, we find that over the 120-trading-day window following the earnings announcement day, firms in an extreme loss portfolio (lowest earnings decile) exhibit a significantly negative drift (buy-and-hold size-adjusted return) of nearly six percent, whereas firms in an extreme profit decile portfolio (highest earnings decile) exhibit a significantly positive drift of over four percent. Further, a hedge portfolio that takes a long position in the extreme profit firms and a short position in the extreme loss firms generates approximately 10 percent abnormal return, which translates into an annualized return of approximately 21 percent. Further tests indicate that this abnormal return is more substantial than, and incremental to the returns generated by previously documented accounting-based trading strategies, most notably the post-earnings-announcement drift, the book-to-market anomaly, and the accruals anomaly. Sensitivity tests show that this loss/profit effect is robust to alternative risk adjustments (size-adjusted returns and Carhart's (1997) four factor model returns), up and down markets, distress risk, short sales constraints, and transaction costs. Finally, the results hold for the entire 30-year sample period, 1976–2005, as well as for three 10-year subperiods: 1976–1985, 1986–1995, and 1996–2005.

What may explain this mispricing? If investors rely on simplified models to assess a firm's future prospects, as findings in behavioral finance literature suggest, they may be assessing the probability of a loss/profit in quarter  $q$  based on its unconditional probability rather than the more complex and hard to calibrate conditional probability. This type of behavior would result in an underestimation of the probability of a loss/profit in quarter  $q$  for firms with a previous loss/profit if, as we assert, conditional probabilities are higher than unconditional probabilities. Consequently, a post loss/profit announcement drift in stock returns would be observed as investors revise upward their priors of a loss/profit in the period leading up to the earnings release of the subsequent quarter. Further, if the drift (partially) represents a market failure to fully reflect conditional probabilities in a timely fashion in stock prices, there should be a positive relation between the magnitude of the drift (the stock-price valuation error) and the difference between conditional and unconditional probabilities (our proxy for investor misperception of the probability of a future loss/profit). In support of this behavioral explanation for the stock price underreaction to loss/profit announcements, we find that conditional probabilities indeed exceed unconditional probabilities. Moreover, differences between conditional and unconditional probabilities are significantly correlated with future abnormal portfolio returns. That is, the higher the difference between conditional and unconditional probabilities, the higher the future abnormal returns. Finally, we document a negative relation between the number of analysts following a stock, a proxy for earnings forecast information available to investors, and the return from the loss/profit strategy. In other words, the less information available to investors, the greater the mispricing as our behavioral explanation would predict.

Our findings contribute to two literatures: the literature on the mispricing of earnings and the literature on the time-series properties of earnings in general, and losses in particular. Our contribution to the literature on the mispricing of earnings concerns showing that losses underlie the earnings-levels anomaly and that this anomaly is incremental to, and more pronounced than previously documented earnings-related anomalies. Our findings also offer a behavioral

<sup>1</sup> For competing theories of stock price anomalies, see, e.g., Brav and Heaton (2002).

**Table 1**  
Sample selection.

	Number of firm- quarters	Number of distinct firms
<b>Primary tests</b>		
All firm-quarter observations with required quarterly data on Compustat and return data on CRSP during sample period 1976–2005. <sup>a</sup>	471,997	15,261
With stock price 5 days prior to the quarterly earnings announcement date above \$1.	458,693	15,143
<b>Primary tests sample size</b>	<b>458,693</b>	<b>15,143</b>
<b>First set of supplementary tests: loss/profit effect vs. PEAD effect</b>		
Primary tests sample with additional data constraints to compute SUE, i.e. quarterly earnings data on Compustat for at least 13 consecutive quarters. <sup>b</sup>	359,909	12,824
<b>Second set of supplementary tests: loss/profit effect vs. value/glamour effect</b>		
Primary tests sample with additional data constraints to compute book-to-market value of equity ratio. <sup>c</sup>	448,500	15,101
<b>Third set of supplementary tests: loss/profit effect vs. accruals effect</b>		
Primary tests sample with additional data constraints to compute accruals. <sup>d</sup>	267,416	10,695

<sup>a</sup> Required data on Compustat is earnings before extraordinary items and discontinued operations (Compustat Quarterly data8) in quarter  $q$ , and total assets (Compustat Quarterly data44) in quarter  $q-1$ . Required data on CRSP is a daily return on quarter  $q$ 's earnings announcement date.

<sup>b</sup> SUE is the standardized unexpected earnings (generated using a seasonal random walk with drift model). Required data on Compustat to compute SUE in quarter  $q$  is earnings per share excluding extraordinary items and discontinued operations (Compustat Quarterly data9) from quarters  $q-12$  to  $q$  (an estimation period spanning the most recent 12 quarters is required).

<sup>c</sup> Required data on Compustat to compute the ratio of book-to-market value of equity is: Compustat Quarterly data59/(data61\*data14) in quarter  $q$ .

<sup>d</sup> Required data on Compustat to compute accruals is earnings before extraordinary items and discontinued operations (Compustat Quarterly data76), net cash flow from operating activities (Compustat Quarterly data108), and extraordinary income and discontinued operations (Compustat Quarterly data78) in quarter  $q$ , as well as total assets (Compustat Quarterly data44) in quarters  $q$  and  $q-1$ . Due to the unavailability of cash flow data prior to 1988, this sample spans 1988–2005.

explanation for this anomaly—which is consistent with an assertion in behavioral finance theories—that due to their limited processing ability investors rely on partial information when pricing stocks, and consequently make systematic valuation errors. This explanation puts in perspective the interpretation for the muted market response to losses asserted by prior studies that “the market regards losses as being transitory” (Collins et al., 1999, p. 57).

Our second contribution, the one related to the literature on the time-series properties of earnings, concerns studying the predictability of losses/profits based on their conditional probabilities. This new focus on conditional probabilities, earnings *signs*, and the tails of the earnings distribution to predict a future loss/profit, rather than on estimating earnings' time-series models using random samples, provides new insights. For example, the conditional probability of a loss is higher than its unconditional probability, and is increasing in the magnitude of the previous quarterly loss. Consequently, considering the conditional probability of a loss leads to the conclusion that losses are unlikely to reverse quickly, particularly when they are large. Conversely, assessing the likelihood of losses based on the time-series models commonly used in the accounting literature to characterize the process underlying earnings (e.g., Brown and Rozeff, 1979; Foster, 1977) may lead to the opposite conclusion that losses are transitory (i.e., are likely to reverse to a profit quickly).

The next section describes the data. Section 3 outlines the tests and the results of our primary empirical findings. Section 4 delineates the tests and results from supplementary tests assessing the relation between the returns from the loss/profit strategy and those of previously documented accounting-based trading strategies. Section 5 offers a behavioral explanation for the post loss/profit announcement drift and assesses its validity. Section 6 considers the effect of distress risk, short sales constraints, transaction costs, and firm size, on our primary findings. The final section, Section 7, offers concluding remarks.

## 2. Data

### 2.1. Sample selection

The data are obtained from the Compustat quarterly database and the CRSP daily returns database. Our analyses include a set of primary tests followed by a set of three supplementary tests. The sample selection procedures for both sets of tests are summarized in Table 1.<sup>2</sup>

For our primary tests, those documenting the post loss/profit announcement drift, the sample period spans from fiscal years 1976 through 2005 (120 fiscal quarters). To be included in the primary tests' sample, a firm-quarter must satisfy the following two requirements. First, it must have the following data available on the Compustat quarterly database: earnings

<sup>2</sup> In addition, we perform a variety of sensitivity tests. The data requirements for these tests are discussed later.

before extraordinary items and discontinued operations (Compustat Quarterly data8), and beginning-of-quarter total assets (Compustat Quarterly data44); and each firm-quarter must have return data available in the CRSP daily returns database. This requirement yields 471,997 firm-quarters covering 15,261 distinct firms. Second, in order to eliminate thinly traded stocks, we exclude all firms with stock prices 5 days prior to the quarterly earnings announcement date below \$1.<sup>3</sup> This final data requirement decreases the final sample for our primary tests to 458,693 firm-quarters, covering 15,143 distinct firms.

The first set of supplementary tests uses the primary tests' sample and imposes additional data requirements to compute standardized unexpected earnings (SUE), i.e., a firm-quarter must have 13 consecutive quarters of data for earnings per share excluding extraordinary and discontinued operations (Compustat Quarterly data9), as an estimation period spanning the most recent 12 quarters is required. These additional data requirements result in a sample of 359,909 firm-quarters (12,824 distinct firms).

The second set of supplementary tests uses the primary tests' sample and imposes additional data requirements to compute the book-to-market value of equity ratio. The required data are: common equity (Compustat Quarterly data59), common shares outstanding (Compustat Quarterly data61), and end-of-quarter closing stock price (Compustat Quarterly data14). These additional data requirements result in a sample of 448,500 firm-quarters (15,101 distinct firms).

The third set of supplementary tests uses the primary tests' sample and imposes additional data constraints to compute quarterly accruals, measured directly from the cash flow statement. The required data to compute accruals are: earnings before extraordinary items and discontinued operations (Compustat Quarterly data76), net cash flow from operating activities (Compustat Quarterly data108), extraordinary income and discontinued operations (Compustat Quarterly data78), and average total assets (Compustat Quarterly data44). Due to the unavailability of cash flow statement information prior to 1988, this sample spans the 18-year period, 1988–2005. These additional data constraints result in a sample of 267,416 firm-quarters (10,695 distinct firms).

## 2.2. Variable definitions

We consider three alternative definitions for our earnings variable. The first definition is earnings before extraordinary items and discontinued operations (Compustat Quarterly data8). The second definition is earnings before extraordinary items, discontinued operations, and special items (Compustat Quarterly data8–Compustat Quarterly data32), and the third definition is net income (Compustat Quarterly data69). All three measures are scaled by beginning-of-quarter total assets (Compustat Quarterly data44) to alleviate a potential heteroscedasticity problem that may arise when earnings data are pooled across firms and over time.<sup>4</sup>

We measure buy-and-hold abnormal returns, for firm  $i$  over  $n$  trading days, as follows:

$$\prod_{t=1,n}(1+R_{it}) - \prod_{t=1,n}(1+ER_{it}) \quad (1)$$

where  $R_{it}$  is the daily return for firm  $i$  on day  $t$ , inclusive of dividends and other distributions, and  $ER_{it}$  is the expected return on day  $t$  for that firm. If a firm delists during the return accumulation window, we compute the remaining return by using the CRSP daily delisting return, reinvesting any remaining proceeds in the appropriate benchmark portfolio, and adjusting the corresponding market return to reflect the effect of the delisting return on our measures of expected returns (see Shumway, 1997; Beaver et al., 2007).<sup>5</sup>

We use two alternative measures to estimate expected returns. The first measure is based on firm size (market capitalization) and the second measure is based on Carhart's (1997) four factor model. Our first measure of daily expected return for firm  $i$  on day  $t$ , the one based on firm size, is defined as the value-weighted return for all firms in firm  $i$ 's size-matched decile on day  $t$ , where size is measured using market capitalization at the beginning of the most recent calendar year. Using size-adjusted returns is common in prior research on earnings-related anomalies (e.g., Bernard and Thomas, 1990; Ball and Bartov, 1996; Sloan, 1996; Dechow et al., 2008), and thus allows comparisons of our results with the findings of this research.

To assess the sensitivity of our findings to alternative risk adjustments, we also compute daily expected returns based on Carhart's (1997) four factor model. Along the lines of prior research (e.g., Ogneva and Subramanyam, 2007), we first

<sup>3</sup> To test the sensitivity of our results to this choice, we alternatively exclude (1) firms with a stock price below \$5, (2) firms with a stock price below a stock price threshold set at \$5 in year 2005 and decreased by eight percent annually for earlier years to account for stock market appreciation, (3) firms in the lowest share turnover decile (computed by fiscal year), or (4) firms in the lowest size (market capitalization) decile. We obtain nearly indistinguishable results (not tabulated for parsimony) for any of these four alternative choices.

<sup>4</sup> The results (not tabulated for parsimony) remain very similar when we use beginning-of-quarter market value of equity as a scalar. Also, since the results from the tests that follow were robust to the earnings definition, we tabulate in the paper the results based on earnings before extraordinary items and discontinued operations (the first definition). This choice is standard in the earnings-related anomalies literature (e.g., Bernard and Thomas, 1990), and thus allows comparisons with previous research.

<sup>5</sup> Poor performance-related delistings (delisting codes 500 and 520–584) often have missing delisting returns in the CRSP database (Shumway, 1997). To correct for this bias, we set missing performance-related delisting returns to –100 percent as recommended by Shumway (1997). Overall, the percentage of delisting sample firms is small (approximately 0.8 percent and 2 percent for the 60-day and 120-day return windows, respectively), which is not surprising given our relatively short return windows. Still, we replicate our tests excluding delisting returns. The results, not tabulated for parsimony, are indistinguishable from the tabulated results.

estimate the following model using a 40-trading-day hold-out period, starting 55 trading days prior to the earnings announcement date:

$$R_{it} - RF_t = a_i + b_i(RMRF_t) + s_i(SMB_t) + h_i(HML_t) + p_i(UMD_t) + e_{it} \quad (2)$$

where  $R_{it}$  is defined as before,  $RF_t$  is the one-month T-bill daily return,  $RMRF_t$  is the daily excess return on a value-weighted aggregate equity market proxy,  $SMB_t$  is the return on a zero-investment factor mimicking portfolio for size,  $HML_t$  is the return on a zero-investment factor mimicking portfolio for book-to-market value of equity; and  $UMD_t$  is the return on a zero-investment factor mimicking portfolio for momentum factor.<sup>6</sup>

We then use the estimated slope coefficients from Eq. (2),  $b_i$ ,  $s_i$ ,  $h_i$ , and  $p_i$ , to compute the expected return for firm  $i$  on day  $t$  as follows:

$$ER_{it} = RF_t + b_i(RMRF_t) + s_i(SMB_t) + h_i(HML_t) + p_i(UMD_t) \quad (3)$$

As in previous research (e.g., Bernard and Thomas, 1989, 1990), standardized unexpected earnings (SUE) are generated via a seasonal random walk with a drift model. More specifically, for firm  $i$  in quarter  $q$ , we first estimate the model by using the most recent 12 quarters of data (i.e., quarters  $q-12$  through  $q-1$ ). We compute  $SUE_{i,q}$  by taking the difference between the reported quarterly earnings per share and expected quarterly earnings per share generated by the model, scaled by the standard deviation of forecast errors over the estimation period.

A firm's book-to-market ratio is defined as book value of equity divided by market capitalization, where market capitalization is the product of the number of shares outstanding and the closing stock price as reported in Compustat. Along the lines of Hribar and Collins (2002), accruals are defined as the difference between earnings before extraordinary items and discontinued operations and net operating cash flows from continuing operations (measured as total cash from operations less the cash portion of discontinued operations and extraordinary items), scaled by average total assets. We compute accruals by starting with earnings before extraordinary items and discontinued operations, not net income, so as to remain consistent throughout the paper with our definition of earnings. Our results are not sensitive to this definition of accruals.

Finally, in testing the sensitivity of our findings to distress risk, and along the lines of prior research (e.g., Dichev, 1998; Khan, 2008), we use Altman's (1968) Z score as a proxy for firm financial distress. We calculate Altman's (1968) Z score following two alternative specifications. First, we use Altman's (1968) model and original coefficients, as follows<sup>7</sup>:

$$\begin{aligned} Z = & 1.2(\text{working capital}/\text{total assets}) + 1.4(\text{retained earnings}/\text{total assets}) \\ & + 3.3(\text{earnings before extraordinary items and discontinued operations}/\text{total assets}) \\ & + 0.6(\text{market value of equity}/\text{total liabilities}) + 1(\text{sales}/\text{total assets}) \end{aligned} \quad (4)$$

Second, we use Altman's (1968) model and original coefficients for years prior to 1980 (as described above), and use Altman's (1968) model and new coefficients re-estimated by Begley et al. (1996) for years after 1980, as follows<sup>8</sup>:

$$\begin{aligned} Z' = & 10.4(\text{working capital}/\text{total assets}) + 1.0(\text{retained earnings}/\text{total assets}) \\ & + 10.6(\text{earnings before extraordinary items and discontinued operations}/\text{total assets}) \\ & + 0.3(\text{market value of equity}/\text{total liabilities}) - 0.17(\text{sales}/\text{total assets}) \end{aligned} \quad (5)$$

In both specifications, a Z score below 1.81 indicates that bankruptcy is likely, a Z score above 2.99 indicates that bankruptcy is unlikely, and a Z score between 1.81 and 2.99 is in the "zone of ignorance" or "gray area" (see Altman, 1968; Begley et al., 1996).

### 3. Primary tests: Do stock prices fully react to loss/profit announcements?

#### 3.1. Methodology

Our primary tests concern whether stock prices fully react in a timely fashion to loss/profit announcements. To that end, we partition all firm-quarter observations into ten earnings deciles. The lowest decile (decile 1) contains firms with the highest losses and the highest decile (decile 10) contains firms with the highest profits. Prior research on earnings-based anomalies (e.g., Bernard and Thomas, 1990; Ball and Bartov, 1996) sort firms into earnings deciles every fiscal quarter based on the distribution of reported earnings in that quarter. This choice involves a potential look-ahead bias, as for firms that announce quarterly earnings early the distribution of reported earnings is not known at the time the portfolio is formed. To address this problem, we compute cut-off points based on the previous fiscal quarter's earnings distribution.<sup>9</sup>

<sup>6</sup>  $RF$ ,  $RMRF$ ,  $SMB$ ,  $HML$ , and  $UMD$  are obtained from Professor Kenneth French's web site ([http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data\\_library.html](http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html)).

<sup>7</sup> In terms of Compustat's quarterly data items, Altman's (1968) Z score using Altman's (1968) model and original coefficients is computed as  $Z = 1.2(\text{data40} - \text{data49})/\text{data44} + 1.4(\text{data58}/\text{data44}) + 3.3(\text{data8}/\text{data44}) + 0.6[(\text{data61} * \text{data14})/\text{data54}] + 1(\text{data2}/\text{data44})$ .

<sup>8</sup> As mentioned in Shumway (2001), the published version of Begley et al. (1996) contains two typographical errors. The coefficients reported above are the corrected ones. In terms of Compustat's quarterly data items, Altman's (1968) Z score using Altman's (1968) model and new coefficients re-estimated by Begley et al. (1996) is computed as  $Z' = 10.4(\text{data40} - \text{data49})/\text{data44} + 1.0(\text{data58}/\text{data44}) + 10.6(\text{data8}/\text{data44}) + 0.3[(\text{data61} * \text{data14})/\text{data54}] - 0.17(\text{data2}/\text{data44})$ .

<sup>9</sup> The results were unchanged when the cut-off points were computed based on the earnings distribution in the same fiscal quarter last year.

**Table 2**  
Buy-and-hold abnormal stock returns for portfolios formed on earnings.

Earnings decile	N	Buy-and-hold abnormal returns					
		[-2, 0]		[1, 60]		[1, 120]	
		SAR	FF	SAR	FF	SAR	FF
1 (High Loss)	46,753	-0.0102 (-22.15)	-0.0109 (-23.91)	-0.0312 (-16.10)	-0.0526 (-25.89)	-0.0579 (-21.53)	-0.1046 (-33.06)
2	44,993	-0.0053 (-13.24)	-0.0059 (-15.29)	-0.0267 (-18.31)	-0.0350 (-21.36)	-0.0444 (-20.93)	-0.0648 (-26.04)
3	45,669	-0.0014 (-4.39)	-0.0021 (-6.69)	-0.0128 (-11.12)	-0.0184 (-14.04)	-0.0198 (-11.60)	-0.0321 (-16.08)
4	46,419	0.0016 (5.68)	0.0011 (4.46)	-0.0040 (-4.29)	-0.0064 (-6.00)	-0.0013 (-0.86)	-0.0099 (-6.05)
5	45,745	0.0033 (11.97)	0.0032 (12.43)	0.0022 (2.37)	0.0002 (0.24)	0.0066 (4.77)	-0.0028 (-1.76)
6	45,948	0.0052 (18.17)	0.0048 (17.78)	0.0060 (6.41)	0.0005 (0.47)	0.0142 (9.88)	-0.0037 (-2.22)
7	45,463	0.0084 (27.80)	0.0078 (27.82)	0.0085 (8.38)	0.0009 (0.84)	0.0158 (10.51)	-0.0019 (-1.15)
8	45,268	0.0094 (29.59)	0.0087 (29.74)	0.0122 (12.30)	0.0034 (2.99)	0.0198 (13.10)	-0.0003 (-0.19)
9	45,357	0.0125 (37.35)	0.0117 (37.76)	0.0175 (16.37)	0.0068 (5.76)	0.0296 (18.04)	0.0062 (3.41)
10 (High Profit)	47,078	0.0187 (47.84)	0.0170 (49.49)	0.0285 (23.15)	0.0150 (11.33)	0.0442 (23.16)	0.0133 (6.55)
<b>High profit-high loss</b>		<b>0.0290</b>	<b>0.0279</b>	<b>0.0596</b>	<b>0.0676</b>	<b>0.1021</b>	<b>0.1178</b>
<i>t</i> -statistics		(47.83)	(48.95)	(26.04)	(27.83)	(30.98)	(31.23)
Alternate <i>t</i> -statistics (Fama-MacBeth)		(38.32)	(38.21)	(9.34)	(11.88)	(10.80)	(12.77)

Notes: This table presents buy-and-hold abnormal stock returns for the following windows: [-2, 0], [1, 60], and [1, 120], where day zero is the earnings announcement date of quarter  $q$ . *t*-statistics are in parenthesis. Alternate *t*-statistics are calculated using the Fama-MacBeth (1973) procedure on the returns to the strategy every quarter. Abnormal returns are measured using size-adjusted returns (SAR) and Carhart's (1997) four-factor model (FF). For firms that delist during the return window, the remaining return is calculated by using the delisting return from the CRSP database, and then reinvesting any remaining proceeds in the appropriate benchmark portfolio. Earnings are earnings before extraordinary items and discontinued operations (Compustat Quarterly data8) in quarter  $q$  scaled by total assets (Compustat Quarterly data44) in quarter  $q-1$ . The full sample (458,693 firm-quarter observations) is classified into deciles of Earnings from lowest Earnings, High Loss, to highest Earnings, High Profit. The cut-off points are determined every quarter  $q$  based on the distribution of Earnings in quarter  $q-1$ .

For each of the ten portfolios, we compute buy-and-hold abnormal returns over two windows, [1, 60] and [1, 120], where day zero is the quarterly earnings announcement date.<sup>10</sup> If investors underreact to loss/profit announcements, we expect the post-announcement returns to vary systematically across the earnings deciles, being most negative for the High Loss portfolio and most positive for the High Profit portfolio, and the spread between the High Profit portfolio and the High Loss portfolio to be significantly positive.

### 3.2. Results

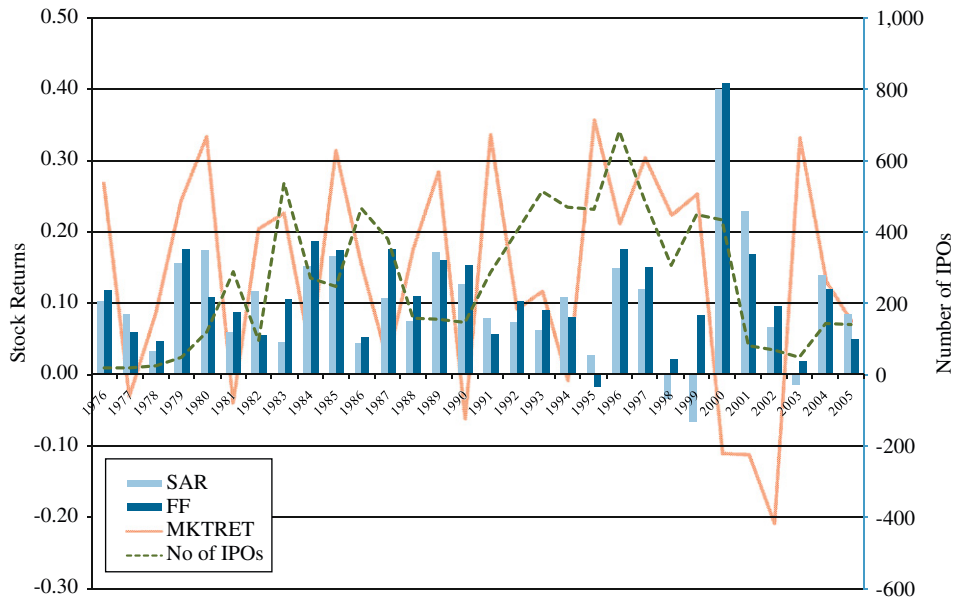
Table 2 reports the results on buy-and-hold abnormal stock returns for the ten portfolios formed on earnings levels.<sup>11</sup> Interestingly, the earnings announcement returns, [-2, 0] window, are significantly negative for the High Loss portfolio, -1.02 percent (*t*-statistic = -22.15), and significantly positive for the High Profit portfolio, 1.87 percent (*t*-statistic = 47.84) suggesting that losses/profits *per se* are bad/good news.<sup>12</sup> More important, the stock price responses to the loss/profit

<sup>10</sup> As a sensitivity analysis, we replicate our tests using the return windows [2, 60] and [2, 120], as well as [3, 60] and [3, 120], where day zero is the quarterly earnings announcement date. The results, not tabulated for parsimony, are indistinguishable from the tabulated results.

<sup>11</sup> The number of observations varies across deciles from 44,993 (decile 2) to 47,078 (decile 10). The reason for this variation is that, as discussed above, we compute cut-off points based on the previous fiscal quarter's earnings distribution to avoid a potential look-ahead bias. Also, the [-2, 0] window is standard in the literature (see, e.g., Bernard and Thomas, 1990; Ball and Bartov, 1996). Still, we checked the sensitivity of the results to this choice by replicating the tests using [-2, 1], [-2, 2], and [-1, 1] windows and the results were robust.

<sup>12</sup> While we present in the tables the results for both size-adjusted returns and Carhart's (1997) four factor model returns, consistent with prior literature and for brevity we discuss only the former. We note that the use of the Carhart's (1997) four factor model results in a shift to the left of the return distribution for our strategy, as well as for the previously documented earnings-based anomalies. This shift leads to a difference between the two alternative return measures in terms of the relative contribution of the long and short portfolios to the hedge portfolio returns, that is, the long portfolio generates approximately 40 (10) percent of the hedge returns using size-adjusted (Carhart's (1997) four factor model) returns. Still, this difference should not be overemphasized, as it is similar across all anomalies and has little effect on the hedge portfolio returns, and thus on our inferences. For example, for the window [1, 120], using size-adjusted returns and Carhart's (1997) four factor model returns, the return spreads between the High Profit and High Loss portfolios are quite similar: 10.21 percent and 11.78 percent, respectively.

	Overall		Up Market ( <i>MKTRET</i> > 0)		Down Market ( <i>MKTRET</i> ≤ 0)		Hot IPO Years (above median)		Cold IPO Years (below median)	
	SAR	FF	SAR	FF	SAR	FF	SAR	FF	SAR	FF
Min	-0.066	-0.017	-0.066	-0.017	0.059	0.059	-0.066	-0.017	-0.014	0.019
Max	0.401	0.410	0.175	0.187	0.401	0.410	0.401	0.410	0.230	0.176
Median	0.094	0.105	0.084	0.106	0.108	0.096	0.074	0.090	0.117	0.110
<i>p</i> -value of signed rank	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(0.02)	(0.02)	(<0.01)	(<0.01)	(<0.01)	(<0.01)
Mean	0.101	0.113	0.085	0.101	0.154	0.151	0.089	0.118	0.114	0.108
<i>t</i> -stat	(6.45)	(7.99)	(6.12)	(8.24)	(3.30)	(3.30)	(3.26)	(4.58)	(7.08)	(7.98)



notes:

This figure presents buy-and-hold abnormal returns by calendar year for the Loss/Profit strategy for the window [1, 120], where day zero is the quarterly earnings announcement date. Abnormal returns are measured using size-adjusted returns (SAR) and Carhart's (1997) four-factor model (FF). For firms that delist during the return window, the remaining return is calculated by using the delisting return from the CRSP database, and then reinvesting any remaining proceeds in the appropriate benchmark portfolio. Earnings are earnings before extraordinary items and discontinued operations (Compustat Quarterly data8) scaled by beginning-of-quarter total assets (Compustat Quarterly data44). The Loss/Profit strategy consists of a long position in the highest Earnings decile (High Profit) and a short position in the lowest Earnings decile (High Loss). The cut-off points are determined every quarter based on the distribution of Earnings in the previous quarter. MKTRET represents the value-weighted annual market return. The annual number of initial public offerings (IPOs) corresponds to the number of non-financial IPOs by U.S. companies completed every year between 1976 and 2005, as reported by Thomson's SDC (Securities Data Company) database. Hot (cold), i.e., high (low), IPO years are defined as years during which the annual number of IPOs is above (below) median over the period 1976–2005.

**Fig. 1.** Buy-and-hold abnormal stock returns by year for the loss/profit strategy. *Notes:* This figure presents buy-and-hold abnormal returns by calendar year for the loss/profit strategy for the window [1, 120], where day zero is the quarterly earnings announcement date. Abnormal returns are measured using size-adjusted returns (SAR) and Carhart's, (1997) four-factor model (FF). For firms that delist during the return window, the remaining return is calculated by using the delisting return from the CRSP database, and then reinvesting any remaining proceeds in the appropriate benchmark portfolio. Earnings are earnings before extraordinary items and discontinued operations (Compustat Quarterly data8) scaled by beginning-of-quarter total assets (Compustat Quarterly data44). The loss/profit strategy consists of a long position in the highest Earnings decile (High Profit) and a short position in the lowest Earnings decile (High Loss). The cut-off points are determined every quarter based on the distribution of Earnings in the previous quarter. MKTRET represents the value-weighted annual market return. The annual number of initial public offerings (IPOs) corresponds to the number of non-financial IPOs by US companies completed every year between 1976 and 2005, as reported by Thomson's SDC (Securities Data Company) database. Hot (cold), i.e., high (low), IPO years are defined as years during which the annual number of IPOs is above (below) median over the period 1976–2005.

announcements are incomplete as a substantial drift in the post loss/profit announcement periods is observed for all ten portfolios. Furthermore, consistent with an underreaction to loss/profit announcements, the drift increases monotonically across the ten earnings deciles. It is most negative for the High Loss portfolio: -3.12 percent (*t*-statistic = -16.10) and -5.79 percent (*t*-statistic = -21.53) and most positive for the High Profit portfolio: 2.85 percent (*t*-statistic = 23.15) and



4.42 percent ( $t$ -statistic=23.16), in the windows [1, 60] and [1, 120], respectively. In addition, a hedge portfolio that takes a short position in the High Loss portfolio and a long position in the High Profit portfolio generates a significantly positive buy-and-hold return of 5.96 percent (approximately a 12 percent annualized return) and 10.21 percent (approximately a 21 percent annualized return) in the windows [1, 60] and [1, 120], respectively.

Fig. 1 portrays the yearly buy-and-hold abnormal returns of our loss/profit trading strategy for the entire sample period, 1976–2005. The strategy concerns taking a long position in the High Profit portfolio and a short position in the High Loss portfolio for the [1, 120] window (portfolios rebalanced quarterly). The picture that emerges from Fig. 1 is that the loss/profit strategy is consistently profitable: it yields positive size-adjusted returns in 27 years (29 years based on Carhart's (1997) four factor model) out of our 30-year sample period. The average portfolio return over the 30 calendar years is 10.1 percent using size-adjusted returns and 11.3 percent using Carhart's (1997) four factor model, both highly statistically significant.<sup>13</sup> Perhaps even more important, our strategy is robust to up and down markets, as well as to "hot" and "cold" initial public offering (IPO) years.<sup>14</sup> Specifically, the loss/profit strategy is successful in generating superior returns in both the 23 up market years and the seven down market years. In up (down) markets our strategy yields, on average, 8.5 (15.4) percent using size-adjusted returns, and 10.1 (15.1) percent using Carhart's (1997) four factor model. This alleviates concerns that inappropriate risk adjustment underlies our findings. The strategy also generates size-adjusted returns of 8.9 percent and 11.4 percent, and Carhart's (1997) four factor model returns of 11.8 percent and 10.8 percent, in hot and cold IPO years, respectively. This alleviates concerns that the returns of our loss/profit strategy are driven by a changing mix of publicly traded firms towards younger and more loss-prone firms after 1970 (see Fama and French 2001, 2004).<sup>15</sup>

Collectively, the results presented in Table 2 and Fig. 1 indicate a substantial stock mispricing related to loss/profit announcements that is robust to alternative risk adjustments and time periods.<sup>16</sup> A natural question arises at this point: is this loss/profit effect distinct from and incremental to previously documented accounting-based anomalies?

The first anomaly that might come to mind concerns stock mispricing based on E/P multiples studied by Basu (1977, 1983) and Lakonishok et al. (1994). However, the objective of these studies is to test whether stock prices are biased due to inflated investor expectations regarding growth in earnings and dividends (e.g., Basu, 1977, p. 663; Lakonishok et al., 1994, p. 1547). This objective, which is distinctly different from our objective of testing the market valuation of earnings signs, leads to fundamental differences in motivation, hypotheses, research design, and findings. In particular, the E/P multiples studies' predictions are silent about loss firms because E/P multiples and earnings growth of loss firms are difficult to interpret, and as a result investors are unlikely to rely on E/P multiples when valuing loss firms. As a result, these studies typically exclude loss firms from their samples (see Basu, 1983, p. 133; Lakonishok et al., 1994, p. 1546).<sup>17</sup> Conversely, our research design requires the inclusion of loss firms in our analysis, as we conjecture that loss firms may be associated with a substantial mispricing. In addition, the hedge portfolio return results are considerably different between our study and the E/P multiples studies in two ways. First, Fama and French (1996) find that the E/P multiples anomaly disappears in a three-factor Fama-French model, whereas the loss/profit hedge portfolio return results are robust to this model. Second, while we find an annualized size-adjusted return of approximately 21 percent to a hedge portfolio that takes a long position in extreme profit firms and a short position in extreme loss firms, Lakonishok et al. (1994, p. 1550) report a hedge portfolio size-adjusted return of only 5.4 percent per annum. As may be expected, this 5.4 percent return is similar to the 8.1 percent annualized return of a hedge portfolio that takes a long position in our highest quintile profit firms and a short position in our lowest quintile profit firms when only profit firms are included in the analysis (results not tabulated). Overall, our discussion suggests that the findings of prior E/P multiples studies and ours are different in important ways.

Other accounting-based strategies shown by prior research to be related to future stock-price performance in broad samples, however, may be related to our findings. In the next section we thus explore whether the loss/profit strategy is different from and incremental to the post-earnings-announcement drift (SUE) strategy, the value-glamour (book-to-market) strategy, and the accruals strategy.

<sup>13</sup> In Table 2, the mean return of the hedge portfolio is slightly higher, 10.21 percent using size-adjusted returns and 11.78 percent using Carhart's (1997) four factor model. The (minor) discrepancy between the results presented in Fig. 1 and those in Table 2 follows because in Table 2 we average the 120-trading-day returns across all sample fiscal quarters, whereas in Fig. 1 we average these returns across all calendar years.

<sup>14</sup> A down (up) market is defined as a negative (positive) value-weighted annual market return. "Hot" ("cold"), i.e., high (low), IPO years are defined as years during which the annual number of IPOs is above (below) median over the period 1976–2005.

<sup>15</sup> To further assess whether the loss/profit strategy is robust to time period, we replicate our tests after partitioning our 30-year sample period into three 10-year subperiods: 1976–1985, 1986–1995, and 1996–2005. Overall, the tests show that the findings reported in Table 2 are stable over the three subperiods, thereby alleviating concerns that our results may be period-specific. For example, the hedge portfolio size-adjusted returns in the first subperiod (10.75 percent), second subperiod (8.68 percent), and third subperiod (11.03 percent) are quite similar and highly statistically significant (the results are not tabulated for parsimony).

<sup>16</sup> Sloan (1996) fails to reject market efficiency when testing the market assessment of annual earnings levels. However, Sloan uses a unique definition of annual earnings, closer to operating income (excluding non-operating income such as interest expense), and includes substantial data requirements, which make it likely that only a very small portion of his sample firms report an annual loss. Moreover, Sloan (1996, p. 303) highlights that his findings apply to annual earnings, not to quarterly earnings.

<sup>17</sup> Interestingly, Basu (1977), who examines the effect of loss firms on the E/P strategy, finds that the inclusion of loss firms in his sample makes little difference for his findings. The reason for the contradictory findings follows because Basu's (1977) carefully selected sample of only 753 NYSE industrial firms with December fiscal year end in the period 1957–1971 contains a negligible number of loss firms. Our findings, which indicate that the inclusion of loss firms has a substantial effect on the results, may thus be viewed as another contribution of our study relative to Basu's (1977).

#### 4. Supplementary tests: relation between post loss/profit announcement drift and previously documented anomalies

##### 4.1. Methodology

To test whether the loss/profit strategy is incremental to the post-earnings-announcement drift, we examine the loss/profit strategy after controlling for the post-earnings-announcement drift (SUE) effect. This examination involves forming portfolios based on the intersection of the two independent rankings of earnings and SUE for each quarter. More specifically, we rank all firm-quarter observations into ten earnings deciles from lowest earnings, High Loss to highest earnings, High Profit. We also independently classify all firm-quarter observations into ten SUE deciles from lowest SUE (“Low SUE”) to highest SUE (“High SUE”). We then compute the difference in buy-and-hold abnormal returns between the two most extreme earnings portfolios, the High Loss (decile 1) and the High Profit (decile 10), for each SUE decile separately. In other words, we test for the loss/profit effect after controlling for the SUE effect. Next, we employ a similar methodology to examine the relation between the loss/profit strategy and the value-glamour and accrual anomalies, using book-to-market value of equity and accruals as classification variables, respectively, instead of SUE.

Finally, to assess the incremental effect of the loss/profit strategy *simultaneously* over the post-earnings-announcement drift (SUE) strategy, the value-glamour strategy, and the accruals strategy, we use a regression setting. More formally, we estimate the following model:

$$BHSAR_{i,q,[1,120]} = a_0 + a_1 Earnings_{i,q} + a_2 SUE_{i,q} + a_3 BM_{i,q} + a_4 Accruals_{i,q} + e_{i,q} \quad (6)$$

where  $BHSAR_{i,q,[1,120]}$  is the buy-and-hold size-adjusted returns for the window [1, 120], where day zero is the earnings announcement date of quarter  $q$ ,  $Earnings_{i,q}$  is the decile ranking of firm  $i$  based on earnings before extraordinary items and discontinued operations in quarter  $q$  scaled by total assets in quarter  $q-1$ ,  $SUE_{i,q}$  is the decile ranking of firm  $i$  based on standardized unexpected earnings in quarter  $q$  (generated using a seasonal random walk with drift model),  $BM_{i,q}$  is the decile ranking of firm  $i$  based on the ratio of book-to-market value of equity at the end of quarter  $q$ , and  $Accruals_{i,q}$  is the decile ranking of firm  $i$  based on accruals scaled by average total assets in quarter  $q$ . The decile rankings for all rank variables are determined every quarter  $q$  based on the distribution of the underlying variables in quarter  $q-1$ . Each rank variable is scaled to range between zero and one. We estimate Eq. (6) using two alternative methods: OLS regression, and least trimmed squares regression in which one percent of the observations with the largest squared residuals are excluded before re-estimating the model. For both methods the standard errors are clustered at the firm  $i$  and quarter  $q$  level following Gow et al. (2009).

##### 4.2. Results

###### 4.2.1. Do losses/profits, sue, book-to-market, and accruals strategies overlap?

As a first step in assessing the relation between our loss/profit strategy and the three potentially related anomalies, we examine the overlap between our strategy and three variables: SUE, book-to-market (BM), and accruals. Panel A of Table 3 displays the number of observations in the High Loss portfolio (i.e., the short portfolio) and in the High Profit portfolio (i.e., the long portfolio) by deciles of each of the three variables SUE, BM, and accruals. Consider, for example, the breakdown of the High Loss portfolio by SUE deciles. Out of 31,657 (8860+20,669+2128) observations in the High Loss (i.e., short) portfolio, only 8860 observations (28 percent) also belong in the Low SUE portfolio (i.e., the short portfolio of the SUE strategy). The other 22,797 nonoverlapping observations (72 percent) consists of 2128 observations (7 percent) in the High SUE portfolio (i.e., the long portfolio of the SUE strategy), and 20,669 observations (65 percent) that are excluded from the SUE strategy, as they correspond to the second to ninth SUE deciles. Likewise, 7465 observations (20 percent) in the High Profit portfolio (i.e., the long portfolio) also belong in the High SUE portfolio (i.e., the long portfolio of the SUE strategy). In contrast, 29,403 observations (80 percent) are nonoverlapping: 2700 observations (7 percent) belong in the Low SUE portfolio (i.e., short portfolio of the SUE strategy), and 26,703 observations (73 percent) are excluded from the SUE strategy as they belong to the second to ninth SUE deciles. The overlap between the loss/profit strategy and the BM and accruals strategies also seems small. For example, only 8156 observations (18 percent) of the High Loss portfolio (i.e., the short portfolio) overlap with the Low BM portfolio (i.e., the short portfolio of the BM strategy), and only 2072 observations (7 percent) overlap with the High Accruals portfolio (i.e., the short portfolio of the accruals strategy). Furthermore, untabulated results from chi-squared tests indicate that the loss/profit strategy is independent from each of these three strategies. These findings thus provide little support for the possibility that the loss/profit announcement drift is another manifestation of the previously documented post-earnings-announcement drift (SUE), value-glamour (BM), or accruals effect.

Panel B of Table 3 reports firm characteristics for earnings deciles by the degree of overlap with each of the other three strategies. Three of the reported characteristics, market value of equity (MVE), total assets, and sales are alternative proxies for firm size, and the other two characteristics, return volatility and Altman's (1968) Z score, are measures of firm risk.<sup>18</sup>

<sup>18</sup> In Table 3, Panel B, the Z scores are consistent whether we use Z scores computed using Altman's (1968) model and original coefficients, or using Altman's (1968) model and original coefficients for years prior to 1980 and Altman's (1968) model and new coefficients re-estimated by Begley et al. (1996) for years after 1980. Therefore, for parsimony, we only display in this panel Z scores computed using Altman's (1968) model and original coefficients.

It is attention worthy that no clear pattern emerges from comparing these characteristics across portfolios. While in some cases overlapping portfolios appear to contain riskier firms than nonoverlapping portfolios, in other cases we find the opposite. For example, in terms of total assets the portfolio consisting of the intersection of the High Loss and High Accruals portfolios (an overlapping portfolio) contains smaller firms than that of the High Loss and

**Table 3**  
Portfolios formed on earnings and on other accounting-based anomaly variables.

Panel A: Number of observations										
Earnings decile	SUE decile			BM decile			Accruals decile			
	1 (Low) Sell	2–9	10 (High) Buy	1 (Low) Sell	2–9	10 (High) Buy	1 (Low) Buy	2–9	10 (High) Sell	
1 (High Loss) Sell	8860	20,669	2128	8156	32,353	5337	9870	19,219	2072	
2–9	27,348	235,918	28,118	15,427	306,969	34,241	9,261	178,750	17,804	
10 (High Profit) Buy	2700	26,703	7465	9130	36,090	797	2363	22,355	5722	
Panel B: Fundamental characteristics										
Variables	Earnings decile	SUE decile			BM decile			Accruals decile		
		1 (Low) Sell	2–9	10 (High) Buy	1 (Low) Sell	2–9	10 (High) Buy	1 (Low) Buy	2–9	10 (High) Sell
<b>MVE (\$million)</b>	1 (High Loss) Sell	359.0 (55.0)	142.9 (50.4)	157.7 (55.4)	219.3 (56.8)	202.6 (55.1)	44.9 (14.6)	274.8 (51.2)	219.6 (75.4)	109.1 (46.5)
	2–9	1362.1 (215.3)	1236.0 (171.4)	1170.0 (160.9)	1118.9 (178.3)	1188.4 (176.2)	132.6 (30.2)	360.0 (64.7)	1507.1 (210.7)	459.7 (83.1)
	10 (High Profit) Buy	2411.8 (395.4)	2638.3 (276.9)	1449.5 (179.4)	2512.7 (327.8)	1816.2 (199.1)	46.1 (15.7)	760.5 (171.2)	3761.3 (391.5)	641.2 (119.3)
<b>Assets (\$million)</b>	1 (High Loss) Sell	534.7 (72.7)	141.2 (35.3)	142.4 (35.4)	141.2 (22.2)	227.4 (43.5)	322.0 (67.1)	247.2 (40.5)	143.1 (39.9)	45.5 (17.6)
	2–9	2778.4 (360.2)	2384.1 (295.8)	2580.5 (306.7)	838.6 (145.0)	2397.0 (296.5)	1186.4 (134.1)	377.2 (90.5)	2061.7 (266.8)	501.3 (92.3)
	10 (High Profit) Buy	741.2 (159.9)	806.1 (122.0)	701.9 (113.6)	567.0 (91.1)	687.6 (103.0)	169.0 (49.2)	322.6 (89.3)	1068.2 (145.2)	280.8 (58.3)
<b>Sales (\$million)</b>	1 (High Loss) Sell	108.1 (15.5)	22.9 (4.2)	18.5 (4.0)	27.4 (3.3)	39.8 (5.6)	60.8 (14.1)	56.4 (8.0)	20.2 (3.3)	9.7 (2.4)
	2–9	342.9 (63.7)	319.9 (55.2)	329.6 (57.9)	211.5 (34.7)	308.2 (50.6)	123.9 (26.4)	131.9 (28.6)	358.7 (53.9)	144.0 (29.0)
	10 (High Profit) Buy	269.8 (60.1)	248.6 (42.9)	210.4 (36.0)	190.2 (34.8)	213.9 (36.0)	48.1 (17.1)	182.9 (45.6)	313.2 (46.7)	90.6 (19.8)
<b>Return volatility</b>	1 (High Loss) Sell	0.76 (0.69)	0.85 (0.78)	0.89 (0.81)	0.86 (0.79)	0.81 (0.74)	0.79 (0.69)	0.94 (0.87)	0.88 (0.81)	0.92 (0.84)
	2–9	0.46 (0.39)	0.47 (0.39)	0.49 (0.40)	0.58 (0.50)	0.46 (0.39)	0.63 (0.55)	0.65 (0.58)	0.53 (0.46)	0.64 (0.58)
	10 (High Profit) Buy	0.46 (0.42)	0.50 (0.44)	0.53 (0.47)	0.48 (0.44)	0.52 (0.46)	0.77 (0.68)	0.59 (0.54)	0.53 (0.49)	0.66 (0.60)
<b>Z score</b>	1 (High Loss) Sell	3.09 (1.26)	5.82 (1.40)	5.76 (1.25)	8.92 (0.72)	6.54 (1.71)	0.96 (1.04)	2.89 (0.88)	10.58 (2.65)	8.66 (2.26)
	2–9	3.29 (2.14)	3.01 (1.98)	2.79 (1.89)	5.34 (1.82)	3.25 (2.06)	1.58 (1.37)	3.04 (2.13)	3.68 (2.05)	4.16 (2.39)
	10 (High Profit) Buy	10.40 (6.49)	8.87 (5.70)	7.04 (4.27)	13.02 (7.88)	7.78 (5.10)	2.21 (1.93)	6.66 (4.47)	10.22 (6.58)	9.66 (5.37)

Notes: Panel A presents the number of firm-quarter observations in portfolios formed on Earnings, SUE, BM, and Accruals. Panel B presents mean and median values of selected variables for these portfolios. Median values are presented in parentheses below mean values. Earnings are earnings before extraordinary items and discontinued operations (Compustat Quarterly data8) scaled by total assets (Compustat Quarterly data44) in quarter  $q-1$ . SUE is the standardized unexpected earnings (generated using a seasonal random walk with drift model), based on diluted earnings per share excluding extraordinary items (Compustat Quarterly data9). BM is the ratio of book-to-market value of equity (Compustat Quarterly data59/(data61\*data14)). Accruals are defined as (Compustat Quarterly data76-(data108-data78)) scaled by average assets (Compustat Quarterly data44). MVE is the market value of equity (Compustat Quarterly data61\*data14). Assets is total assets (Compustat Quarterly data44). Sales is total sales (Compustat Quarterly data2). Return volatility is the annualized stock return volatility over a 120-trading-day window prior to the quarterly earnings announcement date. Z score is computed using Altman's (1968) model and original coefficients, as follows:  $1.2(\text{working capital}/\text{total assets})+1.4(\text{retained earnings}/\text{total assets})+3.3(\text{earnings before extraordinary items and discontinued operations}/\text{total assets})+0.6(\text{market value of equity}/\text{total liabilities})+1(\text{total sales}/\text{total assets})$ , which in terms of Compustat Quarterly data items corresponds to  $1.2[(\text{data40}-\text{data49})/\text{data44}]+1.4(\text{data58}/\text{data44})+3.3(\text{data8}/\text{data44})+0.6[(\text{data61}*\text{data14})/\text{data54}]+1(\text{data2}/\text{data44})$ . To mitigate the influence of outliers, MVE, Assets, Sales, Return Volatility, and Z score are winsorized at the 1st and 99th percentile. The full sample is classified into deciles of Earnings from lowest Earnings, High Loss, to highest Earnings, High Profit. The full sample is also independently classified into deciles of SUE, BM, and Accruals, from lowest (Low) to highest values (High). The cut-off points for Earnings, SUE, BM, and Accruals are determined every quarter  $q$  based on the distribution of the underlying variables in quarter  $q-1$ .

Low Accruals portfolios (a nonoverlapping portfolio with conflicting indications): average (median) total assets of 45.5 (17.6) \$million versus 247.27 (40.5) \$million, respectively. This finding may indicate that the former is riskier than the latter. However, the average (median) Z score for the High Loss and High Accruals portfolio, 8.66 (2.26) is higher than that of the High Loss and Low Accruals portfolio, 2.89 (0.88), indicating the former is less risky than the latter.

Overall, the findings in Table 3 may be viewed as *prima facie* evidence that the post loss/profit announcement drift is not another manifestation of the previously documented post-earnings-announcement drift (SUE), value-glamour (BM), or accruals effects, and that it is not driven by an omitted variable. Still, in the sections below we further assess these possibilities by directly testing the relation between the loss/profit strategy and other accounting-based anomalies, as well as by performing a battery of sensitivity tests.

#### 4.2.2. Losses/profits, sue, and future stock returns

Panel A of Table 4 displays the results from tests of the relation between the post loss/profit announcement drift and the SUE effect (post-earnings-announcement drift). This panel presents 120-trading-day buy-and-hold size-adjusted returns for portfolios formed based on a two-way classification in which observations are sorted independently into ten SUE deciles and ten earnings deciles. Two salient findings emerge from reviewing the results in Panel A. First, the loss/profit effect dominates the SUE effect. To illustrate, consider portfolio returns of two portfolios for which the loss/profit strategy and the SUE strategy provide conflicting indications: extreme loss firms (High Loss) in the High SUE decile and extreme profit firms (High Profit) in the Low SUE decile. Consistent with the predictions of the loss/profit strategy and contrary to the predictions of the SUE strategy, the return on the first portfolio is significantly negative (–1.20 percent) and the return on the second portfolio is significantly positive (1.04 percent). Second, the loss/profit strategy is incremental to the SUE strategy, as the superior return of the loss/profit strategy is observed even after controlling for the SUE strategy. For example, the return on the hedge portfolio, High Profit minus High Loss, is significantly positive for all SUE deciles, yielding percents 5.33, 6.69, 5.08, 10.35, 7.41, 5.89, 5.68, 10.06, 9.29, and 9.38 for portfolios consisting of firms in SUE deciles 1–10, respectively. Thus, the return of the loss/profit strategy remains substantial for all hedge portfolios even after controlling for the SUE effect. Further, combining the two strategies does not improve much the hedge portfolio performance relative to its performance based on loss/profit alone. The 120-trading-day hedge portfolio return of the loss/profit strategy is 10.21 percent (see Table 2), and the return of the hedge portfolio based on the joint classification (High Profit and High SUE minus High Loss and Low SUE) is 12.47 percent, whereas the 120-trading-day return of a SUE-based hedge portfolio is 7.67 percent (not tabulated). Overall, the findings in Panel A provide evidence that the loss/profit effect is incremental to, and more pronounced than the SUE effect.

Comparing our results with those of Narayanamoorthy (2006) highlights new insights produced by our approach. Narayanamoorthy (2006) uses regression analysis to study differential post-earnings-announcement drift between loss firms and profit firms. His regression results imply SUE-based hedge portfolio returns of 6.79 percent for profit firms and 5.07 percent (=6.79–1.72) for loss firms (p. 779, Table 5).<sup>19</sup> He attributes these findings to the lower serial correlation coefficient of SUE for loss firms than that for profit firms. Using portfolio analysis rather than regression analysis and focusing on the tails of the distributions of losses and profits rather than on the total sample of SUE, our results displayed in Panel A of Table 4 offer two new insights. First, losses dominate SUE, as all SUE deciles generate negative post-announcement returns for loss firms (the first two earnings deciles consists of loss firms only as loss firms represent 23 percent of sample firms). Second, for loss firms the SUE-based strategy is inefficient, as the long SUE portfolio generates negative returns, which reduces overall hedge portfolio returns. Consequently, our findings suggest that the SUE-based-strategy performance can be improved substantially (by nearly twofold) relative to Narayanamoorthy's (2006), by taking a short position in the subset of firms in the lowest SUE decile that report a loss and a long position in the subset of firms in the highest SUE decile that report a profit.

#### 4.2.3. Losses/profits, book-to-market, and future stock returns

Panel B of Table 4 presents the results from tests of the relation between the loss/profit effect and the book-to-market (value-glamour) effect.<sup>20</sup> The panel reports 120-trading-day buy-and-hold size-adjusted returns for portfolios formed based on a two-way classification in which observations are sorted independently every quarter into ten book-to-market deciles and ten earnings deciles. There are two points to note. First, the top left corner of the table reports a return of –7.08 percent for a portfolio consisting of firms in the highest loss decile (High Loss) and lowest book-to-market decile (Low BM, known as “glamour” firms), and the bottom right corner of the table reports a return of 8.87 percent for a portfolio consisting of firms in the highest profit decile (High Profit) and highest book-to-market decile (High BM, known as “value” firms). Taking a long position in the latter and a short position in the former generates a return of 15.94 percent, which

<sup>19</sup> As Narayanamoorthy (2006, p. 772) notes, given the way he defines the SUE variable, the regression coefficients in his Table 5 may be interpreted as: “the average abnormal return from a zero investment portfolio formed by going long in the top SUE decile and short in the bottom SUE decile.”

<sup>20</sup> Along the lines of prior studies, we replicate our tests in this section using, in addition to book-to-market ratios, three alternative proxies for the value-glamour effect: cash flow from operation-to-price ratios, Tobin's Q, and sales growth. The results (not tabulated for parsimony) are qualitatively similar.

**Table 4**  
Buy-and-hold abnormal stock returns for portfolios formed on earnings and other accounting-based anomaly variables.

<i>Panel A: Portfolios formed on earnings and SUE for the window [1,120]</i>													
		<b>SUE decile</b>										High SUE–Low SUE	
		1 (Low SUE)	2	3	4	5	6	7	8	9	10 (High SUE)		
<b>Earnings decile</b>	1 (High Loss)	−0.0429	−0.0584	−0.0369	−0.0604	−0.0370	−0.0253	−0.0217	−0.0453	−0.0276	−0.0120	<b>0.0309</b>	(6.02)
	2	−0.0535	−0.0589	−0.0637	−0.0408	−0.0400	−0.0258	−0.0153	−0.0086	−0.0052	−0.0028	<b>0.0507</b>	(7.24)
	3	−0.0354	−0.0425	−0.0342	−0.0335	−0.0136	−0.0052	−0.0139	0.0063	0.0002	0.0223	<b>0.0577</b>	(6.93)
	4	−0.0244	−0.0197	−0.0150	−0.0105	−0.0075	−0.0009	0.0042	0.0163	0.0150	0.0358	<b>0.0602</b>	(7.42)
	5	−0.0232	−0.0180	−0.0082	−0.0081	0.0006	0.0096	0.0232	0.0170	0.0267	0.0345	<b>0.0577</b>	(7.54)
	6	−0.0236	−0.0140	−0.0019	0.0026	0.0164	0.0193	0.0281	0.0308	0.0402	0.0508	<b>0.0744</b>	(10.03)
	7	−0.0098	−0.0124	0.0071	0.0114	0.0089	0.0113	0.0298	0.0297	0.0359	0.0465	<b>0.0563</b>	(7.97)
	8	−0.0184	−0.0001	0.0068	0.0098	0.0176	0.0220	0.0347	0.0278	0.0501	0.0541	<b>0.0724</b>	(10.67)
	9	0.0005	−0.0072	0.0144	0.0185	0.0393	0.0302	0.0434	0.0368	0.0467	0.0752	<b>0.0747</b>	(11.86)
	10 (High Profit)	0.0104	0.0085	0.0138	0.0432	0.0371	0.0336	0.0351	0.0553	0.0653	0.0817	<b>0.0713</b>	(12.84)
<b>High profit–high loss</b>		<b>0.0533</b>	<b>0.0669</b>	<b>0.0508</b>	<b>0.1035</b>	<b>0.0741</b>	<b>0.0589</b>	<b>0.0568</b>	<b>0.1006</b>	<b>0.0929</b>	<b>0.0938</b>		
		(7.82)	(6.78)	(4.24)	(7.82)	(5.53)	(4.24)	(4.15)	(9.01)	(9.13)	(12.04)		
<b>High Profit &amp; High SUE–High Loss &amp; Low SUE</b>													
SAR=0.1247 (15.16)													
FF=0.1129 (13.17)													
<i>Panel B: Portfolios formed on earnings and book-to-market for the window [1,120]</i>													
		<b>BM decile</b>										High BM–low BM	
		<i>Glamour</i>									<i>Value</i>		
		1 (Low BM)	2	3	4	5	6	7	8	9	10 (High BM)		
<b>Earnings decile</b>	1 (High Loss)	−0.0708	−0.1008	−0.0551	−0.0674	−0.0614	−0.0616	−0.0213	−0.0262	−0.0246	−0.0320	<b>0.0387</b>	(6.18)
	2	−0.0410	−0.0639	−0.0663	−0.0696	−0.0636	−0.0541	−0.0368	−0.0329	−0.0245	−0.0273	<b>0.0137</b>	(1.81)
	3	−0.0123	−0.0581	−0.0696	−0.0446	−0.0342	−0.0221	−0.0197	−0.0068	−0.0090	−0.0025	<b>0.0098</b>	(0.03)
	4	0.0010	−0.0163	−0.0080	−0.0198	−0.0161	−0.0081	−0.0004	−0.0011	0.0055	0.0273	<b>0.0262</b>	(4.31)
	5	−0.0277	−0.0215	−0.0302	−0.0227	−0.0177	0.0118	0.0129	0.0313	0.0252	0.0305	<b>0.0582</b>	(6.20)
	6	0.0048	−0.0096	−0.0164	−0.0024	0.0083	0.0172	0.0171	0.0251	0.0317	0.0501	<b>0.0453</b>	(5.96)
	7	0.0025	−0.0126	−0.0019	0.0042	0.0111	0.0152	0.0278	0.0289	0.0260	0.0656	<b>0.0631</b>	(5.94)
	8	0.0112	−0.0114	−0.0041	0.0073	0.0156	0.0324	0.0326	0.0461	0.0548	0.0916	<b>0.0804</b>	(4.76)
	9	0.0133	−0.0026	0.0116	0.0278	0.0403	0.0488	0.0582	0.0686	0.0866	0.0799	<b>0.0666</b>	(0.99)
	10 (High Profit)	0.0286	0.0270	0.0340	0.0535	0.0653	0.0722	0.0842	0.0773	0.0939	0.0887	<b>0.0600</b>	(4.68)
<b>High Profit–High Loss</b>		<b>0.0994</b>	<b>0.1278</b>	<b>0.0891</b>	<b>0.1209</b>	<b>0.1267</b>	<b>0.1338</b>	<b>0.1056</b>	<b>0.1036</b>	<b>0.1185</b>	<b>0.1207</b>		
		(12.64)	(15.61)	(9.22)	(11.43)	(9.99)	(10.50)	(5.97)	(5.83)	(5.74)	(6.14)		
<b>High Profit and High BM–High Loss and Low BM</b>													
SAR=0.1594 (11.39)													
FF=0.1978 (18.11)													

Table 4. (continued)

Panel C: Portfolios formed on earnings and accruals for the window [18,137]													
		Accruals decile									Low–High Accruals		
		1 (Low Accruals)	2	3	4	5	6	7	8	9	10 (High Accruals)		
<b>Earnings decile</b>	1 (High Loss)	–0.0242	–0.0629	–0.0386	–0.0498	–0.0277	–0.0117	–0.0302	–0.0433	–0.0501	–0.0722	<b>0.0480</b>	(1.22)
	2	–0.0121	–0.0110	–0.0260	–0.0349	–0.0573	–0.0526	–0.0305	–0.0388	–0.0750	–0.0798	<b>0.0677</b>	(4.55)
	3	0.0025	–0.0038	–0.0093	0.0035	–0.0199	–0.0269	–0.0271	–0.0495	–0.0513	–0.0664	<b>0.0689</b>	(5.52)
	4	0.0555	0.0139	0.0137	0.0141	–0.0006	0.0009	–0.0170	–0.0162	–0.0285	–0.0178	<b>0.0733</b>	(2.09)
	5	0.0269	0.0119	0.0083	0.0114	0.0105	0.0062	–0.0041	–0.0181	–0.0236	–0.0458	<b>0.0728</b>	(5.25)
	6	0.0341	0.0237	0.0377	0.0209	0.0166	0.0154	–0.0044	–0.0073	–0.0218	–0.0180	<b>0.0521</b>	(3.05)
	7	0.0205	0.0415	0.0323	0.0114	0.0137	0.0134	0.0117	0.0026	–0.0122	–0.0174	<b>0.0379</b>	(2.52)
	8	0.0464	0.0414	0.0373	0.0251	0.0190	0.0154	0.0114	0.0080	0.0000	–0.0240	<b>0.0704</b>	(4.58)
	9	0.0638	0.0498	0.0479	0.0366	0.0332	0.0215	0.0285	0.0160	0.0214	–0.0049	<b>0.0687</b>	(3.46)
	10 (High Profit)	0.0600	0.0605	0.0581	0.0500	0.0494	0.0334	0.0555	0.0333	0.0190	0.0101	<b>0.0499</b>	(1.73)
High Profit–High Loss		<b>0.0843</b> (5.56)	<b>0.1234</b> (9.05)	<b>0.0967</b> (5.09)	<b>0.0999</b> (6.52)	<b>0.0771</b> (4.81)	<b>0.0450</b> (2.28)	<b>0.0856</b> (4.34)	<b>0.0766</b> (5.08)	<b>0.0691</b> (4.42)	<b>0.0823</b> (3.77)		
<b>High Profit and Low Accruals–High Loss and High Accruals</b>													
		<b>SAR=0.1322</b> (7.49)											
		<b>FF=0.1499</b> (7.51)											

Notes: This table presents buy-and-hold abnormal stock returns for the following windows: [1,120] (Panels A and B) and [18, 137] (Panel C), where day zero is the earnings announcement date of quarter  $q$ .  $t$ -statistics are in parenthesis. Abnormal returns are measured using size-adjusted returns (SAR). For the hedge portfolio, we also provide Carhart's (1997) four-factor model (FF) return. For firms that delist during the return window, the remaining return is calculated by using the delisting return from the CRSP database, and then reinvesting any remaining proceeds in the appropriate benchmark portfolio. Earnings are earnings before extraordinary items and discontinued operations (Compustat Quarterly data8) in quarter  $q$  scaled by total assets (Compustat Quarterly data44) in quarter  $q-1$ . SUE is the standardized unexpected earnings in quarter  $q$  (generated using a seasonal random walk with drift model), based on diluted earnings per share excluding extraordinary items (Compustat Quarterly data9). BM is the ratio of book-to-market value of equity (Compustat Quarterly data59)/(data61\*data14) at the end of quarter  $q$ . Accruals is the accruals (Compustat Quarterly data76–(data108–data78)) in quarter  $q$  by average assets (Compustat Quarterly data44) in quarter  $q$ . In each panel, the full sample is classified into deciles of Earnings from lowest Earnings, High Loss, to highest Earnings, High Profit. The full sample is also independently classified into deciles of SUE (Panel A), BM (Panel B), and Accruals (Panel C), respectively, from lowest (Low) to highest values (High). The cut-off points for Earnings, SUE, BM, and Accruals are determined every quarter  $q$  based on the distribution of the underlying variables in quarter  $q-1$ .

**Table 5**

Regressions of buy-and-hold size-adjusted stock returns on Earnings, PEAD, value-glamour, and accruals strategies.

Model: $BHSAR_{i,q,[1,120]} = a_0 + a_1 Earnings_{i,q} + a_2 SUE_{i,q} + a_3 BM_{i,q} + a_4 Accruals_{i,q} + e_{i,q}$						
Variable	Expected sign	Model I	Model II	Model III	Model IV	Model V
Earnings	+	0.0924 (7.80)	0.0710 (6.45)	0.0853 (5.94)	0.0907 (4.62)	0.1281 (8.76)
SUE	+		0.0596 (14.67)	0.0569 (12.80)	0.0625 (9.41)	0.0414 (8.94)
BM	+			0.0534 (3.30)	0.0484 (2.35)	0.0646 (4.51)
Accruals	–				–0.0572 (–9.70)	–0.0522 (–10.36)
Number of observations		458,693	359,909	353,170	216,716	214,549
Adj. $R^2$ (%)		0.6	0.7	0.9	0.9	1.9

Note: This table presents the results from the regression presented above and estimated using standard errors clustered at the firm  $i$  and quarter  $q$  level following Gow et al. (2009).  $t$ -statistics are in parenthesis. Model V corresponds to the least trimmed squares regression in which one percent of the observations with the largest squared residuals are excluded before re-estimating the model.  $BHSAR_{i,q,[1,120]}$  is the buy-and-hold size-adjusted returns of firm  $i$  for the window [1, 120], where day zero is the earnings announcement date of quarter  $q$ . For firms that delist during the return window, the remaining return is calculated by using the delisting return from the CRSP database, and then reinvesting any remaining proceeds in the appropriate size-matched portfolio.  $Earnings_{i,q}$  is the decile ranking of firm  $i$  based on earnings before extraordinary items and discontinued operations (Compustat Quarterly data8) in quarter  $q$  scaled by total assets (Compustat Quarterly data44) in quarter  $q-1$ .  $SUE_{i,q}$  is the decile ranking of firm  $i$  based on standardized unexpected earnings in quarter  $q$  (generated using a seasonal random walk with drift model), calculated using diluted earnings per share excluding extraordinary items (Compustat Quarterly data9).  $BM_{i,q}$  is the decile ranking of firm  $i$  based on the ratio of book-to-market value of equity (Compustat Quarterly data59/(data61\*data14)) at the end of quarter  $q$ .  $Accruals_{i,q}$  is the decile ranking of firm  $i$  based on accruals (Compustat Quarterly data76–(data108–data78)) in quarter  $q$  scaled by average total assets (Compustat Quarterly data44) in quarter  $q$ . The decile rankings for all rank variables are determined every quarter  $q$  based on the distribution of the underlying variables in quarter  $q-1$ . Each rank variable is scaled to range between zero and one.

amounts to approximately 34 percent annualized return. This return is superior to both the return of the hedge portfolio formed based on loss/profit alone, 10.21 percent, reported in Table 2 and the one based on book-to-market alone, 2.43 percent (not tabulated). In fact, the return from the two-way classification is approximately 25 percent higher than the sum of the returns from the two strategies alone, which indicates that combining the loss/profit strategy and the book-to-market strategy improves substantially the performance of the hedge portfolio.

Second, the loss/profit strategy dominates the book-to-market strategy. For example, for all book-to-market deciles the returns are negative for the High Loss portfolio and positive for the High Profit portfolio. In other words, when the book-to-market variable and the loss/profit variable conflict on the sign of a future return, the latter is correct. To see that, consider the portfolio returns of the highest book-to-market decile (High BM) and highest loss decile (High Loss), where the book-to-market (loss/profit) strategy predicts positive (negative) future returns, respectively. Inconsistent with the prediction of the book-to-market strategy, and consistent with the prediction of the loss/profit strategy, the return of this portfolio is significantly negative, –3.20 percent. Likewise, the return of the High Profit and Low BM portfolio is significantly positive, 2.86 percent, which is consistent with the prediction of the loss/profit strategy and contradictory to the prediction of the book-to-market strategy.

The bottom line of Panel B displays the returns of ten hedge portfolios formed based on the loss/profit strategy after controlling for the book-to-market effect. The hedge portfolio return is significantly positive for all book-to-market deciles, ranging from 8.91 to 13.38 percent. That is, the return to the loss/profit strategy is largely unchanged even after controlling for the book-to-market effect. Collectively, the results in Panel B demonstrate that the loss/profit effect is incremental to, and more pronounced than the book-to-market effect.

#### 4.2.4. Losses/profits, accruals, and future stock returns

Panel C of Table 4 examines the relation between the loss/profit strategy and the accruals strategy. The panel presents 120-trading-day buy-and-hold size-adjusted returns for portfolios formed based on a two-way classification in which observations are sorted independently into ten accruals deciles and ten earnings deciles. Consider first the return on a portfolio consisting of a short position in the top right corner of the table where both strategies generate a sell signal (return of –7.22 percent) and a long position in the bottom left corner of the table where both strategies generate a buy signal (return of 6.00 percent), which amounts to 13.22 percent. This return is quite similar to the sum of the returns of the hedge portfolios formed based on loss/profit strategy of 10.21 percent (reported in Table 2) and the return of the accrual-based hedge portfolio of 3.28 (not tabulated). Therefore, combining the two strategies improve, albeit slightly, the hedge portfolio performance relative to its performance based on the loss/profit strategy alone.

Next, the bottom line of Panel C displays the returns of ten hedge portfolios formed based on the loss/profit strategy after controlling for the accruals anomaly. These results indicate that the loss/profit strategy yields substantial returns

**Table 6**

Conditional and unconditional probabilities of a loss/profit, and abnormal stock returns.

Panel A: Contingency table		Loss <sub>q</sub>	Profit <sub>q</sub>	Row total		
Earnings decile <sub>q-1</sub>	1 (High Loss) <sub>q-1</sub>	31,579 (0.77)	9,657 (0.23)	<b>41,236</b> <b>(1.00)</b>		
	2	23,720 (0.57)	17,694 (0.43)	<b>41,414</b> <b>(1.00)</b>		
	3	14,630 (0.34)	28,305 (0.66)	<b>42,935</b> <b>(1.00)</b>		
	4	6,727 (0.15)	37,295 (0.85)	<b>44,022</b> <b>(1.00)</b>		
	5	4754 (0.11)	39,007 (0.89)	<b>43,761</b> <b>(1.00)</b>		
	6	4197 (0.10)	39,952 (0.90)	<b>44,149</b> <b>(1.00)</b>		
	7	3477 (0.08)	40,265 (0.92)	<b>43,742</b> <b>(1.00)</b>		
	8	2845 (0.07)	40,706 (0.93)	<b>43,551</b> <b>(1.00)</b>		
	9	2575 (0.06)	41,120 (0.94)	<b>43,695</b> <b>(1.00)</b>		
	10 (High Profit) <sub>q-1</sub>	3327 (0.07)	41,743 (0.93)	<b>45,070</b> <b>(1.00)</b>		
<b>Column total</b>	<b>97,831</b> (0.23)	<b>335,744</b> (0.77)	<b>433,575</b> <b>(1.00)</b>			
$\chi^2(9)=134,399.26$						
Panel B: Correlation coefficients between differences in conditional and unconditional probabilities of a loss and buy-and-hold abnormal stock returns for portfolios formed on earnings						
	Buy-and-hold abnormal returns					
	[-2, 0]		[1, 60]		[1, 20]	
	SAR	FF	SAR	FF	SAR	FF
Correlation coefficients	<b>-0.86</b>	<b>-0.88</b>	<b>-0.91</b>	<b>-0.98</b>	<b>-0.95</b>	<b>-0.99</b>
p-value (Pearson)	(<)	(< 0.01)	(< 0.01)	(< 0.01)	(< 0.01)	(< 0.01)
p-value (Spearman)	(< 0.01)	(< 0.01)	(< 0.01)	(< 0.01)	(< 0.01)	(< 0.01)

Notes: Panel A presents the frequency and probability of a loss/profit in quarter  $q$  given the magnitude of the Earnings in quarter  $q-1$ . The numbers represent frequencies and those in parentheses represent percentages. Earnings are earnings before extraordinary items and discontinued operations (Compustat Quarterly data8) in quarter  $q$  scaled by total assets (Compustat Quarterly data44) in quarter  $q-1$ . The full sample is classified into deciles of Earnings from lowest Earnings, High Loss, to highest Earnings, High Profit. The cut-off points are determined every quarter based on the distribution of Earnings in the previous quarter. We employ a chi-square test to examine whether the conditional probability of a loss/profit in quarter  $q$  is increasing in the magnitude of the loss/profit in quarter  $q-1$ .  $\chi^2(9)$  is the chi-square statistic with nine degrees of freedom (see Conover 1980, pp. 158–159). Critical values for 0.05 and 0.01 significance levels are, respectively, 16.92 and 21.67. Panel B presents the correlation coefficients between differences in conditional and unconditional probabilities of a loss/profit and buy-and-hold abnormal stock returns for the following windows: [-2, 0], [1, 60], and [1, 120], where day zero is the earnings announcement date of quarter  $q$ , as reported in Table 2.  $p$ -Values are in parenthesis. Abnormal returns are measured using size-adjusted returns (SAR) and Carhart's (1997) four-factor model (FF). For firms that delist during the return window, the remaining return is calculated by using the delisting return from the CRSP database, and then reinvesting any remaining proceeds in the appropriate benchmark portfolio.

even after controlling for the accruals anomaly, ranging from 4.50 to 12.34 percent. Overall, the results in Panel C provide evidence that the loss/profit effect is independent from the accruals anomaly. In summary, the findings in Panels A–C of Table 4 show that the post loss/profit announcement drift is more pronounced than, and incremental to the SUE, book-to-market, and accruals effects.

#### 4.2.5. Losses/profits, sue, book-to-market, accruals, and future stock returns

So far, we examine the ability of the loss/profit effect to predict future returns after controlling for each of the three alternative explanations separately. In this section, we assess the ability of the loss/profit effect to predict future returns after controlling for all three alternative explanations simultaneously by using a regression analysis as specified by Eq. (6). Note that since Eq. (6) includes an intercept,  $a_0$ , and since all variables are scaled to range from zero to one, the least square



**Table 7**  
Buy-and-hold abnormal stock returns for high loss/profit portfolios, by analyst following.

High/low earnings decile	N	Buy-and-hold abnormal returns					
		[-2, 0]		[1, 60]		[1, 120]	
		SAR	FF	SAR	FF	SAR	FF
<i>Panel A: Subsample not followed by analysts</i>							
1 (High Loss)	22,763	-0.0115 (-16.63)	-0.0121 (-17.64)	-0.0479 (-16.65)	-0.0708 (-22.83)	-0.0892 (-22.92)	-0.1417 (-29.66)
10 (High Profit)	15,243	0.0283 (32.52)	0.0262 (36.16)	0.0339 (13.66)	0.0207 (7.82)	0.0511 (13.10)	0.0167 (4.09)
<b>High profit–high loss</b>		<b>0.0398</b>	<b>0.0383</b>	<b>0.0818</b>	<b>0.0915</b>	<b>0.1403</b>	<b>0.1583</b>
<i>t</i> -statistics		(33.60)	(35.17)	(21.25)	(23.67)	(26.31)	(27.65)
Alternate <i>t</i> -statistics (Fama–MacBeth)		(11.27)	(13.66)	(8.95)	(10.54)	(11.12)	(8.34)
<i>Panel B: Subsample followed by one to five analysts</i>							
1 (High Loss)	13,885	-0.0086 (-9.86)	-0.0092 (-10.69)	-0.0164 (-4.37)	-0.0402 (-10.64)	-0.0317 (-6.21)	-0.0739 (-12.58)
10 (High Profit)	12,081	0.0196 (27.35)	0.0179 (25.94)	0.0351 (13.73)	0.0226 (8.08)	0.0553 (13.85)	0.0237 (5.54)
<b>High profit–high loss</b>		<b>0.0282</b>	<b>0.0272</b>	<b>0.0515</b>	<b>0.0628</b>	<b>0.0870</b>	<b>0.0976</b>
<i>t</i> -statistics		(23.90)	(23.58)	(10.75)	(13.31)	(12.93)	(13.58)
Alternate <i>t</i> -statistics (Fama–MacBeth)		(17.89)	(15.45)	(5.21)	(8.41)	(5.65)	(7.93)
<i>Panel C: Subsample followed by more than five analysts</i>							
1 (High Loss)	6,524	-0.0051 (-4.34)	-0.0051 (-4.69)	-0.0017 (-0.36)	-0.0205 (-4.29)	-0.0003 (-0.04)	-0.0462 (-6.14)
10 (High Profit)	15,922	0.0096 (18.11)	0.0087 (17.15)	0.0200 (10.91)	0.0063 (3.18)	0.0311 (11.38)	0.0044 (1.47)
<b>High profit–high loss</b>		<b>0.0146</b>	<b>0.0138</b>	<b>0.0217</b>	<b>0.0267</b>	<b>0.0314</b>	<b>0.0507</b>
<i>t</i> -statistics		(16.34)	(15.96)	(7.75)	(5.28)	(7.53)	(5.42)
Alternate <i>t</i> -statistics (Fama–MacBeth)		(14.29)	(13.47)	(4.02)	(2.87)	(3.92)	(2.49)

Notes: This table presents buy-and-hold abnormal stock returns for the following windows: [-2, 0], [1, 60], and [1, 120], where day zero is the earnings announcement date of quarter  $q$ . *t*-statistics are in parenthesis. Alternate *t*-statistics are calculated using the Fama–MacBeth (1973) procedure on the returns to the strategy every quarter. Abnormal returns are measured using size-adjusted returns (SAR) and Carhart's (1997) four-factor model (FF). For firms that delist during the return window, the remaining return is calculated by using the delisting return from the CRSP database, and then reinvesting any remaining proceeds in the appropriate benchmark portfolio. Earnings are earnings before extraordinary items and discontinued operations (Compustat Quarterly data8) in quarter  $q$  scaled by total assets (Compustat Quarterly data44) in quarter  $q-1$ . High Loss (High Profit) corresponds to firm-quarter observations classified into the lowest (highest) Earnings decile. The cut-off points are determined every quarter  $q$  based on the distribution of Earnings in quarter  $q-1$ . Firm-quarter observations are also independently classified into three subsamples: firms not followed by analysts (Panel A), firms followed by one to five analysts (Panel B), and firms followed by more than five analysts (Panel C). Analyst following is determined based on the number of analysts providing annual earnings per share forecasts in a given year, as reported by the Institutional Brokers Estimates System (I/B/E/S) database.

values of  $a_1$ ,  $a_2$ ,  $a_3$ , and  $a_4$  represent abnormal returns on zero-investment (hedge) portfolios, that is, portfolios where the sum of the weights assigned to individual securities is zero.<sup>21</sup>

Table 5 displays coefficient estimates for Eq. (6) (presented as Models IV) and for three models nested within this equation (presented as Models I, II, and III). Table 5 also displays coefficient estimates for Eq. (6) using a least trimmed squares regression approach in which one percent of the observations with the largest squared residuals are excluded before re-estimating the model (presented as Model V). The findings in Table 5 are robust to alternative estimation methods and model specifications, as the results across the five specifications are similar.<sup>22</sup> Consider, for example, the results for Model IV. As predicted,  $a_1$ ,  $a_2$ , and  $a_3$  are significantly positive, 0.0907, 0.0625, and 0.0484, respectively, and  $a_4$  is significantly negative, -0.0572. Since each estimated coefficient indicates the hedge portfolio return for one of the four strategies, and since the estimated coefficient on the earnings variable is almost twice as high (in absolute value) as any of the other three estimated coefficients, these findings further demonstrate that the loss/profit effect is incremental to, and more pronounced than the three previously documented accounting-related anomalies.

<sup>21</sup> See Fama (1976, pp. 323–331) or Bernard and Thomas (1990, pp. 325–326) for more details on the use of least squares coefficients as portfolio returns.

<sup>22</sup> We also estimate the models using actual values of the explanatory variables rather than their ranks. All estimated coefficients are highly statistically significant in the predicted direction.

	[1, 60]		[61, 120]		[121, 180]		[181, 240]	
	SAR	FF	SAR	FF	SAR	FF	SAR	FF
<b>High Profit – High Loss</b>	<b>0.0596</b>	<b>0.0676</b>	<b>0.0396</b>	<b>0.0485</b>	<b>0.0278</b>	<b>0.0316</b>	<b>0.0110</b>	<b>0.0220</b>
<i>t</i> -statistics	(26.04)	(27.83)	(17.83)	(19.26)	(12.38)	(12.09)	(4.67)	(7.79)

Tests of Differences in (High Profit – High Loss) Across Windows						
	[1, 60] vs. [61, 120]		[61, 120] vs. [121, 180]		[121, 180] vs. [181, 240]	
	SAR	FF	SAR	FF	SAR	FF
<b>Difference</b>	<b>0.0200</b>	<b>0.0191</b>	<b>0.0118</b>	<b>0.0169</b>	<b>0.0168</b>	<b>0.0096</b>
<i>t</i> -statistics	(6.32)	(5.59)	(3.78)	(4.81)	(5.16)	(2.73)

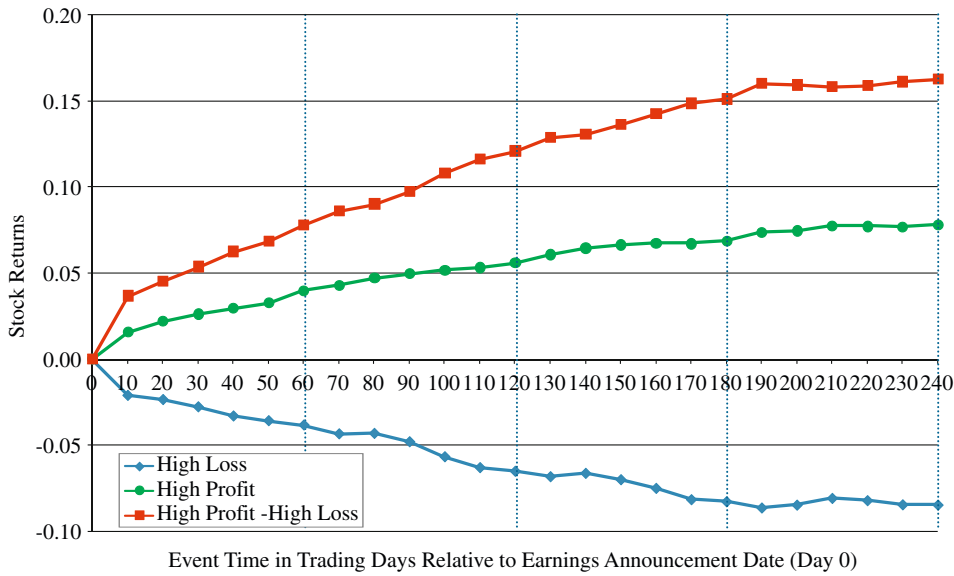


Figure notes:

This figure presents buy-and-hold abnormal returns for the High Loss, High Profit, and the hedge portfolios for the window [1, 240], where day zero is the quarterly earnings announcement date. Abnormal returns are measured using size-adjusted returns. For firms that delist during the return window, the remaining return is calculated by using the delisting return from the CRSP database, and then reinvesting any remaining proceeds in the appropriate size-matched portfolio. Earnings are earnings before extraordinary items and discontinued operations (Compustat Quarterly data8) scaled by beginning-of-quarter total assets (Compustat Quarterly data44). High Loss (High Profit) corresponds to firm-quarter observations classified into the lowest (highest) Earnings decile. The Loss/Profit strategy consists of a long position in the highest Earnings decile (High Profit) and a short position in the lowest Earnings decile (High Loss). The cut-off points are determined every quarter  $q$  based on the distribution of Earnings in quarter  $q-1$ .

**Fig. 2.** Behavior of buy-and-hold abnormal returns for the loss/profit strategy for the window [1, 240]. *Notes:* This figure presents buy-and-hold abnormal returns for the High Loss, High Profit, and the hedge portfolios for the window [1, 240], where day zero is the quarterly earnings announcement date. Abnormal returns are measured using size-adjusted returns. For firms that delist during the return window, the remaining return is calculated by using the delisting return from the CRSP database, and then reinvesting any remaining proceeds in the appropriate size-matched portfolio. Earnings are earnings before extraordinary items and discontinued operations (Compustat Quarterly data8) scaled by beginning-of-quarter total assets (Compustat Quarterly data44). High Loss (High Profit) corresponds to firm-quarter observations classified into the lowest (highest) Earnings decile. The loss/profit strategy consists of a long position in the highest Earnings decile (High Profit) and a short position in the lowest Earnings decile (High Loss). The cut-off points are determined every quarter  $q$  based on the distribution of Earnings in quarter  $q-1$ .

## 5. Conditional probabilities, unconditional probabilities, and post loss/profit announcement drift

### 5.1. Methodology

In this section, we test a behavioral explanation for the post loss/profit announcement drift documented above. The behavioral finance literature (e.g., Mullainathan, 2002; Daniel et al., 2002) argues that investors appear to rely on simplified models to assess a firm’s future prospects. If so, investors may be relying on unconditional probabilities for a loss/profit rather than their conditional probabilities when predicting a future loss/profit. This type of behavior would

**Table 8**  
Buy-and-hold abnormal stock returns for portfolios formed on earnings and Z score for the window [1, 20].

	Z score $\leq$ 1.81 <i>Bankruptcy Likely</i>		1.81 < Z score $\leq$ 2.99 "Grey Area"		Z score > 2.99 <i>Bankruptcy Unlikely</i>	
	SAR	FF	SAR	FF	SAR	FF
<i>Panel A: Model with Altman's (1968) original coefficients</i>						
1 (High Loss)	-0.0475 (-12.20)	-0.0887 (-19.48)	-0.0342 (-4.28)	-0.0699 (-7.94)	-0.0768 (-16.12)	-0.1360 (-24.19)
	N=24,243		N=4534		N=14,435	
10 (High Profit)	0.0850 (10.19)	0.0521 (5.75)	0.0749 (14.01)	0.0280 (4.53)	0.0327 (14.73)	0.0034 (1.44)
	N=4064		N=5680		N=32,556	
<b>High Profit-High Loss</b>	<b>0.1325</b> (14.92)	<b>0.1408</b> (20.29)	<b>0.1090</b> (12.28)	<b>0.0979</b> (8.95)	<b>0.1095</b> (21.76)	<b>0.1394</b> (18.45)
<i>Panel B: Model with Begley et al.'s (1996) coefficients</i>						
1 (High Loss)	-0.0673 (-14.75)	-0.1126 (-20.75)	-0.0388 (-4.68)	-0.0776 (-8.15)	-0.0493 (-12.41)	-0.0991 (-21.65)
	N=18,379		N=4313		N=20,520	
10 (High Profit)	0.0671 (8.42)	0.0306 (3.39)	0.0694 (10.65)	0.0326 (4.53)	0.0387 (17.57)	0.0076 (3.23)
	N=3142		N=3577		N=35,581	
<b>High profit-high loss</b>	<b>0.1344</b> (16.54)	<b>0.1432</b> (20.88)	<b>0.1081</b> (9.73)	<b>0.1102</b> (9.30)	<b>0.0880</b> (21.12)	<b>0.1067</b> (18.29)

*Notes:* This table presents buy-and-hold abnormal stock returns for the window [1, 20], where day zero is the earnings announcement date of quarter  $q$ .  $t$ -statistics are in parenthesis and below them are the numbers of observations. Abnormal returns are measured using size-adjusted returns (SAR). For firms that delist during the return window, the remaining return is calculated by using the delisting return from the CRSP database, and then reinvesting any remaining proceeds in the appropriate size-matched portfolio. Earnings are earnings before extraordinary items and discontinued operations (Compustat Quarterly data8) in quarter  $q$  scaled by total assets (Compustat Quarterly data44) in quarter  $q-1$ . In Panel A, Z scores in quarter  $q$  are computed using Altman's (1968) model and original coefficients, as follows:  $1.2(\text{working capital}/\text{total assets})+1.4(\text{retained earnings}/\text{total assets})+3.3(\text{earnings before extraordinary items and discontinued operations}/\text{total assets})+0.6(\text{market value of equity}/\text{total liabilities})+1.0(\text{total sales}/\text{total assets})$ , which in terms of Compustat Quarterly data items corresponds to:  $1.2[(\text{data}40-\text{data}49)/\text{data}44]+1.4(\text{data}58/\text{data}44)+3.3(\text{data}8/\text{data}44)+0.6[(\text{data}61*\text{data}14)/\text{data}54]+1.0(\text{data}2/\text{data}44)$ . In Panel B, Z scores in quarter  $q$  are computed using Altman's (1968) model and original coefficients for years prior to 1980 (as described above), and using Altman's (1968) model and new coefficients re-estimated by Begley et al. (1996) for years after 1980, as follows:  $10.4(\text{working capital}/\text{total assets})+1.0(\text{retained earnings}/\text{total assets})+10.6(\text{earnings before extraordinary items and discontinued operations}/\text{total assets})+0.3(\text{market value of equity}/\text{total liabilities})-0.17(\text{total sales}/\text{total assets})$ , which in terms of Compustat Quarterly data items corresponds to:  $10.4[(\text{data}40-\text{data}49)/\text{data}44]+1.0(\text{data}58/\text{data}44)+10.6(\text{data}8/\text{data}44)+0.3[(\text{data}61*\text{data}14)/\text{data}54]-0.17(\text{data}2/\text{data}44)$ . As mentioned in Shumway (2001), the published version of Begley et al. (1996) contains two typographical errors. The coefficients reported above are the corrected ones. High Loss (High Profit) corresponds to firm-quarter observations classified into the lowest (highest) Earnings decile. The cut-off points are determined every quarter  $q$  based on the distribution of Earnings in quarter  $q-1$ .

result in an underestimation of the probability of a loss (profit) in quarter  $q$  for firms with a loss (profit) in quarter  $q-1$  if, as we assert, conditional probabilities are higher than unconditional probabilities. Consequently, a drift would be observed after the earnings announcement date, as news arrives to the market and investors correct their errors.

To test this explanation, we perform two tests. First, we examine whether the conditional probability of a current quarterly loss/profit is increasing in the magnitude of the previous quarterly loss/profit. This test employs a chi-square statistic. We design a ten-by-two contingency table with earnings deciles in the previous quarter as rows and the frequency of a loss/profit in the current quarter as columns. We calculate a chi-square statistic to test independence (see Conover, 1980, pp. 153–156). Our second test examines the relation between future abnormal returns, our measure of the valuation errors, and the difference between conditional and unconditional probabilities of a loss/profit, our measure of investor misperception of the likelihood of a future loss/profit. To test for this relation, we compute for each earnings decile the difference between conditional and unconditional probabilities of a loss (profit). Then, we compute the correlation between the two measures: the portfolio returns and the differences in probabilities. If stock prices fail to fully reflect the implications of losses/profits for future losses/profits because investors do not fully rely on conditional probabilities, these two measures should be statistically significantly correlated.<sup>23</sup>

## 5.2. Tests of the relation among conditional probabilities, unconditional probabilities, and post loss/profit announcement drift

Panel A of Table 6 reports the results for the first test, the one related to whether the conditional probability of a loss/profit in quarter  $q$  is increasing in the magnitude of the loss/profit in quarter  $q-1$ . Specifically, the ten-by-two contingency table reported in Table 6 tests whether:  $P(\text{Row } i, \text{Column } j) \neq P(\text{Row } i) * P(\text{Column } j) \forall i \text{ and } j$ . The test employs a chi-square statistic with nine

<sup>23</sup> For these tests, we also use an alternative intertemporal approach to correct for cross-sectional dependence across observations. The results (not tabulated for parsimony) are qualitatively similar to the tabulated results.

**Table 9**

Buy-and-Hold abnormal stock returns for portfolios formed on earnings for firms with traded options.

Earnings decile	N	Buy-and-hold abnormal returns					
		[-2, 0]		[1, 60]		[1, 120]	
		SAR	FF	SAR	FF	SAR	FF
1 (High Loss)	6534	-0.0022 (-1.67)	-0.0020 (-1.63)	-0.0366 (-7.15)	-0.0467 (-8.80)	-0.0622 (-8.34)	-0.0884 (-10.98)
2	7040	-0.0008 (-0.74)	-0.0012 (-1.10)	-0.0249 (-5.72)	-0.0309 (-7.24)	-0.0382 (-5.85)	-0.0450 (-7.07)
3	6802	-0.0006 (-0.61)	-0.0016 (-1.84)	-0.0110 (-3.10)	-0.0238 (-6.62)	-0.0214 (-4.16)	-0.0409 (-7.66)
4	5326	0.0017 (2.00)	0.0016 (2.11)	0.0009 (0.29)	-0.0075 (-2.36)	0.0087 (1.86)	-0.0139 (-2.94)
5	6498	0.0038 (5.40)	0.0044 (6.89)	-0.0012 (-0.48)	-0.0053 (-2.04)	-0.0032 (-0.88)	-0.0125 (-3.25)
6	8192	0.0043 (6.30)	0.0043 (6.92)	0.0024 (1.04)	-0.0083 (-3.44)	0.0075 (2.25)	-0.0120 (-3.35)
7	8838	0.0063 (9.53)	0.0062 (10.25)	0.0018 (0.81)	-0.0071 (-3.00)	0.0021 (0.66)	-0.0173 (-4.98)
8	9401	0.0046 (7.05)	0.0039 (6.43)	0.0056 (2.53)	-0.0056 (-2.42)	0.0077 (2.34)	-0.0135 (-3.96)
9	10,088	0.0067 (10.16)	0.0057 (9.33)	0.0121 (5.43)	-0.0001 (-0.04)	0.0207 (5.99)	-0.0015 (-0.44)
10 (High Profit)	10,321	0.0099 (13.81)	0.0093 (13.54)	0.0167 (6.27)	0.0031 (1.15)	0.0266 (6.63)	0.0040 (1.00)
<b>High Profit–High Loss</b>		<b>0.0121</b>	<b>0.0113</b>	<b>0.0534</b>	<b>0.0498</b>	<b>0.0887</b>	<b>0.0924</b>
<i>t</i> -statistics		(10.36)	(10.15)	(9.50)	(7.57)	(10.64)	(9.22)
Alternate <i>t</i> -statistics (Fama–MacBeth)		(8.44)	(8.94)	(3.33)	(3.31)	(4.01)	(4.43)

Notes: This table presents buy-and-hold abnormal stock returns for the following windows: [-2, 0], [1, 60], and [1, 120], where day zero is the earnings announcement date of quarter  $q$ . *t*-statistics are in parenthesis. Alternate *t*-statistics are calculated using the Fama–MacBeth (1973) procedure on the returns to the strategy every quarter. Abnormal returns are measured using size-adjusted returns (SAR) and Carhart's (1997) four-factor model (FF). For firms that delist during the return window, the remaining return is calculated by using the delisting return from the CRSP database, and then reinvesting any remaining proceeds in the appropriate benchmark portfolio. Earnings are earnings before extraordinary items and discontinued operations (Compustat Quarterly data8) in quarter  $q$  scaled by total assets (Compustat Quarterly data44) in quarter  $q-1$ . The full sample is classified into deciles of Earnings from lowest Earnings, High Loss, to highest Earnings, High Profit. The cut-off points are determined every quarter  $q$  based on the distribution of Earnings in quarter  $q-1$ . The subsample (79,040 firm-quarter observations) in this table consists of firm-quarter observations with traded options, as reported in the database Optionmetrics, in the window [0, 5], where day zero is the earnings announcement date of quarter  $q$ . This subsample covers the period 1996–2005.

degrees of freedom,  $\chi^2(9)$  (see Conover, 1980, pp. 158–159). The results indicate a clear pattern: the higher the loss in quarter  $q-1$ , the higher (lower) the probability of a loss (profit) in quarter  $q$ . For example, out of 41,236 firms in the High Loss decile in quarter  $q-1$ , 31,579 (77 percent) report a loss in quarter  $q$ . In contrast, out of 45,070 firms in the High Profit portfolio in quarter  $q-1$ , only 3327 (7 percent) report a loss in quarter  $q$ . A  $\chi^2(9)$  test of independence rejects the null hypothesis that a loss in quarter  $q$  is independent of the magnitude of a loss/profit in quarter  $q-1$ ; the  $\chi^2(9)$  statistic is statistically significant at a 0.01 level.

Panel B of Table 6 reports the results from correlation tests between the difference in conditional and unconditional probabilities of a loss and the post-announcement returns of the earnings deciles. The results show that the correlation coefficients between the two measures are statistically significant in the predicted direction. Specifically, the correlation coefficients are -0.91 and -0.95 for the windows [1, 60] and [1, 120], respectively, and are statistically significant for both Pearson product moment correlations and Spearman rank correlations. Consider, for example, the results for the [1, 120] window. The 120-trading-day size-adjusted returns for the ten earnings deciles are (in percent): -5.79, -4.44, -1.98, -0.13, 0.66, 1.42, 1.58, 1.98, 2.96, and 4.42 (see Table 2). The differences between conditional and unconditional probabilities of a loss demonstrate a similar pattern: 0.54, 0.34, 0.11, -0.08, -0.012, -0.13, -0.15, -0.16, -0.17, and -0.16 (untabulated results). That is, the larger the valuation error (the absolute value of the abnormal return), the larger the misperception about the probability of a future loss (the absolute value of the difference between conditional and unconditional probabilities). These results support our behavioral explanation for the post loss/profit announcement drift by showing that the loss/profit mispricing is related to differences between conditional and unconditional probabilities of losses/profits, as if stock prices do not fully reflect conditional probabilities in a timely fashion.

### 5.3. Analyst following and post loss/profit announcement drift

Finally, to further assess the validity of our explanation for the loss/profit announcement drift, we examine stock returns for the High Loss portfolio, the High Profit portfolio, and the hedge portfolio (High Profit–High Loss) after

classifying our sample firms into three groups by the number of analysts following a firm. The first group consists of firms with no analyst following, the second of firms followed by one to five analysts (low analyst following), and the third of firms followed by more than five analysts (high analyst following).<sup>24</sup> The idea underlying these tests is that if our explanation for the loss/profit announcement drift is valid, the hedge portfolio return should be greater for less-followed firms with little earnings forecast information available to investors (Bhushan, 1994; Brown and Han, 2000; Bartov et al., 2000). The results, displayed in Table 7, clearly show that the hedge return portfolio is decreasing monotonically as the number of analysts following a firm increases. For example, the hedge portfolio returns for the window [1, 120] for the subsample with no analysts following (Panel A), low analyst following (Panel B), and high analyst following (Panel C) are, respectively, 14.03, 8.70, and 3.14 percent (all statistically significant).

## 6. Distress risk, short sales constraints, transaction costs, firm size, and post loss/profit announcement drift

In this section we assess the sensitivity of our findings to four alternative explanations: distress risk, short sales constraints, transaction costs, and firm size. We begin by examining the daily buy-and-hold abnormal returns for three portfolios, the High Profit, High Loss, and the hedge (i.e., High Profit–High Loss) over the window [1, 240], as portrayed in Fig. 2. The figure shows that the values of the daily abnormal returns diminish over time. Specifically, in the four 60-trading-day periods after portfolio formation, [1, 60], [61, 120], [121, 180], and [181, 240], the stock return performance of the hedge portfolio, 5.96, 3.96, 2.78, and 1.10 percent, respectively, declines monotonically, with statistically significant differences between portfolio returns in consecutive periods. This apparent concavity in abnormal returns in the post portfolio formation period mitigates concerns that our findings are driven by an unidentified risk factor (i.e., mismeasured abnormal returns).

Still, the role of one specific risk factor, distress risk, in explaining the cross-section of expected returns deserves further examination. While several studies (e.g., Chan and Chen, 1991; Fama and French, 1992, 1993) argue that default risk explains the cross-section of expected returns, others (e.g., Dichev, 1998) arrive at an opposite conclusion. To assess the possibility that distress risk underlies our findings, we examine the stock price performance of the High Loss portfolio, the High Profit portfolio, and the hedge portfolio (High Profit–High Loss) after partitioning each into three subportfolios based on their distress risk. We use two alternative measures for distress risk. The first measure is the Altman's (1968) Z score, using Altman's (1968) model and original coefficients, a commonly used proxy for distress risk in the literature (e.g., Dichev, 1998; Khan, 2008). The second measure is based on using Altman's (1968) model and original coefficients for years prior to 1980, and Altman's (1968) model and new coefficients re-estimated by Begley et al. (1996) for years after 1980. For both measures, the cut-off points are Z scores equal to or less than 1.81, which indicate that bankruptcy is likely, Z scores greater than 1.81 yet equal to or less than 2.99, which correspond to the "gray area", and Z scores greater than 2.99, which indicate that bankruptcy is unlikely (Altman, 1968; Begley et al., 1996).

Panel A of Table 8 presents the results based on Altman's (1968) original model and Panel B presents the results based on the re-estimated model. The results in both panels, which are fairly similar, indicate that distress risk is unable to explain our findings, as the post loss/profit announcement drift is observed in all subportfolios, and there is no evidence that this drift is related to distress risk. For example, the hedge portfolio consisting of firms most susceptible to distress risk, those with Z scores equal to or less than 1.81, and the hedge portfolio consisting of firms least susceptible to distress risk, those with Z scores greater than 2.99, yield quite similar returns, 13.25 and 10.95 percent, respectively, using the original model and 13.44 and 8.80 percent, respectively, using the re-estimated model. Further, when the predictions of the loss/profit effect and the distress risk effect contradict each other, the prediction of the former holds. For example, in both panels the returns on the High Loss and Low Z score (equal to or less than 1.81) portfolio are significantly negative, –4.75 and –6.73 percent, respectively, for the original and the re-estimated models, which is consistent with the prediction of the loss/profit effect and at odds with the prediction of the distress risk effect.

Next, we test whether the post loss/profit announcement drift is an implementable strategy by assessing the effect that short sales constraints and transaction costs may have on our findings. To examine the former, we replicate our primary tests after removing from our sample all stocks with no traded options, as stocks with no traded options may be hard to borrow. To implement this additional sample selection criterion we require that all sample firm-quarter observations in a given quarter have options traded as reported in the database Optionmetrics over the window [0, 5], where day zero is the quarterly earnings announcement date. This requirement results in a sample of 79,040 observations covering the 10-year period 1996–2005, compared with 458,693 observations for our full sample covering the entire sample period 1976–2005. The results presented in Table 9 show that our findings are robust to the exclusion of firms with no traded options (i.e., potentially hard-to-borrow stocks). For example, the size-adjusted hedge portfolio returns for the windows [1, 60] and [1, 120] are both significantly positive, 5.34 and 8.87 percent, respectively.

To assess the loss/profit strategy profitability after accounting for the impact of transaction costs, we recalculate the returns of the High Loss portfolio, the High Profit portfolio, and the hedge portfolio to the loss/profit strategy for five alternative assumptions about a trader's transaction costs: 20, 40, 60, 80, and 100 basis points (bps) per round-trip

<sup>24</sup> We replicate these tests using alternative classifications of analyst following (for instance, one to ten analysts for the low analyst following group, and more than ten analysts for the high analyst following group). The results from these tests are qualitatively similar and lead to the same inferences.

trade.<sup>25</sup> As expected, the results (not tabulated for parsimony) indicate that the loss/profit strategy remains profitable even after accounting for round-trip transaction costs as high as 100 bps, as indicated by a significantly negative return for the High Loss portfolio of  $-4.85$  percent and a significantly positive return for the High Profit portfolio of  $3.37$  percent, resulting in a significantly positive return for the hedge portfolio of  $8.22$  percent.<sup>26</sup>

Finally, we replicate our primary tests after excluding small firms to assess whether our results are driven by small firms. This analysis is important for two reasons. First, if the post loss/profit announcement drift is observed only in small firms that tend to be less liquid, it is likely that our strategy is not implementable because of short sales constraints and/or high transaction costs. Second, it is important to know whether the loss/profit anomaly is market-wide or limited to only a subset of small firms that represent a small portion of total market capitalization. To address this question, we replicate the tests in Table 2 after excluding the firms in the lowest size decile. The results for this subsample (not tabulated for parsimony) were similar to those reported in Table 2. For example, for the period [1, 120] the hedge portfolio returns for the full sample reported in Table 2 is  $10.21$  percent vis-à-vis  $9.97$  percent for the subsample. Thus, the inclusion of small firms in our sample is unable to explain the post loss/profit announcement drift. To the extent that small firms serve as a proxy for distress risk, short sales constraints, high transaction costs, or an unidentified risk factor, these explanations are unlikely to explain our findings.

## 7. Conclusion

Over the last three decades, a large volume of empirical work has documented a variety of ways in which stock returns can be predicted based on publicly available information, in particular earnings information. In this study, we examine whether investors fully price the implications of current losses/profits for future losses/profits. Employing a broad sample spanning 30 years, from 1976 through 2005, we find evidence of a loss/profit mispricing. Briefly, over the 120-trading-day window following the earnings announcement, firms in an extreme loss portfolio exhibit a negative drift of nearly six percent, whereas firms in an extreme profit portfolio exhibit a positive drift of over four percent. A hedge portfolio that takes a long position in the extreme profit portfolio and a short position in the extreme loss portfolio generates approximately 10 percent abnormal return, which translates into an annualized return of approximately 21 percent. Further, using both univariate and multivariate tests we show that the mispricing associated with our loss/profit strategy is distinct from, and incremental to three previously documented accounting-based anomalies: the post-earnings-announcement drift, the value-glamour anomaly, and the accruals anomaly. Finally, a variety of sensitivity tests shows that this loss/profit anomaly is robust to alternative risk adjustments, distress risk, short sales constraints, transaction costs, and time periods.

What may explain this mispricing? If investors rely on simplified models to assess a firm's future prospects, as behavioral finance theories suggest, this mispricing may follow because investors fail to fully assess the probability of a loss/profit based on its conditional, rather than unconditional, probability. Since the unconditional probability of a loss/profit is lower than the corresponding conditional probability, this type of investor behavior would result in systematic underestimation of the probability of a loss/profit. Consequently, a negative (positive) post loss (profit) announcement drift in stock returns would be observed, and more so for extreme earnings realizations. Consistent with this explanation for the observed loss/profit mispricing, we find that the differences between conditional and unconditional probabilities, our measure of the misperception of the probability of a future loss/profit, are correlated with the levels of loss/profit mispricing. In other words, the higher the difference between conditional and unconditional probabilities, the larger the loss/profit mispricing. Still, we note that a test of market efficiency is a joint test of market efficiency and the efficacy of the model used for expected returns. Thus, notwithstanding our serious effort to mitigate the "bad model" problem by employing alternative measures for abnormal returns and by performing a battery of sensitivity tests, it is impossible to rule out entirely the possibility that the "bad model" problem (partially) explains our findings.

The primary contribution of our study is that the earnings signs, a loss versus a profit, are mispriced. This finding is statistically significant and economically important. Further, our study shows that this mispricing is related to differences between conditional and unconditional probabilities of losses/profits, as if stock prices do not fully reflect conditional probabilities in a timely fashion.<sup>27</sup> Finally, we demonstrate that considering conditional rather than unconditional probability of losses/profits, and in particular focusing on the tails of the earnings distribution (i.e., extreme losses/profits), lead to new insights about the likelihood of losses/profits. Our findings thus have implications to our understanding of the time-series properties of earnings and on investors' valuation of loss/profit firms.

<sup>25</sup> This is a conservative version of the methodology employed by Tetlock et al. (2008, Table 4), as they set the maximum round-trip transaction costs to 10 bps.

<sup>26</sup> Approximately 60 (90) percent of the hedge portfolio size-adjusted (Carhart's (1997) four factor model) returns originate from the short positions. This may raise a concern that 100 bps may not fully cover transaction costs of short sales. However, Geczy et al. (2002), who investigate short sales costs in the late 1990s, find that most borrowed stocks receive rebates, rather than pay fees. In addition, they find that trading strategies using even expensive-to-borrow short sales remain profitable after accounting for borrowing costs.

<sup>27</sup> A natural question that often arises in the context of earnings-related anomalies is whether it is plausible for a mispricing to persist for so long (i.e., decades). One answer to this intriguing question is provided by behavioral research. For example, Libby et al. (2002, p. 778) observe, "Learning to overcome biases is difficult because of the uncertainty and poor feedback inherent in complex environments."

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