4-2021

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Published in Accounting and Finance. August 2020, pp. 2379-2405
https://doi.org/10.1111/acfi.12669

Earnings momentum meets short-term return reversal

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Abstract

This paper evaluates the effectiveness of a joint strategy that exploits fundamental-based momentum and return-based reversal anomalies. This joint strategy is motivated by two considerations. First, reversal can serve as a natural hedge to momentum. Second, both fundamental and price-related information can contribute to stock return predictability. Consequently, we propose a new joint strategy that synthesises both earnings momentum and short-term reversal. We find that this joint strategy generates considerable economic gains and outperforms the sum of profits from two individual anomalies. Moreover, the proposed strategy appears to be quite robust, generating stable and persistent profits across different market conditions.

Key words: Earnings momentum; Post-earnings announcement drift; Short-term reversals; Anomalies

JEL classification: G11, G12, G14

doi: 10.1111/acfi.12669

1. Introduction

This paper evaluates the effectiveness of a joint investment strategy that synthesises fundamental-based momentum and return-based reversal strategies. This joint strategy is mainly motivated by the following two considerations. First, both conceptually and empirically, reversal can be regarded as a natural hedge to momentum.[1] For example, several recent studies provide ample

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[1]We find that in our sample the correlation between reversal and earnings momentum is about −9.3 percent.

evidence that by combining price-based momentum and reversal strategies, investors can reap substantial economic gains (e.g., Han *et al*., 2016; Zhu and Yung, 2016; Cheng *et al*., 2017). Second, it has been well documented in the academic literature that both fundamental and nonfundamental information are important contributing factors in stock return predictability. For example, studies have shown that fundamental-based momentum interacts with price momentum (e.g., Chordia and Shivakumar, 2006; Novy-Marx, 2015; Huang *et al*., 2018); technical analysis can enhance the performance of fundamental-based anomalies (e.g., Bettman *et al*., 2009; Han *et al*., 2018; Zhu and Sun, 2019); and intra-industry reversal strategies perform better than the simple short-term reversal strategy (Hameed and Mian, 2015).

In this paper, we jointly consider two prominent anomalies: earnings momentum, also known as the post-earnings announcement drift (PEAD), and short-term return reversal. We argue that a joint strategy of earnings momentum and short-term reversal can efficiently synthesise information from fundamental-based momentum and return-based reversal. We emphasise that the joint consideration of earnings momentum and short-term return reversal is not a simple combination of two random anomalies. Unlike the synthesised strategies based on multiple-stage statistical inference in Han *et al*. (2016), we propose a joint and hedged strategy that synthesises *four-dimensional* information (i.e., momentum, reversal, fundamental information and nonfundamental information) in a two-factor framework, which is easily interpreted and implemented.

Earnings momentum or PEAD refers to the anomaly that stocks with positive earnings surprises significantly outperform stocks with negative earnings surprises in the post-announcement months (Ball and Brown, 1968; Chordia and Shivakumar, 2006). It has been shown to be a robust and persistent anomaly (Fama, 1998; Hou *et al*., 2015; Green *et al*., 2017).[2] Moreover, Kausar (2017) shows that *earnings changes* proxied by PEAD dominate *earnings levels* proxied by net income, gross profitability and operating profitability in predicting future returns. This suggests that earnings momentum is unlikely to be explained away by the newly proposed Fama and French (2015) five-factor model that incorporates *earnings levels* among the five factors. In addition, it suggests that earnings momentum is a better candidate for fundamental-based momentum strategy than other fundamental-based anomalies.

Short-term return reversal refers to the anomaly that past 1-month losers outperform past 1-month winners in the subsequent month (Jegadeesh, 1990). The profitability of short-term reversal is economically significant, although the original strategy performs poorly in the post-2000 period

[2]In the Asia-Pacific region, Schneider and Gaunt (2011), Lin *et al*. (2016) and Eom *et al*. (2019) provide evidence on earnings momentum in the Australian, Taiwan and South Korean stock markets, respectively.

(Chordia *et al*., 2014).[3] However, some enhanced reversal strategies such as residual and intra-industry reversal strategies perform well (Da *et al*., 2014; Hameed and Mian, 2015). Short-term reversal captures information about liquidity provision and investor sentiment in the short horizon (e.g., Da *et al*., 2014; Cheng *et al*., 2017). Moreover, short-term reversal could help explain other nonfundamental reversal-type anomalies like idiosyncratic volatility (Huang *et al.,* 2010). Therefore, short-term reversal seems to be a good candidate to capture nonfundamental-based information that is useful for short-term stock return predictability in the joint investment strategy.

Our empirical results provide strong evidence on the effectiveness of this new joint trading strategy. We find that the proposed strategy that takes a long position in recent losers with the strongest earnings surprises and simultaneously takes a short position in recent winners with the weakest earnings surprises generates an average monthly raw return of 2.34 percent with a *t*-statistic of 10.92 from 1980 to 2015. This finding is robust to risk adjustment as its Fama-French five-factor alpha is a highly significant 1.94 percent. The superior performance is also found to be quite robust. We show that the joint strategy survives the post-2000 period, performs well among large stocks, and is robust after controlling for bid-ask spreads, the well-known January effect, industry effect or the effect of quarterly earnings announcements.

Interestingly we document that this new joint strategy outperforms the sum of the respective individual strategies. For example, the sum of the average monthly raw returns from the same two individual strategies is 1.8 percent, which is about half a percent smaller than the 2.34 percent achieved by the joint strategy. This finding highlights the fact that there exists considerable synergy between earnings momentum and short-term reversal, which presumably generates *distinct* and *incremental* information about future returns. Hence from this perspective, our result echoes the wisdom of the ancient Greek philosopher Aristotle, who famously said that 'the whole is greater than the sum of its parts'.

In addition, we document that the performance from this joint strategy appears to be quite stable under both good and bad market conditions. It is well known that momentum strategies tend to perform better following an UP market state, high investor sentiment period, or when there is ample market liquidity (Cooper *et al*., 2004; Antoniou *et al*., 2013; Wang and Xu, 2015; Avramov *et al*., 2016). In contrast, short-term reversal strategies tend to perform better following DOWN market state or when market is volatile and illiquid (Nagel, 2012; Da *et al*., 2014; Hameed and Mian, 2015). Thus, due to the complementary nature of momentum vs. reversal, it is not surprising that a

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[3]In the Asia-Pacific region, Bowman and Iverson (1998), Kang *et al*. (2002) and Chai *et al*. (2017) provide evidence on short-term reversals in New Zealand, Chinese and Australian stock markets, respectively.

momentum-reversal joint strategy seems capable of generating steady profits across different market conditions.

Related to this paper, Han *et al*. (2018) document that some simple technical trading rules such as the moving average rule could enhance the performance of accounting-based anomalies when financial information is stale. Nagel (2012) and Hameed and Mian (2015) also document that short-term reversal strategies perform better in the absence of fundamental information. However, none of these studies focus on the synergy between earnings momentum and short-term return reversal.

In his 1989 letter to the shareholders of Berkshire Hathaway, Warren Buffett, arguably the most famous value investor, commented that 'it's far better to buy a wonderful company at a fair price than a fair company at a wonderful price'. In a sense, our joint earnings momentum-short term reversal strategy is a manifestation of Mr. Buffett's advice. The naïve approach to implementing the earnings momentum strategy is to buy stocks following positive earnings news regardless of prices. We conjecture that Mr. Buffett will likely disagree with this unthoughtful approach. In contrast, our joint strategy suggests that a prudent investor should focus on firms with both strong earnings momentum and recent price concessions (possibly due to liquidity shocks or investors' sentiment swings).

2. Data and methodology

The sample for this study consists of all common stocks (share code 10 or 11) listed on the NYSE, AMEX and NASDAQ from January 1980 to December 2015. Stock information such as returns, prices, trading volumes, shares outstanding and industry codes are from the Center for Research in Security Prices (CRSP). Financial statement data are obtained from Compustat. To alleviate concerns about market microstructure induced biases, we exclude stocks with prices less than \$5 at the end of the portfolio formation period. Empirically, we evaluate the performance of our proposed investment strategies with three risk-factor models: (a) the Fama and French five-factor model (Fama and French, 2015), (b) a seven-factor model that augments the Fama and French five-factor model with a momentum factor and a short-term reversal factor, and (c) the *q*-factor model of Hou *et al*. (2015).[4] We also evaluate the impact of investor sentiment on our portfolio strategies with the Baker and Wurgler (2006) investor Sentiment index and the sentiment data are from Jeffrey Wurgler's website. The sentiment index is orthogonal to a set of macroeconomic variables. Following Shumway (1997), we set delisting returns of -30 percent to NYSE/AMEX delisted stocks and -50 percent to NASDAQ delisted stocks if their delisting returns are missing or zero and delisting is due to performance reasons.

[4]The seven Fama and French factors are from Kenneth French's website. Lu Zhang provides us with the *q*-factor data. We thank these authors for their generosity in sharing the data.

Following the portfolio analysis method used in Jegadeesh and Titman (1993), for short-term reversal, we rank stocks in ascending order based on their prior 1-month returns and assign them into five equal-weighted portfolios (R1 to R5) based on their past 1-month returns. For earnings momentum or PEAD, following Chordia and Shivakumar (2006), we rank stocks based on the most recent earnings surprise (i.e., standardised unexpected earnings (SUE)) in ascending order and assign stocks into five equal-weighted portfolios (M1 to M5). Following the standard practice in earnings momentum or post-earnings announcement drift literature, the SUE for month t is defined as $(E_{iq} - E_{iq-4})/\sigma_{iq}$, where E_{iq} is the most recently announced earnings and σ_{iq} is the standard deviation of $(E_{iq} - E_{iq-4})$ over the past eight quarters. Finally, we intersect five earnings momentum quintiles and five reversal quintiles to form 25 earnings momentum-reversal double-sorted portfolios.

3. Empirical results

We present our main results in Tables 1 and 2 with both equal- and value-weighted portfolios. Additional robustness results focus mainly on equal-weighted returns.

3.1. Univariate sort

Table 1 reports the raw and factor-adjusted returns for strategies based on univariate sort on the most recent earnings surprise (SUE) or past 1-month returns. Panel A shows that earnings momentum or PEAD generates economically and statistically significant profits from 1980 to 2015. The equal-weighted long-short hedge portfolio has an average monthly raw return of 1.11 percent (t-value = 12.6). The seven-factor-adjusted return is 0.88 percent (t-value = 10.79) after controlling for the Fama-French five factors along with the momentum and short-term reversal factors. The q-factor-adjusted average return is 0.77 percent (t-value = 10.82). However, for value-weighted results, the profitability of earnings momentum becomes much smaller. In particular, we notice that it turns insignificant after risk adjustment from the q-factor model.[5]

[5]The q-factor model's explanatory power for momentum is likely due to quarterly rebalancing, which picks up timely earnings information. However, we find that our main results are robust even after adjustments based on the q-factor model (as well as other benchmark models). For example, in Panel B of Table 2, we report that even the value-weighted returns of our proposed strategy remain significant based on the q-factor adjusted returns. Therefore, we conclude that our results are not affected by the quarterly rebalancing method used by the q-factor model. Without the quarterly rebalancing (e.g. with semi-annual or annual rebalancing), the performance of our proposed strategy is likely to be even stronger.

Compared to the earnings momentum strategy, the performance of simple short-term reversal strategy is quite modest. Panel B shows that the monthly equal-weighted raw return is only 0.69 percent (t-value = 4.16) in the sample period of 1980 to 2015. The Fama-French five-factor-adjusted return is only 0.54 percent, albeit with a significant t-statistic. Moreover, the average returns of the value-weighted short-term reversal portfolio become mostly insignificant. These findings are consistent with earlier findings in the literature that the profitability of short-term reversal has been weakened in the recent two decades due to increasing liquidity and trading activities (Chordia *et al*., 2014).

Table 1
Returns to portfolios sorted on earnings surprises or past 1-month returns

Panel A: Earnings momentum

	Equal-weighted returns				Value-weighted returns			
	RAW	FF5	FF5MR	q	RAW	FF5	FF5MR	q
M1	0.63	−0.44	−0.36	−0.27	0.87	−0.17	−0.11	−0.07
	(2.34)	(−7.28)	(−7.50)	(−3.21)	(3.32)	(−2.36)	(−1.48)	(−0.76)
M2	0.81	−0.26	−0.22	−0.15	0.88	−0.05	−0.03	0.00
	(3.13)	(−4.87)	(−4.87)	(−2.06)	(3.59)	(−0.75)	(−0.45)	(0.03)
M3	1.13	0.01	0.02	0.07	0.95	−0.05	−0.03	−0.01
	(4.35)	(0.15)	(0.52)	(0.97)	(4.31)	(−0.95)	(−0.54)	(−0.11)
M4	1.51	0.39	0.38	0.40	1.13	0.08	0.08	0.04
	(5.86)	(8.08)	(7.51)	(6.00)	(5.23)	(1.25)	(1.33)	(0.55)
M5	1.74	0.56	0.52	0.51	1.25	0.17	0.10	0.05
	(6.81)	(9.00)	(8.36)	(6.28)	(6.01)	(2.84)	(1.66)	(0.81)
M5-M1	1.11	1.00	0.88	0.77	0.39	0.34	0.21	0.12
	(12.60)	(11.62)	(10.79)	(10.82)	(3.50)	(3.12)	(1.96)	(0.99)

Panel B: Short-term reversal

	Equal-weighted returns				Value-weighted returns			
	RAW	FF5	FF5MR	q	RAW	FF5	FF5MR	q
M1	1.44	0.32	0.25	0.47	1.09	0.03	−0.10	0.13
	(4.63)	(2.30)	(4.57)	(2.57)	(3.64)	(0.17)	(−1.19)	(0.71)
M2	1.32	0.14	0.11	0.19	1.20	0.16	0.07	0.14
	(5.14)	(1.71)	(2.05)	(1.54)	(5.01)	(2.12)	(0.97)	(1.67)
M3	1.24	0.07	0.07	0.10	1.04	0.01	0.00	−0.03
	(5.23)	(1.10)	(1.23)	(1.02)	(4.99)	(0.19)	(−0.04)	(−0.49)
M4	1.07	−0.04	0.02	−0.01	1.05	0.07	0.16	0.05

(continued)

Table 1 (continued)

Panel B: Short-term reversal

	Equal-weighted returns				Value-weighted returns			
	RAW	FF5	FF5MR	q	RAW	FF5	FF5MR	q
	(4.55)	(−0.73)	(0.40)	(−0.23)	(4.55)	(0.92)	(3.14)	(0.53)
M5	0.75	−0.22	−0.10	−0.20	0.74	−0.13	0.01	−0.16
	(2.60)	(−1.99)	(−1.43)	(−1.54)	(2.86)	(−1.05)	(0.15)	(−1.10)
M5-M1	0.69	0.54	0.34	0.67	0.35	0.16	−0.11	0.29
	(4.16)	(2.30)	(3.68)	(2.26)	(1.72)	(0.62)	(−1.01)	(0.95)

Panel A presents average monthly raw and risk-adjusted returns to portfolios sorted on standardised changes in earnings from the most recent earnings announcements. Each month, the standardised unexpected earnings (SUE) is calculated based on the formula: $(E_{iq} - E_{iq-4})/\sigma_{iq}$, where E_{iq} is the most recently announced earnings and σ_{iq} is the standard deviation of $(E_{iq} - E_{iq-4})$ over the past eight quarters. Each month, stocks are assigned into quintiles based on their SUE. M1 (M5) denotes the portfolio including stocks with most negative (positive) earnings changes. 'M5-M1' denotes the returns to the long-short portfolios that are long in stocks with most positive earnings changes and short in stocks with most negative earnings changes. Panel B presents average monthly raw and risk-adjusted returns for portfolios sorted on stocks' past 1-month returns. Each month, stocks are sorted into quintile portfolios based on their past 1-month returns, where R1 (R5) denotes the portfolio including stocks with worst (best) past 1-month performance. R1 (R5) denotes the portfolios including stocks experiencing largest decreases (increases) in stock returns in the prior 1-month. FF5 refers to Fama-French 5 factors (market, size, book-to-market, profitability and investment factors); FF5MR refers to Fama-French 5 factors and momentum and short-term reversal factors. The q refers to the q-factor model of Hou *et al.* (2015). Sample stocks include common stocks listed on the NYSE, AMEX and NASDAQ exchanges. The sample period is from 1980 to 2015. Stocks with price less than $5 at the end of formation periods are excluded. Newey and West (1987) heteroscedasticity and autocorrelation consistent t-statistics are reported in parentheses. The returns are equal-weighted. All return numbers in the table are in percent.

3.2. The interaction of earnings momentum and short-term reversal

In this article, we are interested in knowing whether a joint earnings momentum and short-term reversal strategy can provide investors with outstanding performance. Empirical results from Table 2 confirm that indeed that is the case.

Table 2 reports the performance of the joint strategy. Panel A shows the results from equal-weighted portfolios. There are several interesting findings. First, among stocks with low (high) earnings surprises, the return spread between recent winners and losers reaches 1.07 percent (0.63 percent) with significant t-statistics. Likewise, among prior 1-month winners (losers), the return spread between stocks with high earnings surprises and those with low earnings surprises reaches 1.61 percent (1.17 percent). Therefore, a conjoint

Table 2
Returns to portfolios sorted on earnings surprises and past 1-month returns

Panel A: Equal-weighted returns

	Raw return						FF5					
	R1	R2	R3	R4	R5	R1-R5	R1	R2	R3	R4	R5	R1-R5
M1	0.94	0.85	0.75	0.58	−0.12	1.07	−0.13	−0.33	−0.41	−0.48	−1.02	0.89
	(2.90)	(3.18)	(3.06)	(2.30)	(−0.42)	(5.99)	(−0.84)	(−3.51)	(−4.96)	(−5.93)	(−7.6)	(3.64)
M2	1.18	0.99	0.96	0.77	0.07	1.11	0.06	−0.15	−0.16	−0.31	−0.87	0.93
	(3.78)	(3.88)	(4.02)	(3.18)	(0.22)	(5.88)	(0.43)	(−1.38)	(−2.13)	(−4.12)	(−6.62)	(3.85)
M3	1.48	1.30	1.17	0.95	0.72	0.76	0.35	0.10	0.01	−0.18	−0.23	0.58
	(4.74)	(4.87)	(4.76)	(4.00)	(2.41)	(3.85)	(2.24)	(1.05)	(0.09)	(−2.81)	(−1.58)	(2.07)
M4	1.78	1.64	1.59	1.35	1.24	0.53	0.66	0.44	0.41	0.26	0.25	0.41
	(5.64)	(6.27)	(6.46)	(5.62)	(4.24)	(2.79)	(4.04)	(5.16)	(4.99)	(3.23)	(2.05)	(1.56)
M5	2.11	1.94	1.67	1.58	1.48	0.63	0.92	0.72	0.45	0.39	0.45	0.47
	(6.61)	(7.44)	(7.11)	(6.51)	(5.20)	(3.54)	(6.13)	(7.22)	(5.25)	(4.95)	(4.15)	(2.16)
M5-M1	1.17	1.09	0.92	1.00	1.61		1.05	1.05	0.86	0.88	1.47	
	(9.32)	(10.44)	(9.10)	(9.19)	(12.42)		(8.27)	(9.62)	(8.05)	(8.01)	(11.11)	
R1M5-R5M1	2.34						1.94					
	(10.92)						(7.79)					

	FF5MR						q					
	R1	R2	R3	R4	R5	R1-R5	R1	R2	R3	R4	R5	R1-R5
M1	−0.12	−0.29	−0.36	−0.35	−0.84	0.71	0.15	−0.19	−0.29	−0.35	−0.86	1.01
	(−1.38)	(−4.02)	(−4.83)	(−4.82)	(−7.41)	(4.85)	(0.78)	(−1.49)	(−2.48)	(−3.74)	(−6.02)	(3.37)

(continued)

Table 2 (continued)

	FF5MR						q					
	R1	R2	R3	R4	R5	R1-R5	R1	R2	R3	R4	R5	R1-R5
M2	0.03	−0.15	−0.14	−0.22	−0.71	0.73	0.26	−0.05	−0.10	−0.24	−0.78	1.04
	(0.33)	(−1.87)	(−2.00)	(−3.18)	(−7.1)	(5.51)	(1.36)	(−0.34)	(−0.97)	(−2.96)	(−5.3)	(3.37)
M3	0.27	0.07	0.02	−0.14	−0.10	0.37	0.48	0.17	0.03	−0.14	−0.20	0.68
	(3.63)	(1.00)	(0.31)	(−2.10)	(−0.99)	(2.58)	(2.45)	(1.30)	(0.30)	(−1.86)	(−1.18)	(1.96)
M4	0.55	0.38	0.39	0.28	0.34	0.22	0.76	0.43	0.41	0.23	0.21	0.55
	(6.00)	(5.30)	(4.63)	(3.90)	(4.16)	(1.81)	(3.69)	(3.36)	(3.70)	(2.96)	(1.44)	(1.71)
M5	0.80	0.64	0.40	0.40	0.51	0.30	0.95	0.68	0.41	0.31	0.37	0.58
	(7.77)	(8.03)	(4.69)	(5.04)	(5.65)	(2.36)	(4.95)	(4.90)	(3.77)	(3.67)	(3.13)	(2.21)
M5-M1	0.92	0.93	0.76	0.75	1.34		0.80	0.87	0.70	0.66	1.23	
	(7.25)	(8.78)	(7.78)	(7.17)	(9.59)		(6.30)	(8.32)	(7.55)	(6.80)	(9.40)	
R1M5-R5M1	1.64						1.80					
	(9.70)						(5.99)					

Panel B: Value-weighted returns

	Raw return						FF5					
	R1	R2	R3	R4	R5	R1-R5	R1	R2	R3	R4	R5	R1-R5
M1	1.01	1.14	1.01	0.90	0.25	0.76	−0.14	0.03	−0.02	−0.10	−0.58	0.44
	(2.83)	(4.08)	(4.29)	(3.44)	(0.82)	(2.88)	(−0.69)	(0.25)	(−0.16)	(−0.88)	(−3.42)	(1.65)
M2	1.02	1.21	0.79	0.80	0.54	0.48	−0.08	0.23	−0.17	−0.17	−0.26	0.18
	(2.90)	(4.42)	(3.20)	(3.12)	(1.91)	(1.63)	(−0.37)	(1.75)	(−1.58)	(−1.29)	(−1.47)	(0.55)
M3	1.25	0.97	1.05	0.97	0.72	0.53	0.13	−0.07	0.02	−0.05	−0.17	0.30
	(4.20)	(3.74)	(5.02)	(4.13)	(2.64)	(2.09)	(0.58)	(−0.61)	(0.2)	(−0.51)	(−1.19)	(0.93)
M4	1.20	1.27	1.27	1.02	0.96	0.24	0.20	0.09	0.22	0.06	0.10	0.09

(continued)

Table 2 (continued)

Panel B: Value-weighted returns

	Raw return						FF5					
	R1	R2	R3	R4	R5	R1-R5	R1	R2	R3	R4	R5	R1-R5
	(4.22)	(5.36)	(5.63)	(4.06)	(3.35)	(0.99)	(1.08)	(0.73)	(1.85)	(0.45)	(0.49)	(0.28)
M5	1.27	1.54	1.21	1.28	1.16	0.11	0.27	0.37	0.09	0.24	0.25	0.02
	(4.07)	(6.83)	(5.76)	(5.40)	(4.49)	(0.47)	(1.49)	(3.14)	(0.97)	(1.79)	(1.56)	(0.06)
M5-M1	0.26	0.41	0.20	0.37	0.91		0.41	0.35	0.11	0.33	0.84	
	(1.26)	(2.71)	(1.42)	(2.43)	(4.46)		(1.87)	(2.35)	(0.69)	(2.09)	(3.79)	
R1M5-R5M1	1.02						0.86					
	(4.16)						(3.29)					

	FF5MR						*q*					
	R1	R2	R3	R4	R5	R1-R5	R1	R2	R3	R4	R5	R1-R5
M1	−0.23	−0.01	0.04	0.03	−0.39	0.17	0.05	0.10	0.04	−0.02	−0.51	0.56
	(−1.46)	(−0.08)	(0.30)	(0.26)	(−2.20)	(0.78)	(0.21)	(0.75)	(0.26)	(−0.19)	(−2.78)	(1.74)
M2	−0.18	0.16	−0.18	−0.09	−0.05	−0.13	0.07	0.22	−0.14	−0.19	−0.22	0.29
	(−1.11)	(1.37)	(−1.68)	(−0.75)	(−0.36)	(−0.63)	(0.27)	(1.52)	(−1.24)	(−1.44)	(−1.08)	(0.73)
M3	0.04	−0.15	0.03	0.07	−0.02	0.05	0.29	−0.02	−0.04	0.02	−0.19	0.48
	(0.25)	(−1.36)	(0.34)	(0.74)	(−0.13)	(0.25)	(1.17)	(−0.16)	(−0.36)	(0.16)	(−1.12)	(1.26)
M4	0.10	0.02	0.17	0.18	0.20	−0.11	0.32	0.05	0.17	−0.03	−0.03	0.35
	(0.67)	(0.13)	(1.38)	(1.58)	(1.49)	(−0.59)	(1.53)	(0.32)	(1.34)	(−0.21)	(−0.10)	(0.88)
M5	0.08	0.27	0.01	0.24	0.34	−0.26	0.19	0.24	−0.04	0.11	0.13	0.06
	(0.49)	(2.28)	(0.09)	(2.05)	(2.70)	(−1.19)	(0.89)	(2.01)	(−0.43)	(0.75)	(0.72)	(0.18)

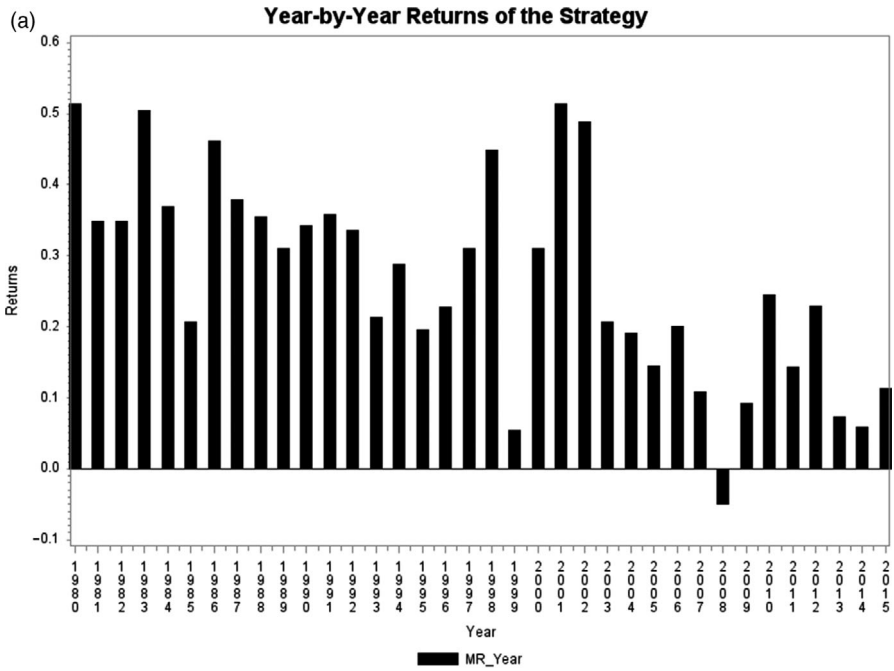
(continued)

Table 2 (continued)

	FF5MR						*q*					
	R1	R2	R3	R4	R5	R1-R5	R1	R2	R3	R4	R5	R1-R5
M5-M1	0.30	0.28	−0.03	0.21	0.73		0.14	0.15	−0.08	0.13	0.64	
	(1.28)	(1.82)	(−0.19)	(1.39)	(3.39)		(0.55)	(0.97)	(−0.51)	(0.80)	(2.78)	
R1M5-R5M1	0.47						0.70					
	(1.93)						(2.35)					

This table presents average monthly raw and risk-adjusted returns to portfolios independently double sorted on the standardised unexpected earnings (SUE) and past 1-month returns. Each month, sample stocks are sorted into quintiles based on their standardised changes in earnings from the most recent earnings announcements. Independently, stocks are sorted into quintiles based on their past 1-month returns. The interaction of two quintiles has 25 portfolios. FF5 refers to Fama-French 5 factors (market, size, book-to-market, profitability and investment factors); FF5MR refers to Fama-French 5 factors and momentum and short-term reversal factors. The *q* refers to the *q*-factor model of Hou *et al*. (2015). Sample stocks include common stocks listed on the NYSE, AMEX and NASDAQ exchanges. The sample period is from 1980 to 2015. Stocks with price less than $5 at the end of formation periods are excluded. Newey and West (1987) heteroscedasticity and autocorrelation consistent *t*-statistics are reported in parentheses. All return numbers in the table are in percent.

(a)


Year-by-Year Returns of the Strategy
Returns
0.6
0.5
0.4
0.3
0.2
0.1
0.0
−0.1
1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015
Year
MR_Year

(b)

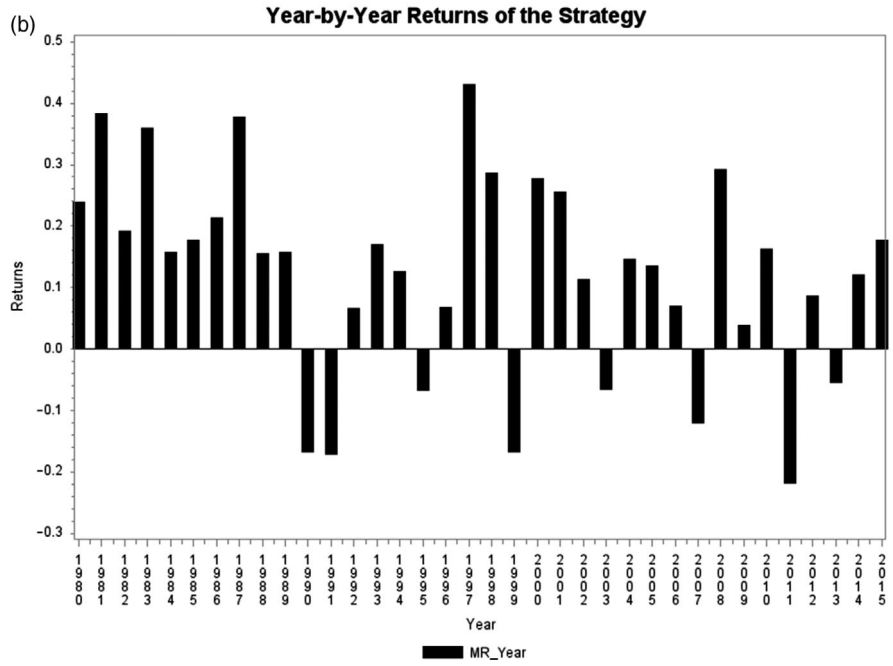

Year-by-Year Returns of the Strategy
Returns
0.5
0.4
0.3
0.2
0.1
0.0
−0.1
−0.2
−0.3
1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015
Year
MR_Year

Figure 1 Year-by-year returns for the momentum-reversal joint strategy.This figure shows the year-by-year returns for the earnings momentum and short-term reversal joint strategy. Panels A and B show the equal-weighted and value-weighted returns for the joint strategy, respectively. The returns are in percent. The sample period is from 1980 to 2015.

consideration of earnings momentum and short-term reversal appears able to identify *true* winners and losers at least in the subsequent short horizon. Moreover, we find that the newly proposed joint earnings momentum-reversal strategy has an average monthly raw return of 2.34 percent (t-value = 10.92). Last but not least, we note that the joint strategy outperforms a simple combination of earnings momentum (1.11 percent) and short-term reversal strategies (0.69 percent) by about half a percent.

These results remain intact after risk adjustments with the three benchmark factor models. The average monthly factor-adjusted returns are 1.94 percent, 1.64 percent and 1.80 percent after controlling for Fama-French five-, seven and q-factor models, respectively. All of them are highly significant.

If the sources of profits from our proposed trading strategy are attributable to slow diffusion of information and/or limited investor attention, then it seems plausible that our strategy should be less (more) profitable among large (small) firms. Panel B of Table 2 reports the results from value-weighted portfolio returns. Since value-weighted portfolios are dominated by large-cap firms, as expected, the average returns are smaller than those from equal-weighted portfolios. However, the profitability of the joint strategy continues to be economically and statistically significant based on both raw and factor-adjusted returns. This result suggests our finding is robust to the use of value-weighted returns.

Figure 1 plots the equal-weighted and value-weighted year-by-year returns of the joint strategy. Panel A shows the equal-weighted portfolio performance. It is quite striking that the joint strategy performs exceptionally well with only one down year. In several cases, the joint strategy enjoys stellar annual returns over 50 percent. Not surprisingly, the value-weighted performance is weaker as shown in Panel B. However, the performance of the joint strategy is still attractive with only eight down years in the sample.

To sum up, these findings suggest that a joint strategy that synthesises fundamental-based momentum and return-based reversal anomalies outperforms a simple sum of two one-dimensional strategies. The superior performance by the joint strategy suggests that the synergy from earnings momentum and short-term reversal is real and can provide significant economic gains to investors.

3.3. Robustness tests

3.3.1. Subperiods

Chordia *et al.* (2014) document that short-term reversal and price momentum strategies are much weakened due to increasing liquidity and trading activity in

the post-2000 period. McLean and Pontiff (2016) show that the profits of many anomalies have been attenuated since these academic anomalies became well known to public investors. Table 3 reports the results for the interaction between earnings momentum and short-term reversal in two subperiods: 1980–1999 and 2000–2015. Consistent with prior studies, the performance of the joint strategy is better in the first sub-sample period. The joint strategy generates an average monthly raw return of 2.75 percent and 1.67 percent for the first and second sample periods, respectively. However, the performance in the post-2000 period is still economically and statistically significant, which indicates that the joint strategy is robust to the subperiod analysis.

3.3.2. January effect

Jegadeesh (1990) documents that short-term return reversals are strongest in January possibly due to tax-loss selling. Jegadeesh and Titman (1993) report that their price momentum strategy is not profitable in January. We are interested in knowing whether our results are sensitive to this well-known January effect. The results are shown in Table 4. The momentum-reversal joint strategy earns 3.52 percent in January and 2.12 percent from February to December. All results are highly significant. Thus, we conclude that our results are not driven or affected by the January effect. The fact that the strategy performs well in January forms a sharp contrast with the price momentum strategy and is supportive of the notion that momentum and reversal are mutually complementary. A closer look at Table 4 suggests that the reversal in short-term losers is the key driver for stronger returns in Januarys for the joint strategy, which is consistent with an explanation based on tax loss selling.[6] To further probe this possibility, we use the change in tax law (Tax Reform Act of 1986) as a quasi-natural experiment and cut our sample into two parts: before 1987 and after 1987. We find that the average January return of the combined strategy is 0.61 percent higher after the enactment of the Tax Reform Act (3.61 percent vs. 3 percent). We interpret this evidence as being consistent with the tax loss selling explanation.

3.3.3. Size effect

The existing literature on momentum and reversal documents that the profits of short-term reversal and momentum strategies are higher among small stocks (Hong *et al.*, 2000; Avramov *et al.*, 2006). We divide all sample firms into two size groups based on the median of their market capitalisations. Table 5 reports the results. As expected, the joint strategy earns significantly higher returns among small stocks than among large stocks. The monthly average raw return is 3.21 percent in the small-stock group vs. 1.23 percent in the large-cap

[6]We thank the referee for suggesting this explanation.

Table 3
Subperiod analysis

	1980–1999						2000–2015					
	R1	R2	R3	R4	R5	R1-R5	R1	R2	R3	R4	R5	R1-R5
M1	1.31	0.97	0.80	0.64	−0.14	1.45	0.48	0.69	0.67	0.50	−0.17	0.65
	(3.36)	(2.81)	(2.50)	(1.99)	(−0.42)	(7.33)	(0.88)	(1.66)	(1.76)	(1.24)	(−0.36)	(2.45)
M2	1.27	1.06	1.05	0.87	0.10	1.17	1.06	0.91	0.87	0.61	−0.01	1.07
	(3.37)	(3.18)	(3.36)	(2.85)	(0.31)	(5.03)	(2.03)	(2.28)	(2.36)	(1.57)	(−0.02)	(3.96)
M3	1.73	1.46	1.29	1.20	0.87	0.86	1.19	1.12	1.05	0.65	0.50	0.69
	(4.68)	(4.36)	(4.07)	(4.00)	(2.35)	(3.82)	(2.25)	(2.59)	(2.73)	(1.72)	(1.10)	(2.42)
M4	2.11	1.90	1.85	1.61	1.56	0.55	1.37	1.31	1.30	1.00	0.80	0.57
	(5.40)	(5.59)	(5.77)	(5.07)	(4.15)	(2.45)	(2.71)	(3.29)	(3.42)	(2.84)	(1.88)	(2.00)
M5	2.61	2.31	1.95	1.89	1.79	0.81	1.50	1.49	1.33	1.20	1.12	0.38
	(6.60)	(6.84)	(5.97)	(5.70)	(4.70)	(3.42)	(2.98)	(3.78)	(4.06)	(3.46)	(2.68)	(1.47)
M5-M1	1.29	1.33	1.14	1.25	1.93		1.02	0.80	0.66	0.70	1.29	
	(8.90)	(10.01)	(9.08)	(9.99)	(12.57)		(4.80)	(5.36)	(4.32)	(4.17)	(6.53)	
R1M5-R5M1	EW	VW					EW	VW				
RAW	2.75	1.25					1.67	0.69				
	(12.10)	(3.72)					(5.39)	(1.98)				
FF5	2.45	0.90					1.42	0.70				
	(7.56)	(2.22)					(4.37)	(1.78)				
FF5MR	2.18	0.62					1.25	0.50				
	(10.46)	(2.13)					(5.16)	(1.46)				
q	2.32	0.97					1.40	0.41				
	(6.00)	(2.07)					(3.63)	(1.03)				

This table reports the monthly equal-weighted (EW) and value-weighted (VW) raw and factor-adjusted returns for short-term reversal and earnings momentum double-sorted portfolios as defined in Table 2 for two subperiods from 1980 to 1999 and from 2000 to 2015. The 5 × 5 portfolios report EW raw returns. The data include all common stocks listed on the NYSE, AMEX and NASDAQ exchanges. Stocks with price less than $5 at the end of formation periods are excluded. Newey and West (1987) heteroscedasticity and autocorrelation consistent *t*-statistics are reported in parentheses.

Table 4
January effect

	January						February–December					
	R1	R2	R3	R4	R5	R1-R5	R1	R2	R3	R4	R5	R1-R5
M1	3.82	2.08	1.49	1.17	0.19	3.63	0.69	0.74	0.68	0.53	−0.15	0.84
	(3.88)	(2.67)	(1.71)	(1.48)	(0.26)	(6.02)	(2.03)	(2.73)	(2.76)	(2.05)	(−0.50)	(4.48)
M2	3.33	2.04	1.42	1.07	0.55	2.78	0.99	0.90	0.92	0.74	0.02	0.96
	(3.77)	(2.81)	(1.87)	(1.28)	(0.78)	(7.09)	(3.08)	(3.46)	(3.78)	(3.00)	(0.07)	(5.15)
M3	3.55	2.50	1.68	1.06	0.66	2.89	1.30	1.20	1.12	0.94	0.73	0.57
	(3.87)	(3.25)	(2.06)	(1.23)	(0.78)	(4.78)	(4.04)	(4.39)	(4.47)	(3.90)	(2.39)	(2.89)
M4	3.90	2.55	1.99	1.54	1.00	2.90	1.59	1.56	1.56	1.34	1.27	0.32
	(4.41)	(3.07)	(2.34)	(2.13)	(1.12)	(4.37)	(4.89)	(5.89)	(6.26)	(5.43)	(4.19)	(1.70)
M5	3.71	2.90	1.78	1.29	0.70	3.01	1.97	1.85	1.66	1.61	1.55	0.42
	(3.91)	(3.40)	(2.41)	(1.46)	(0.79)	(6.36)	(6.01)	(6.94)	(6.84)	(6.45)	(5.19)	(2.26)
M5-M1	−0.11	0.81	0.29	0.12	0.51		1.28	1.12	0.98	1.08	1.70	
	(−0.27)	(3.53)	(1.06)	(0.31)	(1.08)		(9.00)	(9.73)	(8.57)	(9.46)	(12.89)	
R1M5-R5M1	EW	VW					EW	VW				
RAW	3.52	2.04					2.12	0.93				
	(6.46)	(3.65)					(9.92)	(3.52)				
FF5	3.68	2.31					1.71	0.75				
	(6.97)	(3.38)					(5.92)	(2.33)				
FF5MR	2.77	1.08					1.58	0.51				
	(5.27)	(1.82)					(10.21)	(2.04)				
q	3.31	2.26					1.46	0.45				
	(5.84)	(2.75)					(4.40)	(1.25)				

This table reports the monthly equal-weighted (EW) and value-weighted (VW) raw and factor-adjusted returns for short-term reversal and earnings momentum double-sorted portfolios as defined in Table 2 for two subsamples: January vs. non-January months. The 5 × 5 portfolios report EW raw returns. The data include all common stocks listed on the NYSE, AMEX and NASDAQ exchanges. The sample period is from 1980 to 2015. Stocks with price less than $5 at the end of formation periods are excluded. Newey and West (1987) heteroscedasticity and autocorrelation consistent *t*-statistics are reported in parentheses.

Table 5
Size effect

	Large stocks						Small stocks					
	R1	R2	R3	R4	R5	R1-R5	R1	R2	R3	R4	R5	R1-R5
M1	1.12	1.18	1.10	0.82	0.41	0.71	0.91	0.45	0.39	0.22	−0.62	1.53
	(3.28)	(4.63)	(4.36)	(3.22)	(1.40)	(3.59)	(2.76)	(1.56)	(1.41)	(0.81)	(−2.00)	(6.82)
M2	1.20	1.25	1.09	0.83	0.40	0.80	1.16	0.71	0.80	0.64	−0.13	1.29
	(3.69)	(5.00)	(4.47)	(3.41)	(1.35)	(3.64)	(3.67)	(3.52)	(3.09)	(2.50)	(−0.40)	(5.56)
M3	1.25	1.30	1.17	1.02	0.82	0.43	1.63	1.29	1.30	0.93	0.55	1.08
	(4.07)	(5.12)	(5.04)	(4.33)	(2.79)	(1.92)	(5.04)	(4.50)	(4.90)	(3.45)	(1.72)	(4.71)
M4	1.49	1.42	1.34	1.18	1.01	0.48	1.95	1.90	1.67	1.58	1.37	0.58
	(4.78)	(5.75)	(5.47)	(5.19)	(3.38)	(2.17)	(5.62)	(6.76)	(5.98)	(5.81)	(4.37)	(2.73)
M5	1.64	1.55	1.45	1.31	1.08	0.57	2.59	2.28	2.13	1.92	1.86	0.73
	(5.20)	(6.26)	(6.49)	(5.67)	(3.92)	(2.80)	(7.44)	(7.47)	(7.78)	(6.61)	(5.96)	(3.49)
M5-M1	0.52	0.37	0.35	0.49	0.67		1.68	1.83	1.74	1.70	2.48	
	(3.79)	(3.17)	(2.86)	(3.82)	(4.98)		(9.59)	(12.91)	(12.08)	(13.19)	(14.220	
R1M5-R5M1	EW	VW					EW	VW				
RAW	1.23	0.79					3.21	2.66				
	(5.63)	(3.30)					(13.75)	(10.49)				
FF5	0.66	0.66					2.26	2.26				
	(2.41)	(2.41)					(7.73)	(7.73)				
FF5MR	0.25	0.25					1.96	1.96				
	(0.95)	(0.95)					(7.97)	(7.97)				
q	0.49	0.49					2.09	2.09				
	(1.62)	(1.62)					(6.17)	(6.17)				

This table reports the monthly equal-weighted (EW) and value-weighted (VW) raw and factor-adjusted returns for short-term reversal and earnings momentum double-sorted portfolios defined in Table 2 for two subsamples: large stocks vs. small stock. The 5 × 5 portfolios report EW raw returns. Each month, sample stocks are divided into two groups based on their market capitalisations. The large (small) stock group includes stocks with market capitalisations above (below) the sample median. Our sample includes all common stocks listed on the NYSE, AMEX and NASDAQ exchanges. The sample period is from 1980 to 2015. Stocks with price less than $5 at the end of formation periods are excluded. Newey and West (1987) heteroscedasticity and autocorrelation consistent *t*-statistics are reported in parentheses.

category. All these average returns are highly significant. The outperformance among small stocks is consistent with the hypothesis that investors are subject to limited attention constraints (Kahneman, 1973) and consequently underreact to earnings news, especially among small stocks.

3.3.4. The effect of earnings announcements

Fundamental-based strategies should be most potent immediately after the release of such fundamental information, even though the post-announcement drift could last for several months. Han *et al.* (2018) document that some simple technical rules could help enhance the performance of accounting-based anomalies provided that financial information is not late. Nagel (2012) and Hameed and Mian (2015) report that short-term reversal strategies perform better in the absence of fundamental information. Given these findings, it is interesting to see if and to what extent our findings are influenced by the earnings announcement effect.

To account for this effect, we use the quarterly earnings announcements (report date of quarterly earnings (RDQ)) to identify the arrival of public fundamental information. Specifically, we divide all sample observations into two groups: (a) the RDQ group in which the report date of quarterly earnings coincides with the reversal formation month, and (b) the non-RDQ group in which there are no quarterly earnings announcements in the formation month. Table 6 reports the results. The momentum-reversal joint strategy generates similar returns across the RDQ and non-RDQ samples (2.25 percent vs. 2.40 percent). Thus, we conclude that our results do not appear to be affected by the announcement effect.

3.3.5. Industry effect

Hameed and Mian (2015) document that industry-adjusted short-term reversal strategies experience higher profits than traditional short-term reversal strategies. Moskowitz and Grinblatt (1999) document industry-based price momentum strategies generate significant profits. We examine whether our results are sensitive to the industry effect. Following Fama and French (1997), we classify firms into 17 industries based on their 4-digit standard industrial classification (SIC) codes. Each month, we rank stocks from 1 to 5 based on their past 1-month returns within each industry, then we assign all stocks into five portfolios based on their ranks. Therefore, we form five short-term reversal portfolios based on the past 1-month industry-adjusted returns. Our results from Table 7 show that our findings are robust after accounting for the industry effect. Specifically, the earnings momentum-reversal joint strategy has an average return of 2.46 percent with a highly significant t-statistic of 12.32. In comparison with the results from Table 2, we find that our results are not affected by the industry effect.

Table 6
Quarterly earnings announcements

	RDQ						Non-RDQ					
	R1	R2	R3	R4	R5	R1-R5	R1	R2	R3	R4	R5	R1-R5
M1	0.70	0.56	0.55	0.40	−0.47	1.17	1.02	0.97	0.77	0.58	−0.19	1.20
	(2.17)	(1.97)	(2.16)	(1.49)	(−1.43)	(4.61)	(2.89)	(3.53)	(3.02)	(2.26)	(−0.61)	(5.61)
M2	1.07	0.74	0.81	0.83	0.18	0.89	1.23	0.95	0.94	0.69	−0.03	1.25
	(3.41)	(2.80)	(2.97)	(3.05)	(0.49)	(3.07)	(3.75)	(3.60)	(3.83)	(2.83)	(−0.09)	(6.06)
M3	1.24	1.19	1.22	1.04	1.00	0.24	1.56	1.29	1.12	0.86	0.56	1.00
	(3.71)	(4.01)	(4.57)	(3.87)	(2.86)	(0.93)	(4.62)	(4.64)	(4.45)	(3.49)	(1.91)	(4.47)
M4	1.35	1.49	1.51	1.48	1.65	−0.29	2.00	1.74	1.49	1.20	1.06	0.94
	(4.27)	(5.20)	(5.08)	(5.64)	(5.51)	(−1.27)	(5.92)	(6.45)	(5.88)	(4.79)	(3.54)	(4.35)
M5	1.79	1.81	1.83	1.87	2.06	−0.28	2.21	2.06	1.64	1.44	1.11	1.10
	(4.76)	(5.98)	(7.41)	(6.90)	(6.86)	(−0.95)	(6.60)	(7.59)	(6.94)	(5.62)	(3.70)	(5.42)
M5-M1	1.05	1.26	1.25	1.47	2.53		1.19	1.09	0.88	0.85	1.30	
	(4.34)	(6.46)	(7.37)	(8.04)	(11.30)		(7.36)	(8.70)	(7.07)	(6.70)	(8.23)	
R1M5-R5M1	EW	VW					EW	VW				
RAW	2.25	1.34					2.40	1.18				
	(7.44)	(3.97)					(10.18)	(4.01)				
FF5	2.06	1.15					2.06	0.92				
	(6.52)	(2.88)					(6.93)	(2.48)				
FF5MR	1.75	0.71					1.74	0.50				
	(5.21)	(1.70)					(8.64)	(1.78)				
q	1.99	0.99					1.89	0.74				
	(6.04)	(2.42)					(5.30)	(1.80)				

This table reports the monthly equal-weighted (EW) and value-weighted (VW) raw and factor-adjusted returns for short-term reversal and earnings momentum double-sorted portfolios as defined in Table 2 for two subsamples: RDQ and non-RDQ. The 5 × 5 portfolios report EW raw returns. The RDQ sample includes observations in which stocks' quarterly earnings announcements occur in the formation month; the non-RDQ sample includes the remaining stock observations. Our data include common stocks listed on the NYSE, AMEX and NASDAQ exchanges. The sample period is from 1980 to 2015. Stocks with price less than $5 at the end of formation periods are excluded. Newey and West (1987) heteroscedasticity and autocorrelation consistent *t*-statistics are reported in parentheses.

Table 7
The industry effect

	R1	R2	R3	R4	R5	R1-R5
M1	1.06	0.95	0.66	0.49	−0.22	1.27
	(3.34)	(3.57)	(2.59)	(1.98)	(−0.76)	(7.58)
M2	1.27	1.08	0.94	0.68	−0.04	1.31
	(4.20)	(4.14)	(4.01)	(2.76)	(−0.15)	(7.79)
M3	1.61	1.39	1.16	0.83	0.63	0.98
	(5.26)	(5.31)	(4.65)	(3.44)	(2.21)	(5.87)
M4	1.96	1.66	1.58	1.27	1.17	0.79
	(6.51)	(6.37)	(6.25)	(5.38)	(4.09)	(4.68)
M5	2.24	1.99	1.66	1.54	1.39	0.85
	(7.17)	(7.52)	(7.08)	(6.09)	(5.19)	(5.04)
M5-M1	1.18	1.04	1.01	1.05	1.61	
	(9.79)	(9.14)	(9.85)	(9.62)	(11.83)	
R1M5-R5M1	EW	VW				
RAW	2.46	1.18				
	(12.32)	(4.98)				
FF5	2.15	1.01				
	(9.54)	(4.06)				
FF5MR	1.89	0.68				
	(11.14)	(2.80)				
q	1.98	0.77				
	(7.53)	(2.81)				

This table reports the monthly equal-weighted (EW) and value-weighted (VW) raw and factor-adjusted returns for industry-based short-term reversal and earnings momentum double-sorted portfolios. The 5 × 5 portfolios report EW raw returns. Following Fama and French (1997), we classify firms into 17 industries based on their 4-digit standard industrial classification (SIC) codes. Each month, we rank stocks from 1 to 5 based on their past 1-month returns within each industry, then we assign all stocks into five portfolios based on their ranks. Our sample includes common stocks listed on the NYSE, AMEX and NASDAQ exchanges. The sample period is from 1980 to 2015. Stocks with price less than $5 at the end of formation periods are excluded. Newey and West (1987) heteroscedasticity and autocorrelation consistent *t*-statistics are reported in parentheses.

3.4. The joint strategy and market conditions

Momentum strategies perform better following UP market conditions, high investor sentiment, and when market liquidity is high (Cooper *et al.*, 2004; Antoniou *et al.*, 2013; Wang and Xu, 2015; Avramov *et al.*, 2016). In contrast, short-term reversal strategies perform better following DOWN market conditions, or when market is highly volatile and illiquid (Nagel, 2012; Da *et al.*, 2014; Hameed and Mian, 2015). In this subsection, we examine whether a momentum-reversal joint strategy could efficiently hedge the time-varying risks under time-varying market conditions.

In this section, we examine the performance of the momentum-reversal joint strategies under three market conditions. First, if the past 3-month CRSP value-weighted market index is positive (negative), then we define the market state as UP (DOWN). Second, if the Baker and Wurgler (2006) investor sentiment index is above (below) the sample median, then the market is categorised as in a high (low) sentiment period. Third, if the daily return volatility of CRSP value-weighted market index from the past 1 month is higher (lower) than the volatility from the past 12 months CRSP market index, then the market is deemed as in a high (low) volatility regime.

Panel A in Table 8 reports the raw and factor-adjusted returns for portfolios conditional on UP and DOWN market states. We find that the long leg has similar returns following both UP and DOWN market states and that long-short portfolio has higher returns following a DOWN market state. The joint strategy has an average monthly raw return of 1.94 percent and 2.92 percent

Table 8
The joint strategy conditional on market conditions

Panel A: Market state

	RAW			FF5		
	UP	DOWN	UP − DOWN	UP	DOWN	UP − DOWN
R1M5 (EW)	2.03	2.30	−0.27	0.76	1.28	−0.52
	(6.26)	(3.15)	(0.35)	(5.41)	(4.36)	(−1.76)
R5M1 (EW)	0.09	−0.62	0.71	−0.92	−1.23	0.31
	(0.30)	(−1.19)	(1.23)	(−6.00)	(−5.75)	(1.24)
R1M5-R5M1 (EW)	1.94	2.92	−0.98	1.68	2.51	−0.82
	(9.30)	(6.84)	(−2.15)	(6.88)	(5.81)	(1.91)
R1M5-R5M1 (VW)	1.01	1.05	−0.04	0.86	0.86	0.00
	(4.17)	(1.81)	(0.07)	(3.02)	(1.51)	(0.00)

Panel B: Investor sentiment

	RAW			FF5		
	High	Low	High − Low	High	Low	High − Low
R1M5 (EW)	2.12	2.14	−0.02	1.11	0.61	0.49
	(5.89)	(3.78)	(−0.02)	(5.66)	(3.05)	(1.92)
R5M1 (EW)	−0.33	0.24	−0.58	−1.00	−1.04	0.04
	(−1.09)	(0.43)	(−0.95)	(−5.68)	(−6.13)	(0.17)
R1M5-R5M1 (EW)	2.44	1.90	0.57	2.10	1.65	0.46
	(9.66)	(7.09)	(1.70)	(6.42)	(5.56)	(1.15)
R1M5-R5M1 (VW)	1.47	0.23	1.24	1.33	0.06	1.27
	(4.84)	(0.59)	(2.53)	(4.15)	(0.14)	(2.49)

(continued)

Table 8 (continued)

Panel C: Market volatility

	RAW			FF5		
	High	Low	High − Low	High	Low	High − Low
R1M5 (EW)	2.55	1.87	0.68	1.34	0.68	0.66
	(3.87)	(5.23)	(0.89)	(5.35)	(3.98)	(2.30)
R5M1 (EW)	−0.32	−0.01	−0.31	−1.16	−0.94	−0.22
	(−0.59)	(−0.04)	(−0.53)	(−5.38)	(−6.51)	(−0.96)
R1M5-R5M1 (EW)	2.86	1.88	0.98	2.50	1.61	0.88
	(7.39)	(8.20)	(2.19)	(6.30)	(5.95)	(2.05)
R1M5-R5M1 (VW)	1.81	0.57	1.24	1.65	0.40	1.25
	(3.55)	(2.02)	(2.00)	(3.35)	(1.25)	(2.00)

Panel A presents average monthly equal-weighted (EW) and value-weighted (VW) raw and 5-factor adjusted returns to the joint strategy (R1M5-R5M1) defined in Table 2 following UP and DOWN market states. The market is UP (DOWN) if the past 3-month CRSP value-weighted market index is positive (negative). Panel B reports the results following high and low investor sentiment periods. The market is defined as high (low) sentiment if Baker and Wurgler's (2006) composite sentiment index is above (below) the median value in the sample period. Panel C reports the results following high and low volatile markets. The market is high (low) volatile if the volatility of the past 1-month CRSP value-weighted market index is higher (lower) than the volatility of the past 12-month CRSP market index. The data sample includes common stocks listed on the NYSE, AMEX and NASDAQ exchanges. The sample period is from 1980 to 2015. The sample period for sentiment is from 1980 to September 2015. Stocks with price less than $5 at the end of formation periods are excluded. Newey and West (1987) heteroscedasticity and autocorrelation consistent *t*-statistics are reported in parentheses.

following UP and DOWN markets, respectively. However, the return difference of the long, short and long-short portfolios between UP and DOWN markets are relatively small after controlling for the five factors. The value-weighted return difference between UP and DOWN markets is close to zero. Overall, these findings suggest that the long leg, short leg and long-short spread of the joint strategy have consistent returns following both UP and DOWN markets.

Panel B reports the results for investor sentiment. The profits of short and long-short portfolios are higher following high sentiment periods. The raw return difference for the joint strategy following high and low sentiment periods is about 0.57 percent. However, the return differences become smaller after controlling for risk factors. The value-weighted return of the joint strategy is significant higher following high sentiment periods.

Panel C reports the results for difference across market volatility regimes. The profits of the long, short and long-short portfolios are higher following the

high-volatility market regime. The raw return difference between high and low volatility market regimes reaches about 1 percent. Both long and short legs contribute to the return difference. However, the return difference becomes smaller after controlling for risk factors.[7] It is quite easy to understand why our strategy works better when volatility is higher. The consensus explanation for short-term reversal is based on illiquidity (e.g. Campbell *et al.*, 1993; Avramov *et al.*, 2006). As liquidity dries up when the market is volatile or when the market is down, the profits coming from reversal should go up.

Taken together, we show that the joint strategy based on earnings momentum and short-term reversal generates persistent and stable profits across different market conditions. This shows that the combination of earnings momentum and reversal can deliver stable and persistent profits.

3.5. Earnings momentum vs. price momentum

Existing studies document that price momentum is a quite robust anomaly, though it has been widely exploited in the recent two decades. Chordia and Shivakumar (2006) and Novy-Marx (2015) find evidence that price momentum is related to earnings momentum. As such, it is interesting to know whether the joint strategy proposed in this paper can be explained by price momentum or vice versa.

We report that in our sample, the correlation between the returns of the price momentum-based joint strategy (PMR) and earnings momentum-based joint strategy (EMR) is 0.5. Moreover, PMR earns an average monthly return of 2.59 percent with a standard deviation of 5.95 percent, whereas EMR has a mean return of 2.24 percent but a smaller standard deviation of 4.64 percent. Based on these summary statistics, it appears that the two strategies are positively correlated and have similar performance profiles. It is expected that the two momentum strategies are highly correlated, consistent with existing studies.

To further sort out the differences between the two strategies, we perform a portfolio analysis by triple-sorting on past 1-month return (REV), price momentum based on past 11-month returns, as well as earnings momentum. To ensure that we have a sufficiently large number of stocks in each portfolio, we sort portfolios into terciles instead of quintiles. The results are shown in Panel A of Table 9. First, among the past 1-month losers (REV = 1), the earnings momentum strategy (E3-E1) implemented on stocks with the weakest price momentum (P1) still earns an average monthly return of 0.72 percent with a highly significant *t*-statistic of 6.82. In contrast, among stocks that are recent 1-month losers and have the weakest earnings momentum (E1), the price

[7]We find that the return spreads reported in UP/DOWN market states and low/high volatility states are statistically significant. However, the difference across the two sentiment regimes is not statistically significant.

Table 9
Average returns of triple-sorted portfolios on short-term reversal, price momentum, and earnings momentum

Panel A

	REV = 1				REV = 3			
	E1	E2	E3	E3-E1	E1	E2	E3	E3-E1
PMOM1	1.00	1.41	1.72	0.72	−0.33	0.23	0.50	0.82
	(3.00)	(4.32)	(5.32)	(6.82)	(−1.07)	(0.73)	(1.69)	(6.87)
PMOM2	0.94	1.49	1.89	0.95	0.25	0.74	1.28	1.03
	(3.69)	(5.94)	(7.04)	(9.35)	(1.03)	(3.03)	(5.44)	(10.88)
PMOM3	1.17	1.47	2.19	1.02	0.73	1.09	1.70	0.97
	(3.66)	(4.70)	(6.83)	(7.63)	(2.43)	(3.77)	(5.84)	(9.75)
PMOM3-PMOM1	0.17	0.06	0.47		1.05	0.86	1.21	
	(0.80)	(0.30)	(2.49)		(4.36)	(3.80)	(5.58)	

Panel B

	PMOM = 1				PMOM = 3			
	E1	E2	E3	E3-E1	E1	E2	E3	E3-E1
REV1	1.00	1.41	1.72	0.72	1.17	1.47	2.19	1.02
	(3.00)	(4.32)	(5.32)	(6.82)	(3.66)	(4.70)	(6.83)	(7.63)
REV2	0.72	1.06	1.49	0.77	1.11	1.43	1.84	0.73
	(2.46)	(3.70)	(5.19)	(7.06)	(4.35)	(5.53)	(6.73)	(7.38)
REV3	−0.33	0.23	0.50	0.82	0.73	1.09	1.70	0.97
	(−1.07)	(0.73)	(1.69)	(6.87)	(2.43)	(3.77)	(5.84)	(9.75)
REV1-REV3	−1.33	−1.18	−1.22		−0.44	−0.39	−0.49	
	(−10.45)	(−8.62)	(−7.61)		(−2.31)	(−2.28)	(−3.42)	

This table presents the average monthly equal-weighted raw returns of portfolios independently sorted on past 1-month returns, past 11-month returns and the standardised unexpected earnings (SUE). Panel A reports the portfolio returns based on the past 11-month returns and SUE in two groups based on the past 1-month returns. Panel B reports the portfolio returns based on the past 1-month returns and SUE in two groups based on the past 11-month returns. Our sample includes common stocks listed on the NYSE, AMEX and NASDAQ exchanges. The sample period is from 1980 to 2015. Stocks with price less than $5 at the end of formation periods are excluded. Newey and West (1987) heteroscedasticity and autocorrelation consistent *t*-statistics are reported in parentheses.

momentum strategy has an average return that is statistically indifferent from zero. In fact, the only profitable price momentum strategy is implemented on stocks with strongest earnings momentum (E3). Second, among the recent 1-month winners (REV = 3), we find that both earnings momentum and price momentum strategies are profitable and have similar performance. To sum up, our triple-sorting portfolio analysis indicates that the earnings momentum

(SUE)-based joint strategy is likely to be more robust than the price momentum-based joint strategy.

Panel B in Table 9 reports the performance of the interaction of earnings momentum and short-term reversal after controlling for price momentum. The results show that SUE can still efficiently identify true short-term winners or losers from those false short-term winners or losers within both past winners and losers' portfolios. In addition, simple short-term reversals are also significant in all three SUE portfolios within both past winners and losers' portfolios, though the magnitude is larger among past losers. The momentum-reversal joint strategy has an average monthly raw return of 2.04 percent and 1.46 percent with significant *t*-values among past losers and past winners, respectively. These results provide more evidence that the momentum and reversal joint strategy performs well even after controlling for price momentum.

4. Conclusion

This paper evaluates the effectiveness of a joint investment strategy that synthesises fundamental-based momentum and return-based reversal strategies. We find strong evidence that the joint strategy is more profitable than the simple addition of two individual strategies. Our results retain their significance after a battery of robustness checks. The profits generated from the strategy are also quite stable and resilient across various market conditions.

Some readers might wonder what are the sources of synergy between earnings momentum and short-term reversal? We conjecture that there are three possible channels. First, intuitively the joint strategy prevents investors from naively chasing higher prices. Other things being equal, by construction, a lower purchasing price necessarily means higher subsequent returns. Second, the empirical evidence presented in this paper supports the notion that our proposed joint strategy works better among smaller firms, suggesting that at least part of the profits could come from the slow diffusion of information (likely due to limited investor attention (e.g. Peng and Xiong, 2006)). Third, as argued by Da *et al*. (2014), short-term reversal strategies tend to perform better after isolating the impact from fundamental news. Our future research will continue to explore the interaction between various anomalies and study its impact on investment performance.

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