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PROFITABILITY OF PRICE, EARNINGS AND REVENUE MOMENTUM STRATEGIES: THE INDIAN EVIDENCE

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ABSTRACT

Momentum has remained an unsettled anomaly in finance. In this paper, we examine the profitability of univariate and multivariate sorted momentum strategies based on prior returns, earnings surprises and revenue surprises using the data for 493 companies that form part of Bombay Stock Exchange (BSE) 500 index in India from January 2002 to June 2010. Momentum profits are found to be persistent in the intermediate horizon (up to six months). Price momentum winners provide higher returns vis-à-vis earnings and revenue momentum winners. On long-short basis, earnings momentum strategy is most profitable. Earnings momentum is able to subsume price and revenue momentum. Further, the informational content of revenue surprises is incrementally very small. Triple sorted momentum portfolio using all the three criteria provides the highest return of 2.28% per month. The Capital Asset Pricing Model (CAPM) and the Fama-French model fail to explain these returns. The post-holding analysis reveals strong overreaction patterns for both winners as well as losers, thus, supporting the behavioural explanation. Momentum winners and losers perform better during market upturns. This study contributes to the asset pricing and behavioral finance literature especially for emerging markets such as India.

Keywords: price momentum, earnings momentum, revenue momentum, CAPM, Fama-French model

INTRODUCTION

The efficient market hypothesis given by Fama (1970) states that it is not possible to outperform the market if it is efficient and if stock prices reflect all the related information content. However, substantial evidence in the financial literature shows that future returns can be predicted using past information and that prices of securities do not follow a random walk.

Nearly two and a half decades ago, two simple strategies for earning profits in the stock market were documented by DeBondt and Thaler (1985) and Jegadeesh and Titman (1993). DeBondt and Thaler (1985) showed the profitability of the so-called "contrarian strategy", which consists of ranking stocks according to their long-term past returns (3 to 5 years), observing them over a holding period and forming zero-cost portfolios that buy losers and sell winners. An alternative strategy implemented on a shorter horizon (3 to 12 months), which is popularly known as the "price momentum strategy" in academic literature, was also found to be profitable by Jegadeesh and Titman (1993). Those authors documented that past winners outperform past losers by approximately one percent per month over the holding period. Both price momentum and contrarian strategies have been tested for robustness for various international markets outside of the US (see Rouwenhorst, 1998, for the 12 major European stock markets; Bacmann and Dubois, 2000, for the Swiss market; Chan, Hameed and Tong, 2000, for the stock market indices of 22 countries; Bacmann, Dubois and Isakov, 2001, for G-7 countries; Griffin, Ji and Martin, 2003, for the stocks of 39 countries; and Chui, Titman and Wei, 2010, for 37 countries[1]). These researchers all found that price momentum (also termed the prior return effect[2]) strategy is profitable and not an outcome of a data snooping bias. These studies cover different time periods and provide similar results using different methodologies.

The profitability of price momentum strategies has been well accepted, but debate persists regarding the sources of its profits. There are two competing views on the issue. One set of researchers suggests that observable price momentum may be explained by risk models, and hence, there are rational sources of momentum profits (see, e.g., Fama & French, 1996, Conrad & Kaul, 1998, Chordia & Shivakumar, 2002).

Other researchers use behavioural models and assume price momentum to be a consequence of investors' overreaction or under-reaction (see, e.g., Barberis, Shleifer, & Vishny, 1998; Daniel, Hirshleifer, & Subramanyam, 1998; Hong & Stein, 1999). Some researchers also attribute momentum to the 'disposition effect'[3] and the 'bandwagon effect' (see, e.g., Grinblatt & Han, 2002; Shumway & Wu, 2006; Hobson, 2012).

Ball and Brown (1968) document another phenomenon called the "post earnings announcement drift", which suggests that the stock prices tend to follow the direction of their recent earnings surprises. More recently, Chan, Jegadeesh and Lakonishok (1996) tried to determine whether the market's under-reaction to past earnings information helps in forecasting the future returns from past returns, and they coined another strategy called the "earnings momentum strategy", which became famous. The profitability of earnings momentum

strategies has been empirically verified in the financial literature (see Griffin, Ji, & Martin, 2005; Leippold & Lohre, 2012). Chan et al. (1996) and Griffin et al. (2005) document that earnings momentum is not able to capture the informational content in price momentum because every ranking criterion has its own power to predict future returns. However, some researchers have acknowledged a close relationship between price and earnings momentum because they share the same source of information, i.e., corporate fundamentals (see Chordia & Shivakumar, 2006). The intense focus on earnings surprises from investors and academicians is not surprising; earnings are a summary of material economic events that affect a firm in a given period. However, the other information present in financial statements beyond earnings may also have significant information content. This thought is shared by Jegadeesh and Livnat (2006), who evaluate whether revenue gives incremental information apart from earnings and examine the way investors process this information and use it for decision making. The authors also find that stocks with large revenue surprises tend to provide significant abnormal returns during the post-announcement period.

Chen, Chen, Hsin and Lee (2014) check the profitability of "revenue momentum strategies" together with the previously documented "price momentum" and "earnings momentum" strategies for the US market. They show that earnings and revenue may contain considerable common information about a firm's economic activities—as the starting point of income statements is revenue, and the ending point is earnings—but each financial variable contains incremental informational content. The authors further document that multivariate strategies tend to yield higher profits than strategies based on single criterion. A long-short zero-cost triple sorted strategy that uses information of prior returns, earnings and revenue surprises provides a monthly return of 1.44% in their study.

There is also a body of literature that asserts that if momentum is a result of a behavioural aberration—that is, if it is caused by under-reaction or overreaction—then the same can be deciphered from the post-holding return patterns. If momentum is caused by under-reaction, then abnormal profits in the holding period should become normal in the post-holding period. Alternatively, if overreaction is the reason behind momentum profits, then reversals should be observed in momentum profits. Jegadeesh and Titman (2001) document that over their sample period, there were reversals in price momentum profits from the second through the fifth year. Lee and Swaminathan (2000) observe that price momentum is partially an outcome of investors' overreaction because the profits start reversing significantly after the third year until the fifth year. Chan et al. (1996) confirm that under-reaction to earnings surprises is more short-lived for returns than it is for past returns.

Price momentum has also been tested for emerging markets, including India. Vu (2012) reports that the returns from price momentum strategy are higher for emerging markets (i.e., Africa, Asia, Europe, Latin America and the Middle East) than for developed markets. Cakici, Fabozzi and Tan (2013) document the profitability of price momentum strategy for the emerging markets of Asia and Latin America but not for Eastern Europe. Anusakumar, Ali and Hooy (2013) study momentum in context of ASEAN stock markets for period of 2000 to 2011 and found absence of momentum in Malaysia and Thailand, however found negative momentum for Philippines and Indonesia dua to superior performance of loser portfolios. Sehgal and Balakrishnan (2002) and Petr and Abdullah (2012) report the existence of short-term continuation patterns in stock returns for the Indian market. In another study, Sehgal and Balakrishnan (2004) document that the part of price momentum returns in India that has not been captured by CAPM is partially explained by the Fama-French model, and momentum profits persist in the post-holding period. Griffin et al. (2005), in their study of 39 countries, document that there are insignificant profits yielded by price and earnings momentum strategies for India, but price momentum profits are higher than earnings momentum profits. Sehgal and Balakrishnan (2008) document strong momentum profits in India for individual stocks and portfolios formed based on different company characteristics. Sehgal and Jain (2011) confirm the presence of momentum profits for the Indian market and observe momentum in sectoral returns. These authors note that sectoral momentum can be a source of stock momentum.

Thus, price momentum strategies have been extensively tested in the Indian context. However, empirical work on earnings and revenue momentum strategies is lacking. Sagi and Seasholes (2007) propose that enhanced momentum strategies can outperform traditional price momentum strategies. In this study, we are motivated to investigate the market reaction to the joint informational content of prior returns, earnings surprises and revenue surprises. Additionally, prior research shows that this informational content can be used to divide the stocks into different risk-return characteristics that can then be used to create profitable investment strategies (see, e.g., Jegadeesh & Titman, 1993; Chan et al., 1996; Jegadeesh & Livnat, 2006; Chen et al., 2014). The present study attempts to answer the following questions:

1. Are momentum strategies based on single sorts—i.e. short-term prior returns, earnings surprises and revenue surprises—profitable?
2. Do multivariate sorted strategies perform better than univariate sorted strategies?
3. Does the profitability of trading strategies vary for conditional and independent sorting procedures?

4. Can the cross-sectional pattern of returns for momentum portfolios be explained by standard asset pricing models such as CAPM and the Fama-French model?
5. What are the post-holding return patterns for momentum portfolios and their possible behavioural implications?
6. Do momentum profits differ for market upturns and downturns?

The paper is organised into seven sections, including the present one. The next section covers data and their sources. Then, we evaluate price, earnings and revenue momentum strategies based on univariate as well as multivariate sorting. In the next section, we test whether the profitability of different trading strategies can be explained by standard risk models. After that, we study the post-holding return patterns of sample momentum portfolios and verify whether momentum profits are sensitive to market conditions, respectively. The summary, conclusions and policy observations are given in the last section.

DATA

The data are composed of monthly stock prices for 493[4] Indian companies that were included in the Bombay Stock Exchange (BSE) 500 index from January 2002 to June 2010. The stock prices are adjusted for capitalisation changes, such as stock dividends, stock splits and rights issue. The stock price data are used to estimate percentage returns, which are then used for further computation. The sample securities account for approximately 90% of the total market capitalisation and trading activity on BSE, and hence, it is fairly representative of market performance.

The BSE 200 index is used as a surrogate of aggregate economic wealth. The index is broadly based, free-float weighted and constructed on the lines of the S&P 500, USA. Market capitalisation (price times the number of shares outstanding) is used as a measure of company size, and the price-to-book value ratio for sample companies is used to construct a value factor.

Quarterly earnings (i.e., earnings per share, excluding extraordinary items) and net sales or revenue data have been used to calculate SUE (standardised unexpected earnings) and SUR (standardised unexpected revenue), respectively, which are described in the next section. The company and market index-related data have been obtained with Thomson-Reuters *'Datastream*[5] software.

The implicit yield on 91-day treasury bills is used as a proxy for a risk-free rate for which the data have been taken from the Reserve Bank of India (RBI) website (www.rbi.org.in).

PRICE, EARNINGS AND REVENUE MOMENTUM

In this section, we examine the profitability of prior returns-, earnings surprises- and revenue surprises-based momentum strategies. Four types of investment strategies are evaluated: univariate sorted, bivariate conditionally sorted, bivariate independently sorted and multivariate sorted.

Univariate strategies involve portfolio formation based on a single ranking criterion, i.e., prior returns, earnings surprises or revenue surprises. In bivariate conditionally sorted strategies, the securities are first ranked and grouped based on one of the attributes, and then, sub-groups are formed within each group based on another attribute. In bivariate independently sorted strategies, the securities are ranked separately based on any two attributes, and then, the intersection of two independently formed groups is used to form portfolios. For multivariate sorted strategies, the securities are ranked independently based on each of the three firm attributes, and their intersection is used to form triple sorted portfolios.

An investment strategy is defined as *J* months/*K* months, where *J* represents the number of months of portfolio formation, and *K* represents the number of months of portfolio holding. Both the 6-6 and the 12-12 strategies are employed.

Following Jegadeesh and Titman (1993), for the 6-6 price momentum strategy, stocks are sorted at the end of June, *t*, based on their past 6 months' average return, *t*-5 to *t*, which is known as the formation period, and then divided into quintiles. The top 20% stocks are regarded as 'winners' and named 'P1', whereas the bottom 20% are labelled 'losers' and named 'P5'. Monthly excess returns[6] on equally weighted quintile portfolios are then observed for the next six months[7], which is known as the holding period, i.e., July to December ($t + 1$ to $t + 6$). Again in December, quintiles are formed based on the past six months' average return of stocks from July to December, and the holding period returns are observed for next six months. This process is repeated for the entire study period, and a return series of price momentum is observed for different portfolios. Our estimation procedure results in non-overlapping portfolio[8] formation and holding periods. Mean returns (termed unrestricted returns) are estimated for the sample portfolios, which are tested for statistical significance at

the 5% level using *t*-statistics (two-tailed basis). The return differentials between winners (P1) and losers (P5) are also computed.

A similar procedure is adopted for the 12-12 strategy; the difference is that in the 12-12 strategy, the formation and holding period is for 12 months instead of 6 months.

For earnings momentum, SUE is used as a measure of earnings surprises[9], as suggested by Chan et al. (1996), which is calculated as follows:

$$SUE_{i,t} = \frac{Actual\ EPS_{i,t} - E(EPS_{i,t})}{Stdev\ (EPS_{i,t})} \quad (1)$$

where $SUE_{i,t}$ = standardised unexpected earnings at time *t* for firm *I,* $EPS_{i,t}$ = earnings per share, excluding extraordinary items at time *t* for firm *I,* E ($EPS_{i,t}$) = average earnings per share, excluding extraordinary items for the previous 8 quarters at time *t* for firm *I,* and Stdev ($EPS_{i,t}$) = standard deviation of earnings per share, excluding extraordinary items for the previous 8 quarters at time *t* for firm *i.*

For the 6-6 strategy, the stocks are ranked based on SUE at the end of second quarter, i.e., June, *t*. While calculating SUE, only stocks that have at least four values of earnings per share are included, excluding extraordinary items in the preceding 8 quarters. After the stocks are sorted based on SUE, they are divided into quintiles, i.e., E1 to E5, with E1 having stocks with the highest earnings surprises or SUE and E5 having stocks with the lowest earnings surprises or SUE. The holding period returns are observed for these quintile portfolios for the next 6 months, i.e., July to December. The portfolios are rebalanced in December (end of the fourth quarter), and the holding period returns are observed for the next six months.

A similar procedure is adopted for the 12-12 strategy; the difference is that in the 12-12 strategy, the stocks are ranked based on earnings surprises (i.e., SUE) at the end of second quarter only, i.e., at the end of June, *t*, and the holding period is 12 months instead of 6 months.

Next, we form portfolios based on revenue surprises. Following Jegadeesh and Livnat (2006), standardised unexpected revenue (SUR) is used as a measure of revenue surprises, which is calculated as follows:

$$SUR_{i,t} = \frac{Actual\ REV_{i,t} - E(REV_{i,t})}{Stdev\ (REV_{i,t})} \quad (2)$$

where $SUR_{i,t}$ = standardised unexpected revenue at time *t* for firm *I,* $REV_{i,t}$ = revenue or net sales at time *t* for firm *I,* E ($REV_{i,t}$) = average revenue or net sales

for the previous 8 quarters at time t for firm I, and Stdev ($REV_{i,t}$) = standard deviation of revenue or net sales for the previous 8 quarters at time t for firm i.

The SUR-based portfolio formation procedure is exactly the same as that of the SUE-based portfolios discussed above.

To test the dominance of one strategy over other strategies based on a single criterion and to see whether there is any incremental information content in these three criteria, following George and Hwang (2004), a pairwise nested comparison model is used for both the 6-6 and the 12-12 strategies. For instance, if there is a comparison between the 6-6 price momentum strategy with the 6-6 earnings momentum strategy, then two groups are formed. In the first group, stocks are first sorted by earnings surprises (SUE) at the end of second quarter, i.e., June, t and divided into terciles, E1 to E3. Within each tercile, stocks are again sorted based on their past six months' average returns, i.e., from January to June, $t - 5$ to t, and sub-divided into terciles, P1 to P3. Then, the excess returns of these 9 equally weighted portfolios are observed for the next six months, i.e., July to December, $t + 1$ to $t + 6$, which is known as the holding period. The portfolios are rebalanced similarly in December (end of the fourth quarter) using the data of SUE at the end of fourth quarter and the past six months' average returns, i.e., July to December. The holding period returns are observed for the next six months. This process is repeated for the entire study period, and a return series of these nine portfolios are observed for different portfolios. The profitability of the price momentum strategy (P1–P5) within E1, E2 and E3 is calculated. Similarly, in the second group, the stocks are first sorted by their past six months' average return and divided into terciles, P1 to P3. Within each tercile, the stocks are then sorted based on their earnings surprises and sub-divided into terciles, E1 to E3. Then, the excess returns of these 9 equally weighted portfolios are observed for the next six months, i.e., the holding period. The portfolios are rebalanced after every six months for the entire study period. The return series are observed, and the profitability of the earnings momentum strategy (E1–E3) within P1, P2 and P3 is calculated.

Similarly, revenue momentum strategy is compared to earnings momentum, and the price momentum strategy is compared to the revenue momentum strategy. In the case of a 12-12 strategy, the procedure is similar, except that in the 12-12 strategy, the stocks are ranked based on earnings surprises (i.e., SUE) and revenue surprises (i.e., SUR) only once in 12 months, i.e., at the end of second quarter only, June, t. For price momentum, stocks are ranked based on their past 12 months' average returns, i.e., from July to June, $t - 11$ to t, and the holding period is 12 months instead of 6 months.

If the return of any one strategy conditional on the variable of the other strategy is profitable, then it shows that the first strategy cannot dominate the other. If one strategy is not found to dominate the other, then it reflects that each measure has some additional information, and combining them can give greater returns. The profitability of momentum strategies based on combined criteria is then checked using the dependent sorting mentioned above. For example, the momentum portfolio in earnings and prior returns sorts (conditional double sorts) is measured as the difference between E1P1 and E3P3. Similar computations are performed for other combinations.

If every variable has incremental informational content, then it would be useful to test the profitability of momentum strategies based on combined criteria using independent sorting. Portfolios based on combined criteria are constructed in two ways: first, by taking two variables of price, earnings and revenue at a time, i.e., portfolios based on independent double sorting, and then, using all three together, i.e., portfolios based on independent triple sorting.

Portfolios based on double sorting are constructed as follows. For example, to test the efficacy of the 6-6 price-and-earnings combined momentum strategy, the sample stocks are sorted according to their past six months' average returns and divided into terciles, P1 to P3. All stocks are again sorted independently based on earnings surprises (i.e., SUE) at the end of the second quarter, i.e., June, *t* and divided into terciles, E1 to E3. After this, nine two-way sorted portfolios are formed based on two independent sorts. For example, the intersection of P1 and E1, labelled P1E1, is the portfolio formed by the stocks with the highest six months' past returns and earnings surprises. Monthly excess returns on these 9 equally weighted portfolios are then observed for the next six months, which is known as the holding period, i.e., July to December. The estimation procedure is repeated every six months, and the return series are obtained for these nine portfolios for the entire study period. Price-and-earnings combined momentum strategy profits are then calculated by going long in the P1E1 portfolio and short in the P3E3 portfolio. The estimation procedure is repeated every six months. A similar procedure is adopted for the 12-12 strategy, the difference being that the stocks are sorted only once a year based on each criterion. Independent combinations of price-revenue and earnings-revenue are constructed in the same way.

Finally, we estimate the returns on independent triple-sorted portfolios. Twenty-seven portfolios are formed by the intersection of three prior returns, earnings surprises and revenue surprises groups each. The momentum portfolio is defined as the difference between the returns of P1E1R1 and P3E3R3. P1E1R1 consists of stocks with the highest six/twelve months' past returns, earnings and

revenue surprises, whereas P3E3R3 consists of stocks that rank lowest independently on each of the criterion.

The profitability of independent double- and triple-sorted strategies is then compared with that of the single-sorted and conditional double-sorted strategies. Table 1 provides the mean excess returns on our 6-6 and 12-12 sample portfolios. For convenience, we report the results for the corner portfolios, i.e., only winners and losers.

Table 1
Unrestricted returns on momentum portfolios

The table is organised into four panels. Panel A provides results for univariate sorted portfolios. Panel B and C show results for independent and dependent double sorted portfolios respectively. Unrestricted returns for triple sorted portfolios are provided in panel D. The sample returns are tested for significance using t-statistic (Two-tailed basis at 5% level).

Panel A: Univariate Sorted Results

6-6								
	Mean returns	*t*-value		Mean returns	*t*-value		Mean returns	*t*-value
P1	0.0458	3.3633	E1	0.0380	2.8614	R1	0.0326	2.7018
P5	0.0324	2.0281	E5	0.0182	1.3831	R5	0.0265	1.7683
P1–P5	0.0135	1.4992	E1–E5	0.0198	3.9156	R1–R5	0.0061	1.0549
12-12								
P1	0.0468	2.8736	E1	0.0270	2.1203	R1	0.0233	1.9271
P5	0.0425	2.3743	E5	0.0160	1.2382	R5	0.0215	1.4491
P1–P5	0.0044	0.3949	E1–E5	0.0109	2.3529	R1–R5	0.0019	0.3340

Double Sorted Results
Panel B: Independent Sorts

6-6								
	Mean returns	*t*-value		Mean returns	*t*-value		Mean returns	*t*-value
E1P1	0.0328	2.0770	R1P1	0.0259	1.7463	E1R1	0.0305	1.9269
E3P3	0.0117	0.6003	R3P3	0.0217	1.0599	E3R3	0.0180	0.9955
E1P1–E3P3	0.0211	2.0394	R1P1–R3P3	0.0042	0.3710	E1R1–E3R3	0.0124	1.7539
12-12								
E1P1	0.0283	1.3976	R1P1	0.0260	1.3071	E1R1	0.0274	1.6113
E3P3	0.0164	0.8723	R3P3	0.0202	1.0444	E3R3	0.0202	1.0164
E1P1–E3P3	0.0119	1.6754	R1P1–R3P3	0.0058	0.7334	E1R1–E3R3	0.0072	1.0049

Panel C: Dependent Sorts

6-6							
Price Momentum Vs. Earnings Momentum							
Price momentum in various SUE groups				Earnings momentum in various prior returns groups			
Portfolios classified by SUE	Portfolios classified by prior returns	Mean returns	*t*-value	Portfolios classified by prior returns	Portfolios classified by SUE	Mean returns	*t*-value
E1	P1	0.0323	2.0744	P1	E1	0.0331	2.0724
	P3	0.0305	1.6359		E3	0.0134	0.9328
	P1–P3	0.0018	0.1890		E1–E3	0.0196	3.0726
E2	P1	0.0141	0.8919	P2	E1	0.0254	1.4514
	P3	0.0247	1.3564		E3	0.0225	1.2931
	P1–P3	–0.0106	–1.1419		E1–E3	0.0029	0.4879
E3	P1	0.0151	1.0394	P3	E1	0.0289	1.5402
	P3	0.0097	0.4797		E3	0.0110	0.5674
	P1–P3	0.0054	0.6236		E1–E3	0.0179	2.4507
	E1P1–E3P3	0.0226	2.0305		P1E1–P3E3	0.0220	1.9792
Revenue Momentum Vs. Earnings Momentum							
Revenue momentum in various SUE groups				Earnings momentum in various SUR groups			
Portfolios classified by SUE	Portfolios classified by SUR	Mean returns	*t*-value	Portfolios classified by SUR	Portfolios classified by SUE	Mean returns	*t*-value
E1	R1	0.0314	1.9375	R1	E1	0.0350	2.0543
	R3	0.0323	1.7980		E3	0.0140	0.9360
	R1–R3	–0.0009	–0.1370		E1–E3	0.0209	3.2778
E2	R1	0.0178	1.1449	R2	E1	0.0271	1.5164
	R3	0.0218	1.1854		E3	0.0096	0.5621
	R1–R3	–0.0040	–0.6454		E1–E3	0.0175	2.9571
E3	R1	0.0084	0.5363	R3	E1	0.0266	1.5313
	R3	0.0151	0.7757		E3	0.0158	0.9063
	R1–R3	–0.0067	–1.0311		E1–E3	0.0108	1.7180
	E1R1–E3R3	0.0162	1.8771		R1E1–R3E3	0.0192	2.2689

(*continued on next page*)

Table 1: Panel C (*continued*)

Price Momentum Vs. Revenue Momentum							
Price momentum in various SUR groups				Revenue momentum in various prior returns groups			
Portfolios classified by SUR	Portfolios classified by prior returns	Mean returns	*t*-value	Portfolios classified by prior returns	Portfolios classified by SUR	Mean returns	*t*-value
R1	P1	0.0257	1.7571	P1	R1	0.0264	1.7875
	P3	0.0244	1.4455		R3	0.0145	0.9550
	P1–P3	0.0012	0.1424		R1–R3	0.0119	2.2882
R2	P1	0.0194	1.2435	P2	R1	0.0192	1.1964
	P3	0.0139	0.7211		R3	0.0222	1.1659
	P1–P3	0.0055	0.6295		R1–R3	–0.0030	–0.4245
R3	P1	0.0180	1.1232	P3	R1	0.0258	1.4807
	P3	0.0195	0.9416		R3	0.0203	0.9764
	P1–P3	–0.0015	–0.1395		R1–R3	0.0055	0.7922
	R1P1–R3P3	0.0062	0.5187		P1R1–P3R3	0.0061	0.5244
12-12							
Price Momentum Vs. Earnings Momentum							
Price momentum in various SUE groups				Earnings momentum in various prior returns groups			
Portfolios classified by SUE	Portfolios classified by prior returns	Mean returns	*t*-value	Portfolios classified by prior returns	Portfolios classified by SUE	Mean returns	*t*-value
E1	P1	0.0301	1.4728	P1	E1	0.0303	1.4692
	P3	0.0254	1.6064		E3	0.0259	1.1892
	P1–P3	0.0048	0.5733		E1–E3	0.0044	0.6723
E2	P1	0.0211	1.0420	P2	E1	0.0251	1.5171
	P3	0.0252	1.3942		E3	0.0165	1.0000
	P1–P3	–0.0041	–0.6744		E1–E3	0.0086	1.6115
E3	P1	0.0249	1.2133	P3	E1	0.0281	1.7139
	P3	0.0175	0.8941		E3	0.0163	0.8821
	P1–P3	0.0074	1.2186		E1–E3	0.0118	1.7837
	E1P1–E3P3	0.0126	1.8011		P1E1–P3E3	0.0140	1.6478

(*continued on next page*)

Table 1: Panel C (*continued*)

Revenue Momentum Vs. Earnings Momentum							
Revenue momentum in various SUE groups				Earnings momentum in various SUR groups			
Portfolios classified by SUE	Portfolios classified by SUR	Mean returns	*t*-value	Portfolios classified by SUR	Portfolios classified by SUE	Mean returns	*t*-value
E1	R1	0.0267	1.5468	R1	E1	0.0285	1.5507
	R3	0.0318	1.7368		E3	0.0166	0.9777
	R1–R3	–0.0052	–0.9032		E1–E3	0.0119	1.7445
E2	R1	0.0187	1.0830	R2	E1	0.0260	1.4435
	R3	0.0251	1.2372		E3	0.0184	1.0448
	R1–R3	–0.0064	–1.1331		E1–E3	0.0077	1.3624
E3	R1	0.0162	0.9603	R3	E1	0.0269	1.3830
	R3	0.0201	0.9145		E3	0.0175	0.9109
	R1–R3	–0.0039	–0.5131		E1–E3	0.0094	1.6808
	E1R1–E3R3	0.0065	0.6798		R1E1–R3E3	0.0110	1.2687
Price Momentum Vs. Revenue Momentum							
Price momentum in various SUR groups				Revenue momentum in various prior returns groups			
Portfolios classified by SUR	Portfolios classified by prior returns	Mean returns	*t*-value	Portfolios classified by prior returns	Portfolios classified by SUR	Mean returns	*t*-value
R1	P1	0.0276	1.3391	P1	R1	0.0236	1.1774
	P3	0.0199	1.1821		R3	0.0237	1.0874
	P1–P3	0.0076	1.1393		R1–R3	–0.0001	–0.0168
R2	P1	0.0187	0.9611	P2	R1	0.0191	1.2823
	P3	0.0225	1.2981		R3	0.0211	1.1417
	P1–P3	–0.0038	–0.5558		R1–R3	–0.0019	–0.3455
R3	P1	0.0235	1.0447	P3	R1	0.0182	1.0583
	P3	0.0194	0.9810		R3	0.0214	1.0832
	P1–P3	0.0041	0.5288		R1-R3	–0.0031	–0.4222
	R1P1–R3P3	0.0082	1.1348		P1R1–P3R3	0.0023	0.2701

Panel D: Triple Sorts

6-6		
	Mean returns	*t*-value
E1R1P1	0.0335	2.1396
E3R3P3	0.0107	0.5027
E1R1P1–E3R3P3	0.0229	1.6553
12-12		
E1R1P1	0.0290	1.4326
E3R3P3	0.0137	0.6792
E1R1P1-E3R3P3	0.0153	1.4588

Investing only in the long side, price momentum winner is the best performing portfolio, with monthly returns of 4.58% and 4.68% for the 6-6 and the 12-12 strategy, respectively. Earnings or revenue momentum on a standalone basis and any combination based on prior returns, earnings and revenue surprises also failed to provide a better trading strategy. Focusing on a long-short zero investment strategy, the triple-sorted portfolio provides the highest return, 2.28%, per month based on the difference between E1R1P1 and E3R3P3. The return from the strategy is closely followed by conditionally double-sorted earnings-price momentum strategy (see Panel C) based on the difference in the returns of E1P1 and E3P3.

Some important conclusions can be drawn from Table 1.

1. In general, momentum patterns in stock returns (winners–losers) tend to become weaker as one elongates the portfolio formation and the holding windows, i.e., from 6-6 to 12-12. Hence, momentum profits are persistent on the intermediate horizons, as documented by earlier studies.
2. For 6-6 strategies, earnings momentum is not subsumed by either price or revenue momentum; the difference between the returns of earnings-based portfolios within each price/revenue group is statistically significant, in general (see Panel C).
3. For 6-6 strategies, both price and revenue momentum is subsumed by earnings momentum. This finding is confirmed by the fact that the difference in the returns of price/revenue sorted portfolios within each earnings group is not statistically significant (see Panel C).
4. The informational content of revenue surprises is incrementally very small after accounting for earnings and price momentum.
5. For India, price momentum winners provide the highest return vis-à-vis earnings and revenue momentum winners, which is consistent with the findings of Chen et al. (2014) for the US market.

6. On a long-short basis, earnings momentum provides the most profitable trading strategy in India, followed by price and revenue momentum strategies, which is in contrast with Chen et al. (2014), who find that the price momentum strategy works best for the US market.

MOMENTUM PROFITS AND ASSET PRICING MODELS

To account for the risk factors, we employ two asset pricing frameworks: CAPM and the Fama-French model. Excess returns on each portfolio are regressed on the excess returns for the market factor using the excess return version of the market model, which is employed to operationalise CAPM:

$$R_{pt} - R_{ft} = a + b\,(R_{mt} - R_{ft}) + e_t \tag{3}$$

where $R_{pt} - R_{ft}$ is the excess portfolio return based on a criterion, and $R_{mt} - R_{ft}$ is the excess return on the market index (BSE 200). The intercept term (a) measures abnormal performance, b is the sensitivity coefficient, and e_t is the error term.

We next regress the excess portfolio returns on market size and value factors using the Fama-French framework (1993):

$$R_{pt} - R_{ft} = a + b\,(R_{mt} - R_{ft}) + s\,(R_{SMBt}) + l\,(R_{LMHt}) + e_t \tag{4}$$

where R_{SMBt} and R_{LMHt} are size and value factors, respectively, and s and l show the sensitivity of asset returns on each of these factors. All other terms have the same meaning as those shown in Equation (3).

The size and value factors are constructed using the Fama-French (1993) methodology. The size (SMB) factor is the difference between the average returns on small stocks and large stocks on a month-to-month basis, which is expected to be neutral to the value effect. The value (LMH) factor is the difference between the average return on low P/B and high P/B stocks each period, which is expected to be neutral to the size effect. These risk factors have been constructed by the intersection of independently sorted two-size and two-value risk groups[10].

Table 2 reports alphas (risk-adjusted returns) based on CAPM. The market factor fails to explain the returns on most of the winner portfolios. The momentum profits measured as alpha differentials are actually becoming larger compared than the mean return differentials; this phenomenon occurs because winners exhibit lower betas than losers, thus defying the risk story.

Table 2
Regression results based on CAPM: $R_{pt} - R_{ft} = a + b\,(R_{mt} - R_{ft})$

Excess returns on the sample portfolios are regressed on excess returns for the market factor as per CAPM framework. The intercept terms (representing abnormal profits) are evaluated at 5% level of significance using *t*-statistics (two-tailed basis).

Panel A: Univariate Sorted Results

6-6					
	a	*b*	t(*a*)	t(*b*)	Adjusted R^2
P1	0.0263	1.1538	3.9538	15.4384	0.7697
P5	0.0092	1.3689	1.2409	16.4213	0.7910
E1	0.0175	1.2165	4.1216	25.5754	0.9019
E5	–0.0017	1.1777	–.3409	21.0301	0.8614
R1	0.0139	1.1072	3.7112	26.3940	0.9074
R5	0.0042	1.3173	0.6745	18.7611	0.8317
12-12					
P1	0.0224	1.4453	3.4307	19.7026	0.8450
P5	0.0201	1.3259	1.7128	10.0920	0.5868
E1	0.0123	1.1700	3.1631	26.7475	0.9096
E5	0.0014	1.1506	0.2781	19.8973	0.8476
R1	0.0090	1.1096	2.3537	25.8164	0.9036
R5	0.0050	1.3060	0.8229	19.0081	0.8354

Double Sorted Results
Panel B: Independent Sorts

6-6					
	a	*b*	t(*a*)	t(*b*)	Adjusted R^2
E1P1	0.0199	1.1256	3.4597	18.7540	0.8687
E3P3	–0.0038	1.3576	–0.4734	16.1354	0.8303
R1P1	0.0138	1.0635	2.6244	19.4384	0.8767
R3P3	0.0057	1.4011	0.6151	14.4861	0.7976
E1R1	0.0172	1.1640	4.0218	26.1890	0.9282
E3R3	0.0032	1.2938	0.4991	19.1411	0.8733
12-12					
E1P1	0.0125	1.3468	1.9623	20.8665	0.9024
E3P3	0.0019	1.2320	0.2917	18.5551	0.8796
R1P1	0.0102	1.3413	1.9378	25.0599	0.9303
R3P3	0.0055	1.2487	0.7402	16.5864	0.8536
E1R1	0.0140	1.1373	2.8255	22.6353	0.9158
E3R3	0.0047	1.3183	0.7492	20.7773	0.9016

Panel C: Dependent Sorts

6-6						
Price Momentum Vs. Earnings Momentum						
Price momentum in various SUE groups						
		a	*b*	t(*a*)	t(*b*)	Adjusted R^2
E1	P1	0.0197	1.1071	3.3903	18.3236	0.8633
	P3	0.0155	1.3080	2.0856	16.8691	0.8425
E2	P1	0.0013	1.1278	0.2140	18.4409	0.8648
	P3	0.0102	1.2772	1.3707	16.5622	0.8376
E3	P1	0.0031	1.0570	0.6658	22.1258	0.9021
	P3	–0.0064	1.4046	–0.7499	15.8962	0.8261
Earnings momentum in various prior returns groups						
P1	E1	0.0202	1.1273	3.2776	17.5751	0.8531
	E3	0.0017	1.0282	0.3243	19.0555	0.8723
P2	E1	0.0110	1.2628	1.8773	20.7258	0.8899
	E3	0.0080	1.2661	1.5090	22.9034	0.9081
P3	E1	0.0141	1.2968	1.7341	15.3265	0.8153
	E3	–0.0041	1.3288	-0.4678	14.4076	0.7958
Revenue Momentum Vs. Earnings Momentum						
Revenue momentum in various SUE groups						
E1	R1	0.0180	1.1696	3.3782	21.0792	0.8932
	R3	0.0177	1.2773	2.6801	18.6179	0.8670
E2	R1	0.0051	1.1123	0.9270	19.5473	0.8779
	R3	0.0067	1.3160	1.0420	19.5492	0.8779
E3	R1	–0.0046	1.1401	–0.9348	22.1985	0.9027
	R3	–0.0006	1.3748	–0.0772	17.3562	0.8500
Earnings momentum in various SUR groups						
R1	E1	0.0208	1.2375	3.9403	22.4885	0.9050
	E3	0.0017	1.0755	0.3338	19.9910	0.8826
R2	E1	0.0126	1.2687	1.8689	18.0112	0.8592
	E3	–0.0044	1.2293	–0.7666	20.3490	0.8863
R3	E1	0.0123	1.2492	2.0781	20.2334	0.8851
	E3	0.0019	1.2153	0.2630	16.3406	0.8339

(*continued on next page*)

Table 2: Panel C (*continued*)

Price Momentum Vs. Revenue Momentum						
Price momentum in various SUR groups						
		a	*b*	t(*a*)	t(*b*)	Adjusted R^2
R1	P1	0.0138	1.0404	2.5822	18.7452	0.8686
	P3	0.0107	1.2011	1.7123	18.4928	0.8655
R2	P1	0.0067	1.1178	1.1922	19.1738	0.8737
	P3	–0.0014	1.3441	–0.1798	16.0545	0.8289
R3	P1	0.0049	1.1482	0.8592	19.3030	0.8752
	P3	0.0032	1.4276	0.3517	15.1424	0.8116
Revenue momentum in various prior returns groups						
P1	R1	0.0143	1.0564	2.7367	19.3981	0.8763
	R3	0.0022	1.0792	0.3840	18.3274	0.8634
P2	R1	0.0059	1.1613	1.1451	21.6002	0.8978
	R3	0.0066	1.3635	0.9899	19.6535	0.8791
P3	R1	0.0119	1.2197	1.6724	16.4955	0.8365
	R3	0.0041	1.4119	0.4308	14.1340	0.7895
12-12						
Price Momentum Vs. Earnings Momentum						
Price momentum in various SUE groups						
		a	*b*	t(*a*)	t(*b*)	Adjusted R^2
E1	P1	0.0142	1.3575	2.1749	20.5503	0.8996
	P3	0.0133	1.0261	2.2512	17.1277	0.8615
E2	P1	0.0050	1.3743	0.9899	26.8613	0.9388
	P3	0.0110	1.2059	2.0233	21.8390	0.9101
E3	P1	0.0089	1.3593	1.3515	20.3387	0.8978
	P3	0.0024	1.2847	0.3539	18.5150	0.8791
Earnings momentum in various prior returns groups						
P1	E1	0.0143	1.3671	2.1359	20.2190	0.8967
	E3	0.0089	1.4558	1.3420	21.7899	0.9098
P2	E1	0.0121	1.1093	2.5687	23.3475	0.9205
	E3	0.0035	1.1000	0.7270	22.3129	0.9136
P3	E1	0.0153	1.0884	2.9478	20.6992	0.9009
	E3	0.0024	1.1798	0.3206	15.2735	0.8317

(*continued on next page*)

Table 2: Panel C (*continued*)

Revenue Momentum Vs. Earnings Momentum						
Revenue momentum in various SUE groups						
		a	*b*	t(*a*)	t(*b*)	Adjusted R^2
E1	R1	0.0133	1.1379	2.3167	19.5850	0.8906
	R3	0.0176	1.2142	2.9699	20.2804	0.8972
E2	R1	0.0051	1.1540	1.0178	22.6530	0.9159
	R3	0.0093	1.3477	1.4547	20.9080	0.9027
E3	R1	0.0031	1.1168	0.5591	19.8351	0.8930
	R3	0.0033	1.4378	0.4087	17.8492	0.8711
Earnings momentum in various SUR groups						
R1	E1	0.0143	1.2099	2.2746	19.0083	0.8846
	E3	0.0034	1.1299	0.6286	20.8961	0.9026
R2	E1	0.0121	1.1878	1.9714	19.1395	0.8860
	E3	0.0048	1.1512	0.7779	18.2433	0.8759
R3	E1	0.0116	1.3033	2.1008	23.4076	0.9209
	E3	0.0027	1.2566	0.4003	18.2047	0.8755
Price Momentum Vs. Revenue Momentum						
Price momentum in various SUR groups						
R1	P1	0.0113	1.3897	2.0591	25.0769	0.9304
	P3	0.0070	1.1041	1.1589	18.0962	0.8742
R2	P1	0.0037	1.2726	0.5407	18.1353	0.8746
	P3	0.0094	1.1176	1.3720	16.1024	0.8460
R3	P1	0.0060	1.4915	0.8207	20.0486	0.8951
	P3	0.0042	1.2967	0.5981	18.2482	0.8760
Revenue momentum in various prior returns groups						
P1	R1	0.0077	1.3556	1.4773	25.6541	0.9333
	R3	0.0067	1.4489	0.9691	20.6170	0.9002
P2	R1	0.0075	0.9939	1.6182	21.2496	0.9055
	R3	0.0067	1.2217	1.1216	20.1422	0.8960
P3	R1	0.0050	1.1258	0.8077	17.9118	0.8719
	R3	0.0066	1.2618	0.8113	15.4328	0.8346

Panel D: Triple Sorts

6-6					
	a	*b*	t(*a*)	t(*b*)	Adjusted R^2
E1R1P1	0.0208	1.1105	3.5161	18.0000	0.8590
E3R3P3	–0.0057	1.4334	–0.5673	13.6702	0.7781
12-12					
E1R1P1	0.0133	1.3379	1.9788	19.6495	0.8912
E3R3P3	–0.0016	1.3056	–0.2052	16.4989	0.8523

Table 3
Regression results based on FF model: $R_{pt} - R_{ft} = a + b\,(R_{mt} - R_{ft}) + s\,(R_{SMBt}) + l\,(R_{LMHt})$

Excess returns on the sample portfolios are regressed on excess returns for the market factor as well as two mimicking portfolios for size and value factors. The regression alphas are again tested for significance by employing t-statistics at 5% level.

Panel A: Univariate Sorted Results

6-6									
	a	*b*	*s*	*l*	t(*a*)	t(*b*)	t(*s*)	t(*l*)	Adj. R^2
P1	0.0124	1.1070	0.5128	–0.6988	2.2292	18.6202	5.7141	–4.2587	0.8665
P5	–0.0021	1.2797	0.4471	0.3155	–0.2780	16.0422	3.7131	1.4330	0.8247
E1	0.0127	1.2068	0.1739	–0.3554	2.9528	26.4247	2.5227	–2.8192	0.9172
E5	–0.0094	1.1154	0.3042	0.2442	–1.8753	20.9632	3.7866	1.6624	0.8854
R1	0.0094	1.0897	0.1665	–0.1822	2.4119	26.2305	2.6554	–1.5890	0.9168
R5	–0.0067	1.2428	0.4242	0.1054	–1.0757	18.8043	4.2513	0.5776	0.8634
12-12									
P1	0.0080	1.3465	0.5850	–0.3610	1.4118	22.3625	6.2401	–2.2283	0.9032
P5	–0.0164	1.0612	1.4860	1.2122	–3.2670	19.8860	17.884	8.4416	0.9368
E1	0.0085	1.1448	0.1542	–0.2306	2.0936	26.4692	2.2897	–1.9817	0.9181
E5	–0.0059	1.0981	0.2993	0.1086	–1.1233	19.5781	3.4271	0.7194	0.8671
R1	0.0042	1.0773	–0.1736	0.1936	1.0731	25.6693	–1.5369	2.9623	0.9148
R5	–0.0044	1.2395	0.0723	0.3822	–0.7036	18.8030	0.4077	3.7236	0.8595

Double Sorted Results
Panel B: Independent Sorts

6-6									
	a	*b*	*s*	*l*	t(*a*)	t(*b*)	t(*s*)	t(*l*)	Adj. R^2
E1P1	0.0159	1.1013	0.3629	–0.4827	2.8997	18.3180	2.3791	–2.3815	0.8904
E3P3	–0.0152	1.1363	1.1744	1.0689	–3.0519	20.8556	8.4959	5.8192	0.9408
R1P1	0.0113	1.0616	0.2123	–0.5101	2.2214	19.0669	1.5027	–2.7179	0.8937
R3P3	–0.0082	1.1438	1.4223	1.0974	–1.4510	18.5510	9.0928	5.2796	0.9316
E1R1	0.0135	1.1333	0.3416	–0.3108	3.3889	26.0369	3.0929	–2.1181	0.9427
E3R3	–0.0068	1.1149	1.0208	0.6805	–1.7125	25.6799	9.2669	4.6494	0.9565
12-12									
E1P1	0.0123	1.3398	0.7702	0.0860	2.2620	23.0884	4.4238	0.3531	0.9303
E3P3	–0.0005	1.1596	0.8103	0.8898	–0.1176	24.9882	5.8198	4.5688	0.9481
R1P1	0.0110	1.3630	0.5910	–0.2658	2.3568	27.3899	3.9584	–1.2728	0.9468
R3P3	0.0027	1.1643	0.9955	1.0362	0.6023	24.4505	6.9683	5.1849	0.9483
E1R1	0.0153	1.1739	0.5420	–0.4500	3.5717	25.7180	3.9580	–2.3493	0.9386
E3R3	0.0026	1.2558	0.8563	0.7669	0.6568	29.5987	6.7272	4.3072	0.9611

Panel C: Dependent Sorts

6-6										
Price Momentum Vs. Earnings Momentum										
Price momentum in various SUE groups										
		a	*b*	*s*	*l*	t(*a*)	t(*b*)	t(*s*)	t(*l*)	Adj. R^2
E1	P1	0.0162	1.0928	0.3059	–0.5216	2.9062	17.8929	1.9745	–2.5333	0.8838
	P3	0.0070	1.1748	0.8492	0.2780	1.0625	16.2786	4.6381	1.1425	0.8865
E2	P1	–0.0016	1.1005	0.2669	–0.1815	–0.2629	16.6366	1.5903	–0.8140	0.8684
	P3	–0.0006	1.0999	1.0805	0.5003	–0.1112	18.4949	7.1614	2.4954	0.9196
E3	P1	–0.0024	0.9696	0.5465	0.2111	–0.6086	22.3519	4.9662	1.4439	0.9329
	P3	–0.0182	1.1773	1.2172	1.0715	–3.3291	19.7099	8.0321	5.3211	0.9339
Earnings momentum in various prior returns groups										
P1	E1	0.0162	1.1109	0.3527	–0.6029	2.7933	17.4945	2.1890	–2.8164	0.8802
	E3	–0.0040	0.9473	0.5576	0.0610	–0.8454	18.3251	4.2516	0.3499	0.9025
P2	E1	0.0033	1.1545	0.7502	0.0723	0.6813	21.4736	5.5000	0.3991	0.9287
	E3	0.0009	1.1269	0.7322	0.6888	0.2667	29.2319	7.4863	5.2999	0.9628
P3	E1	0.0047	1.1541	0.9277	0.2518	0.6582	14.6225	4.6328	0.9462	0.8662
	E3	–0.0167	1.0896	1.2924	1.0969	–2.9679	17.6907	8.2708	5.2830	0.9242

(*continued on next page*)

Table 3: (*continued*)

Revenue Momentum Vs. Earnings Momentum										
Revenue momentum in various SUE groups										
		a	*b*	*s*	*l*	t(*a*)	t(*b*)	t(*s*)	t(*l*)	Adj. R^2
E1	R1	0.0137	1.1332	0.4003	–0.3547	2.7019	20.4424	2.8462	–1.8983	0.9113
	R3	0.0085	1.1670	0.8764	–0.2141	1.6213	20.2151	5.9834	–1.1000	0.9217
E2	R1	–0.0021	1.0106	0.7055	0.0663	–0.4639	20.2118	5.5620	0.3934	0.9216
	R3	–0.0025	1.1800	0.9082	0.1776	–0.4835	21.2358	6.4419	0.9479	0.9308
E3	R1	–0.0103	1.0256	0.5905	0.5970	–2.7284	24.8486	5.6387	4.2907	0.9477
	R3	–0.0114	1.1771	1.1048	0.8113	–2.2106	20.8554	7.7149	4.2638	0.9366
Earnings momentum in various SUR groups										
R1	E1	0.0182	1.2258	0.2356	–0.3891	3.4571	21.3074	1.6143	–2.0060	0.9136
	E3	–0.0053	0.9640	0.6976	0.2667	–1.2741	21.3555	6.0910	1.7528	0.9312
R2	E1	0.0021	1.1227	1.0293	0.0517	0.4334	20.8341	7.5284	0.2847	0.9314
	E3	–0.0121	1.0856	0.7823	0.6433	–2.8821	23.7009	6.7312	4.1658	0.9456
R3	E1	0.0050	1.1573	0.7076	–0.1218	0.9764	20.6501	4.9763	–0.6445	0.9212
	E3	–0.0085	1.0339	1.0534	0.6443	–1.7133	19.0161	7.6364	3.5155	0.9261
Price Momentum Vs. Revenue Momentum										
Price momentum in various SUR groups										
R1	P1	0.0119	1.0525	0.1448	-0.5951	2.3320	18.8240	1.0205	–3.1569	0.8890
	P3	0.0038	1.0749	0.7069	0.5140	0.7085	18.5050	4.7965	2.6248	0.9105
R2	P1	0.0017	1.0524	0.4795	–0.0243	0.3225	17.7294	3.1838	–0.1216	0.8910
	P3	–0.0132	1.1275	1.2068	0.8999	–2.5761	20.0310	8.4502	4.7424	0.9356
R3	P1	–0.0002	1.0854	0.4915	–0.1032	–0.0343	18.0163	3.2153	–0.5080	0.8934
	P3	–0.0104	1.1842	1.3813	0.9478	–1.7888	18.6535	8.5759	4.4288	0.9289
Revenue momentum in various prior returns groups										
P1	R1	0.0115	1.0477	0.2437	–0.4655	2.2680	18.8297	1.7261	–2.4818	0.8925
	R3	–0.0019	1.0343	0.3893	–0.1704	–0.3418	16.8132	2.4946	–0.8215	0.8759
P2	R1	–0.0001	1.0761	0.5867	0.0662	–0.0120	21.3404	4.5861	0.3896	0.9252
	R3	–0.0034	1.1813	1.0195	0.7448	–0.8162	26.0301	8.8544	4.8682	0.9569
P3	R1	0.0035	1.0570	0.8678	0.7737	0.6272	17.4666	5.6521	3.7922	0.9088
	R3	–0.0098	1.1453	1.4381	1.2281	–1.7068	18.1606	8.9876	5.7762	0.9302

(*continued on next page*)

Table 3: (*continued*)

12-12										
Price Momentum Vs. Earnings Momentum										
Price momentum in various SUE groups										
		a	*b*	*s*	*l*	t(*a*)	t(*b*)	t(*s*)	t(*l*)	Adj. R^2
E1	P1	0.0140	1.3528	0.7391	0.0579	2.4540	22.1250	4.0288	0.2257	0.9241
	P3	0.0133	1.0261	0.7587	0.0001	2.7059	19.4933	4.8039	0.0006	0.9056
E2	P1	0.0037	1.3340	0.5449	0.4955	0.8993	30.7134	4.1818	2.7185	0.9610
	P3	0.0103	1.1843	0.7578	0.2647	2.4987	26.8334	5.7225	1.4292	0.9493
E3	P1	0.0075	1.3167	0.6505	0.5233	1.3212	21.7031	3.5739	2.0554	0.9256
	P3	0.0002	1.2177	0.8363	0.8229	0.0380	23.4792	5.3744	3.7806	0.9404
Earnings momentum in various prior returns groups										
P1	E1	0.0143	1.3677	0.8034	–0.0076	2.4919	22.3126	4.3685	–0.0295	0.9250
	E3	0.0078	1.4241	0.7448	0.3899	1.4041	23.9932	4.1827	1.5655	0.9371
P2	E1	0.0129	1.1336	0.5727	–0.2989	3.2488	26.7657	4.5069	–1.6818	0.9442
	E3	0.0022	1.0597	0.5427	0.4950	0.5731	25.9136	4.4232	2.8845	0.9475
P3	E1	0.0156	1.0969	0.7049	–0.1046	3.7123	24.4209	5.2310	–0.5547	0.9362
	E3	–0.0002	1.1007	0.9456	0.9716	–0.0385	19.7861	5.6654	4.1616	0.9229
Revenue Momentum Vs. Earnings Momentum										
Revenue momentum in various SUE groups										
E1	R1	0.0144	1.1699	0.5967	–0.3931	2.8090	21.3948	3.6369	–1.7128	0.9144
	R3	0.0168	1.1916	1.0170	0.2776	4.8855	32.3954	9.2155	1.7984	0.9657
E2	R1	0.0047	1.1427	0.7002	0.1388	1.2151	27.3789	5.5919	0.7927	0.9502
	R3	0.0084	1.3207	0.8592	0.3320	1.7061	25.2141	5.4675	1.5102	0.9433
E3	R1	0.0017	1.0738	0.5123	0.5287	0.3512	21.1223	3.3587	2.4778	0.9230
	R3	0.0008	1.3638	1.0064	0.9081	0.1394	22.8390	5.6174	3.6237	0.9374
Earnings momentum in various SUR groups										
R1	E1	0.0156	1.2479	0.4938	–0.4669	2.6349	19.7486	2.6044	–1.7606	0.8996
	E3	0.0027	1.1112	0.6790	0.2299	0.6321	24.0518	4.8983	1.1855	0.9372
R2	E1	0.0118	1.1784	0.9439	0.1155	2.6816	25.1099	6.7042	0.5865	0.9424
	E3	0.0034	1.1073	0.6198	0.5384	0.6403	19.6085	3.6579	2.2718	0.9122
R3	E1	0.0108	1.2808	0.6766	0.2760	2.4050	26.6717	4.6961	1.3696	0.9480
	E3	0.0004	1.1881	0.8723	0.8419	0.0950	24.2049	5.9234	4.0872	0.9444

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Table 3: (*continued*)

Price Momentum Vs. Revenue Momentum										
Price momentum in various SUR groups										
		a	*b*	*s*	*l*	t(*a*)	t(*b*)	t(*s*)	t(*l*)	Adj. R^2
R1	P1	0.0119	1.4089	0.6716	–0.2350	2.5576	28.2916	4.4949	–1.1244	0.9503
	P3	0.0065	1.0910	0.6813	0.1601	1.2515	19.5027	4.0589	0.6817	0.9066
R2	P1	0.0020	1.2193	0.9095	0.6552	0.3925	22.7984	5.6685	2.9191	0.9357
	P3	0.0079	1.0722	0.9884	0.5575	1.6781	21.3352	6.5554	2.6434	0.9287
R3	P1	0.0042	1.4382	0.6722	0.6550	0.6681	21.1579	3.2960	2.2960	0.9226
	P3	0.0024	1.2418	0.9816	0.6747	0.4957	24.3856	6.4247	3.1572	0.9438
Revenue momentum in various prior returns groups										
P1	R1	0.0083	1.3738	0.6136	–0.2236	1.8398	28.4124	4.2297	–1.1018	0.9506
	R3	0.0052	1.4020	0.6505	0.5748	0.8567	21.7665	3.3663	2.1264	0.9260
P2	R1	0.0075	0.9956	0.6448	–0.0205	2.0603	25.4693	5.4980	–0.1249	0.9417
	R3	0.0055	1.1843	0.8004	0.4592	1.2301	24.9136	5.6117	2.3020	0.9436
P3	R1	0.0043	1.1055	0.7674	0.2491	0.8475	20.2090	4.6756	1.0852	0.9143
	R3	0.0032	1.1605	0.9578	1.2433	0.6215	21.3112	5.8626	5.4404	0.9352

Panel D: Triple Sorts

6-6									
	a	*b*	*s*	*l*	t(*a*)	t(*b*)	t(*s*)	t(*l*)	Adj. R^2
E1R1P1	0.0204	1.1421	0.0087	–0.6052	3.4793	17.8228	0.0538	–2.8016	0.8735
E3R3P3	–0.0192	1.1736	1.3887	1.2293	–2.7906	15.6052	7.2783	4.8488	0.9050
12-12									
E1R1P1	0.0148	1.3811	0.5112	–0.5309	2.3323	20.4186	2.5192	–1.8704	0.9052
E3R3P3	–0.0043	1.2245	1.0037	0.9962	–0.8357	22.1669	6.0559	4.2970	0.9364

We also examine whether the three-factor FF model can explain the momentum returns, which are missed by CAPM. One can see from Table 3 that momentum profits persist in the FF framework, as shown by the statistical significance of winner portfolio alphas. With the exception of univariate price momentum, where the winner portfolio loads on the size factor, all winner portfolios exhibit lower loadings on size and value factors compared than do loser portfolios. In short, our winner portfolios are composed of low-beta, relatively large-sized and high price-to-book value firms. These findings provide evidence against the capability of risk models in explaining momentum profits. In other words, prior return-, earnings surprise- and revenue surprise-based patterns in stock returns warrant behavioural explanations, which we attempt to investigate in the next section.

POST-HOLDING RETURNS PATTERN

We observe the return behaviour of our 6-6 winner, loser and momentum portfolios for 6-month holding periods and 24 months after the holding period. We specifically find the average return for each month from $t + 1$ until $t + 30$ based on portfolio rebalancing after every six months. Then, these returns are cumulated over the 30-month period, and the average of the cumulative returns for each month is estimated, as shown in Table 4 and Figure 1. Due to lack of space, we show results only for the univariate sorted portfolios[11]. It can be clearly observed that all winners exhibit a negative slope in returns, whereas the losers exhibit a positive slope in returns on a post-holding period basis. These slopes depict a strong overreaction for both winners and losers. The investors likely believe winners to be much better than expected, whereas the losers turn out to be not as bad as per their expectations. The post-holding period behavioural correction leads to the weakening of momentum profits, which actually become significantly small (and sometimes become slightly negative) between the third and ninth months of the post-holding period ($t + 9$ to $t + 15$).

In sum, the overreaction hypothesis seems to explain momentum profits in the Indian context. The failure of risk models in capturing momentum and the post-holding return behaviour of momentum portfolios thus lends support to the behaviour explanation for the observed phenomenon, which is pervasive for all types of ranking variables, i.e., prior returns, earnings and revenue surprises. The following conclusions can be drawn regarding the post-holding return behaviour of univariate sorted portfolios:

1. Earnings momentum provides higher profits than both price and revenue momentum for the post-holding window, as shown by cumulative returns. This finding is in contrast with Chen et.al (2014), who find that the price momentum strategy works best on a post-holding basis for the US market.
2. Momentum profits are also more persistent in the case of earnings momentum because they remain positive over the entire post-holding period.
3. Revenue momentum profits are short-lived and almost disappear in approximately four months on a post-holding basis.

Table 4
Post-holding period analysis of 6-6 univariate momentum winner and loser portfolios

Cumulative returns and average cumulative returns are shown for 6-6 univariate sorted winners and losers on post-holding basis, i.e. for 24 months beyond portfolio holding period.

Price momentum	Cumulative returns			Average cumulative returns		
Months	P1	P5	P1–P5	P1	P5	P1–P5
$t+1$	0.0314	0.0161	0.0153	0.0314	0.0161	0.0153
$t+2$	0.0819	0.0408	0.0411	0.0409	0.0204	0.0206
$t+3$	0.1251	0.0605	0.0646	0.0417	0.0202	0.0215
$t+4$	0.1666	0.0684	0.0982	0.0417	0.0171	0.0246
$t+5$	0.2385	0.1494	0.0892	0.0477	0.0299	0.0178
$t+6$	0.2750	0.1941	0.0809	0.0458	0.0324	0.0135
$t+7$	0.3004	0.1879	0.1126	0.0429	0.0268	0.0161
$t+8$	0.3098	0.2052	0.1046	0.0387	0.0256	0.0131
$t+9$	0.3449	0.2289	0.1160	0.0383	0.0254	0.0129
$t+10$	0.3942	0.2874	0.1068	0.0394	0.0287	0.0107
$t+11$	0.4284	0.3671	0.0612	0.0389	0.0334	0.0056
$t+12$	0.4345	0.3805	0.0540	0.0362	0.0317	0.0045
$t+13$	0.4624	0.3965	0.0659	0.0356	0.0305	0.0051
$t+14$	0.4942	0.5059	–0.0117	0.0353	0.0361	–0.0008
$t+15$	0.5159	0.5224	–0.0065	0.0344	0.0348	–0.0004
$t+16$	0.5560	0.5286	0.0273	0.0347	0.0330	0.0017
$t+17$	0.6543	0.5764	0.0779	0.0385	0.0339	0.0046
$t+18$	0.7107	0.6241	0.0866	0.0395	0.0347	0.0048
$t+19$	0.7025	0.6170	0.0855	0.0370	0.0325	0.0045
$t+20$	0.6687	0.6015	0.0673	0.0334	0.0301	0.0034
$t+21$	0.6747	0.6178	0.0569	0.0321	0.0294	0.0027
$t+22$	0.7165	0.6744	0.0421	0.0326	0.0307	0.0019
$t+23$	0.7811	0.7269	0.0542	0.0340	0.0316	0.0024
$t+24$	0.8139	0.7556	0.0583	0.0339	0.0315	0.0024
$t+25$	0.8054	0.7473	0.0581	0.0322	0.0299	0.0023
$t+26$	0.8217	0.7750	0.0466	0.0316	0.0298	0.0018
$t+27$	0.8471	0.7983	0.0488	0.0314	0.0296	0.0018
$t+28$	0.8601	0.8053	0.0548	0.0307	0.0288	0.0020
$t+29$	0.9113	0.8692	0.0421	0.0314	0.0300	0.0015
$t+30$	0.9605	0.9247	0.0358	0.0320	0.0308	0.0012

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Table 4: (*continued*)

Earnings momentum	Cumulative returns			Average cumulative returns		
Months	E1	E5	E1–E5	E1	E5	E1–E5
$t+1$	0.0392	–0.0178	0.0570	0.0392	–0.0178	0.0570
$t+2$	0.0626	0.0060	0.0566	0.0313	0.0030	0.0283
$t+3$	0.0944	0.0185	0.0759	0.0315	0.0062	0.0253
$t+4$	0.1382	0.0192	0.1190	0.0345	0.0048	0.0297
$t+5$	0.1892	0.0766	0.1125	0.0378	0.0153	0.0225
$t+6$	0.2282	0.1092	0.1190	0.0380	0.0182	0.0198
$t+7$	0.2383	0.1043	0.1340	0.0340	0.0149	0.0191
$t+8$	0.2443	0.1117	0.1326	0.0305	0.0140	0.0166
$t+9$	0.2727	0.1268	0.1459	0.0303	0.0141	0.0162
$t+10$	0.3042	0.1650	0.1392	0.0304	0.0165	0.0139
$t+11$	0.3510	0.2113	0.1398	0.0319	0.0192	0.0127
$t+12$	0.3626	0.2156	0.1470	0.0302	0.0180	0.0123
$t+13$	0.3742	0.2240	0.1502	0.0288	0.0172	0.0116
$t+14$	0.3873	0.2349	0.1524	0.0277	0.0168	0.0109
$t+15$	0.4020	0.2535	0.1485	0.0268	0.0169	0.0099
$t+16$	0.4073	0.2700	0.1373	0.0255	0.0169	0.0086
$t+17$	0.4848	0.3342	0.1506	0.0285	0.0197	0.0089
$t+18$	0.5203	0.3731	0.1472	0.0289	0.0207	0.0082
$t+19$	0.4924	0.3656	0.1267	0.0259	0.0192	0.0067
$t+20$	0.4829	0.3445	0.1384	0.0241	0.0172	0.0069
$t+21$	0.4912	0.3573	0.1339	0.0234	0.0170	0.0064
$t+22$	0.5147	0.3960	0.1187	0.0234	0.0180	0.0054
$t+23$	0.5483	0.4372	0.1111	0.0238	0.0190	0.0048
$t+24$	0.5684	0.4566	0.1118	0.0237	0.0190	0.0047
$t+25$	0.5572	0.4410	0.1162	0.0223	0.0176	0.0046
$t+26$	0.5652	0.4504	0.1149	0.0217	0.0173	0.0044
$t+27$	0.5938	0.4703	0.1235	0.0220	0.0174	0.0046
$t+28$	0.6037	0.4582	0.1456	0.0216	0.0164	0.0052
$t+29$	0.6420	0.5156	0.1264	0.0221	0.0178	0.0044
$t+30$	0.6751	0.5473	0.1278	0.0225	0.0182	0.0043

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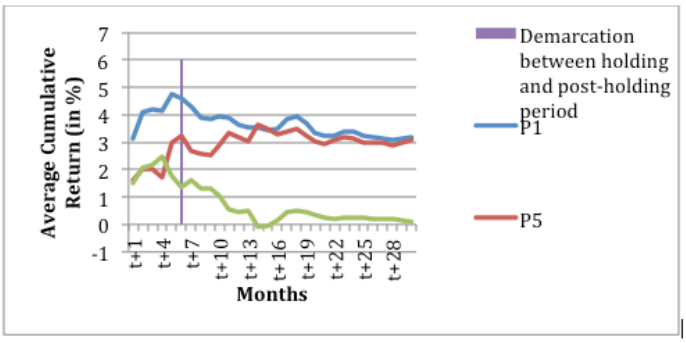
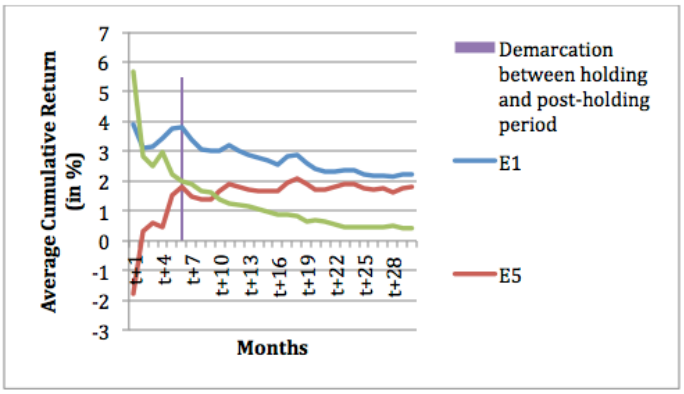
Table 4: (*continued*)

Revenue momentum	Cumulative returns			Average cumulative returns		
Months	R1	R5	R1–R5	R1	R5	R1–R5
$t+1$	0.0314	–0.0038	0.0352	0.0314	–0.0038	0.0352
$t+2$	0.0503	0.0309	0.0194	0.0251	0.0154	0.0097
$t+3$	0.0790	0.0541	0.0249	0.0263	0.0180	0.0083
$t+4$	0.1113	0.0606	0.0507	0.0278	0.0152	0.0127
$t+5$	0.1534	0.1320	0.0214	0.0307	0.0264	0.0043
$t+6$	0.1955	0.1589	0.0366	0.0326	0.0265	0.0061
$t+7$	0.1951	0.1587	0.0364	0.0279	0.0227	0.0052
$t+8$	0.2058	0.1733	0.0326	0.0257	0.0217	0.0041
$t+9$	0.2249	0.1859	0.0389	0.0250	0.0207	0.0043
$t+10$	0.2493	0.2305	0.0188	0.0249	0.0230	0.0019
$t+11$	0.2798	0.2843	–0.0045	0.0254	0.0258	–0.0004
$t+12$	0.2901	0.2962	–0.0060	0.0242	0.0247	–0.0005
$t+13$	0.2921	0.3142	–0.0222	0.0225	0.0242	–0.0017
$t+14$	0.3111	0.3287	–0.0176	0.0222	0.0235	–0.0013
$t+15$	0.3293	0.3527	–0.0234	0.0220	0.0235	–0.0016
$t+17$	0.4108	0.4362	–0.0254	0.0242	0.0257	–0.0015
$t+18$	0.4360	0.4773	–0.0413	0.0242	0.0265	–0.0023
$t+19$	0.4120	0.4568	–0.0448	0.0217	0.0240	–0.0024
$t+20$	0.3987	0.4357	–0.0370	0.0199	0.0218	–0.0018
$t+21$	0.4061	0.4524	–0.0463	0.0193	0.0215	–0.0022
$t+22$	0.4328	0.5011	–0.0683	0.0197	0.0228	–0.0031
$t+23$	0.4745	0.5444	–0.0699	0.0206	0.0237	–0.0030
$t+24$	0.4947	0.5607	–0.0660	0.0206	0.0234	–0.0028
$t+25$	0.4829	0.5339	–0.0510	0.0193	0.0214	–0.0020
$t+26$	0.5016	0.5538	–0.0522	0.0193	0.0213	–0.0020
$t+27$	0.5263	0.5609	–0.0347	0.0195	0.0208	–0.0013
$t+28$	0.5343	0.5533	–0.0190	0.0191	0.0198	–0.0007
$t+29$	0.5816	0.6048	–0.0232	0.0201	0.0209	–0.0008
$t+30$	0.6266	0.6447	–0.0181	0.0209	0.0215	–0.0006

Price Momentum



Earnings Momentum



Revenue Momentum

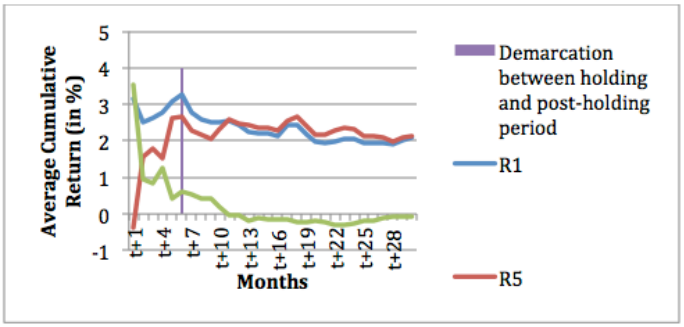


Figure 1. Post-holding period analysis of 6-6 univariate momentum of winner and loser portfolios.
Average cumulative returns are shown for 6-6 univariate sorted winners, losers and momentum portfolios on post-holding basis, i.e. for 24 months beyond portfolio holding period. The *y*-axis shows the return (in %) and the *x*-axis shows the time period (in months).

RELATIONSHIP BETWEEN MARKET STATES AND MOMENTUM PROFITS

Another important research issue in the momentum literature that has evoked an academic response relates to the state-dependent nature of momentum profits. In other words, are momentum profits stronger during market upturns or downturns? We next focus our attention on this issue. Various studies (see, e.g., Cooper, Gutierrez, & Hameed, 2004; Griffin, Ji, & Martin, 2005; Hou, Peng, & Xiong, 2009) have studied the relationship between market states and momentum profits, particularly price or earnings momentum. The ostrich effect, as documented by Karlson, Loewenstein and Seppi (2009), states that in a rising market, investors pay more attention to stocks, but they withdraw from the market as the market starts to fall. In other words, price momentum should be greater in UP markets than in DOWN markets because irrational exuberance leads to more overreaction during rising markets, but earnings and revenue momentum should be greater in DOWN markets because investors tend to pay less attention to stocks and hence to fundamental information, resulting in under-reaction.

The dependence of the profitability of these momentum strategies on the state of the market, i.e., upturn and downturn, is checked for 6-6 portfolios following Cooper et al. (2004). Each month, the state of the market is identified using the excess market return, i.e., deducting the risk-free return from the return on the market index for that month. If the excess market return of a particular month is positive (negative), the state of the market is considered to be UP (DOWN). We regress the returns of winner, loser and zero-investment momentum sample portfolios on the market state dummy variable as follows:

$$R_{pt} - R_{ft} = \alpha + \Delta * D_t + e_t \quad (5)$$

where D_t = dummy variable that takes the value of '1' if the market state is 'UP' and '0' otherwise; α = average return in the downturn period; and Δ = the difference between the average return in upturn and downturn period.

The results of the dummy variable regressions are shown in Table 5. In cases of univariate sorted portfolios, both winners and losers provide statistically significant higher returns during market upturns. These return patterns are, however, self-cancelling for price and earnings momentum, resulting in momentum profits that are state independent. The results for bivariate and multivariate sorted portfolios are similar to those for univariate sorted portfolios[12]. Notably, in cases of revenue momentum, momentum profits seem to be significantly higher in the downturn.

Thus, momentum patterns appear to be stronger during market upturns which supports the overreaction hypothesis. Zero-investment momentum profits, however, seem to be state-independent, owing to the self-cancelling patterns of winners and losers with the exception of revenue momentum sorted portfolios.

Table 5
The conditionality of momentum returns on market states: $R_{pt} - R_{ft} = \alpha + \Delta * D_t$

Excess returns on sample portfolios are regressed on a dummy variable for economic state which takes the value 1 and 0 otherwise. The slope of dummy variable shows the sensitivity of momentum profits to market condition and it is tested for statistical significance using *t*-value at 5% level. A statistically significantly positive slope shall imply that sample portfolios perform better during market upturn.

Panel A: Univariate sorted results

	α	Δ	t(α)	t(Δ)	Adjusted R^2
P1	–0.0685	0.1751	–4.2793	8.8397	0.5207
P5	–0.0841	0.1784	–3.9809	6.8221	0.3908
E1	–0.0697	0.1650	–4.3025	8.2322	0.4846
E5	–0.0866	0.1606	–5.3180	7.9649	0.4679
R1	–0.0650	0.1495	–4.4210	8.2137	0.4835
R5	–0.0894	0.1775	–4.7037	7.5462	0.4407

Double sorted results
Panel B: Independent sorts

	α	Δ	t(α)	t(Δ)	Adjusted R^2
E1P1	–0.0766	0.1790	–4.6036	8.4102	0.5682
E3P3	–0.1003	0.1832	–4.0949	5.8489	0.3852
R1P1	–0.0772	0.1688	–4.9448	8.4512	0.5706
R3P3	–0.0929	0.1876	–3.5445	5.5941	0.3637
E1R1	–0.0726	0.1687	–4.0535	7.3609	0.5009
E3R3	–0.0955	0.1857	–4.4805	6.8137	0.4615

Panel C: Dependent sorts

Price Momentum Vs. Earnings Momentum						
Price momentum in various SUE groups						
		α	Δ	t(α)	t(Δ)	Adjusted R^2
E1	P1	–0.0756	0.1766	–4.6030	8.4056	0.5679
E3	P3	–0.1071	0.1912	–4.2352	5.9076	0.3901

(*continued on next page*)

Table 5: Panel C (*continued*)

Earnings momentum in various prior returns groups						
		α	Δ	t(α)	t(Δ)	Adjusted R^2
P1	E1	–0.0759	0.1784	–4.4314	8.1378	0.5517
P3	E3	–0.0977	0.1779	–3.9222	5.5845	0.3629
Revenue Momentum Vs. Earnings Momentum						
Revenue momentum in various SUE groups						
E1	R1	–0.0733	0.1712	–3.9579	7.2311	0.4918
E3	R3	–0.1017	0.1912	–4.2719	6.2772	0.4202
Earnings Momentum in various SUR groups						
R1	E1	–0.0731	0.1769	–3.6944	6.9859	0.4742
R3	E3	–0.0906	0.1740	–4.3325	6.5067	0.4382
Price Momentum Vs. Revenue Momentum						
Price momentum in various SUR groups						
R1	P1	–0.0752	0.1650	–4.8642	8.3460	0.5643
R3	P3	–0.1006	0.1966	–3.8884	5.9379	0.3926
Revenue momentum in various prior returns groups						
P1	R1	–0.0753	0.1664	–4.8027	8.2968	0.5614
P3	R3	–0.0932	0.1857	–3.4653	5.3964	0.3467

Panel D: Triple sorts

	α	Δ	t(α)	t(Δ)	Adjusted R^2
E1R1P1	–0.0741	0.1761	–4.4346	8.2399	0.5579
E3R3P3	–0.1063	0.1913	–3.8794	5.4608	0.3522

SUMMARY AND CONCLUSIONS

Momentum has remained an unsettled anomaly in finance, and the sources of momentum profits are all the more intriguing. Researchers have split views, and there is a debate over whether the sources are rational or behavioural. Although price momentum has gained considerable attention in the financial literature for the Indian market, work on earnings and revenue momentum strategies is virtually absent.

In this paper, we are motivated to investigate the profitability of univariate and multivariate sorted momentum strategies based on prior returns, earnings surprises and revenue surprises using data for 493 companies that formed part of the BSE 500 index in India from January 2002 to June 2010. We employ both 6-6 and 12-12 strategies. We use standardised unexpected earnings

(SUE) and standardised unexpected revenue (SUR) as measures of earnings and revenue surprises, respectively.

The empirical results show that momentum profits are persistent on the intermediate horizon for the Indian market, but they become weaker as one elongates the portfolio formation and the holding windows, i.e., from 6-6 to 12-12. Price momentum winners provide higher returns vis-à-vis earnings and revenue momentum winners, and this finding is consistent with the findings of Chen et al. (2014) for the US market. On a long-short basis, earnings momentum provides the most profitable trading strategy.

These momentum profits are not explained by CAPM or the FF model, as shown by the statistically significant winner portfolio alphas. Our winner portfolios are composed of low-beta, relatively large-sized and high price-to-book value firms, which defy risk-story.

Next, we try to observe the post-holding patterns of the average of cumulative returns of our 6-6 winners, losers and momentum portfolios to see whether a behavioural explanation is at work. We observe that all winners exhibit a negative slope, whereas the losers exhibit a positive slope in returns on a post-holding period basis for 24 months after the holding period. These slopes depict a strong overreaction for both winners and losers. The investors likely believe winners to be much better than expected, whereas the losers turn out to be not as bad as per their expectations. Momentum profits are persistent in cases of earnings momentum; these profits remain positive over the entire post-holding period, but revenue momentum profits are short-lived and almost disappear in approximately four months on a post-holding basis.

We also check the dependence of the profitability of these 6-6 momentum strategies on the state of market, i.e., upturn and downturn, following Cooper et al. (2004). The results again reconfirm the overreaction phenomenon for the Indian market. Both winners and losers provide statistically significant higher returns during market upturns for all our sample portfolios. Prior research indicates that overreaction is higher in UP markets than in DOWN markets (see Hou et al., 2009). Zero-investment momentum profits, however, seem to be state-independent due to the self-cancelling patterns of winners and losers with the exception of revenue momentum sorted portfolios.

The study concludes that momentum profits are persistent for the Indian market, and its sources are behavioural, not rational. These results are important for portfolio managers and investment analysts who are continuously searching for trading strategies that can provide them abnormal returns. From their perspective, a triple-sorted long-short trading strategy would be best on a risk-

adjusted basis because both winners and losers contribute to profitability (winners with positive alphas and losers with negative alphas). Furthermore, information contained in short-term prior returns and earnings surprises is fairly important for strategy formation, whereas the information in revenue surprises is small. From policymakers' perspective, the Indian equity market seems to be inefficient in terms of the information contained in past prices and fundamentals. Appropriate measures such as better corporate disclosures, lower trading costs and a widening investor base through financial literacy need to be undertaken to make the markets structurally efficient. From an academic point of view, the study provides an examination of specific trading strategies for India, which is an emerging market. The study also explores the risk dimension and the behavioural dimension of profitability for such strategies.

Given the limited timeframe and data, we could not employ strategies that required a period of less than 6 months, which is the limitation of the study. Hence, the results should be interpreted in that light. The present study also provides directions for further research. The momentum-based trading strategies can be examined for several emerging markets using longer time periods. The profitability of such strategies needs to be examined vis-à-vis other multi-factor benchmarks that involve additional risk-factors, such as price momentum (see Carhart, 1997) and sector momentum (Liu & Zhang, 2008). The profitability of trading strategies can also be evaluated using a shorter portfolio formation and holding windows up to three months by employing high-frequency data. The economic feasibility of these trading strategies may be explicitly tested by incorporating transaction costs and tax effects. The study contributes to the equity market anomaly and asset pricing literature for India.

NOTES

1. In this study, Chui, Titman and Wei (2010) document profits from price momentum profits for 37 countries except for Japan, Korea, Turkey and Taiwan.
2. See Avramov and Chordia (2006), Chou, Ho and Ko (2012), Ammann, Odoni and Oesch (2012).
3. According to "disposition effect", investors tend to sell stocks quickly which experience price appreciation but they cling to stocks which are declining (Shefrin & Statman, 1985).
4. The BSE 500 index list was taken as on June-end 2010. Thomson-Reuters '*Datastream*' compiles data for only 493 out of 500 companies for the study period.
5. Ince and Porter (2006) show that Thomson-Reuter '*Datastream*' software may not be suitable for study markets outside US, owing to data-biases,

especially for small size firms and during their early coverage period, i.e. 1975–2002. We use this software as it is employed in most of the comparative international studies. However, the impact of data-biases is expected to be limited in our case as our sample comprises of BSE 500 index firms which are large size and actively traded. Further, we focus on a more recent study period, that is, starting from 2002.

6. Excess returns are being calculated as the difference between the stock return and 91-days *t*-bill yield on period to period basis.
7. Here, the holding period is observed immediately after the formation period. Several comparative studies have not skipped any time period between the formation and the holding period (see Moskowitz & Grinblatt, 1999; Chen, Chen, Hsin, & Lee, 2014). Also, studies show that if the micro-structure issues are mitigated, then results become stronger and profitability increases (see Chordia & Shivakumar, 2002). Hence, even if we skip a month or some weeks before holding these portfolios, it will further strengthen our results.
8. Jegadeesh and Titman (1993) report that results for their non-overlapping portfolios are similar to that of over-lapping portfolios. Hence, the portfolio formation procedure is not expected to significantly alter our further analysis.
9. Here, Earning surprises could have been calculated using Forward earnings or analysts' forecast of earnings also but because of unavailability of data for Indian firms, only actual quarterly earnings are used.
10. 2*2 sorting is used as SMB and LMH factor exhibit more moderate correlation than in case of 2*3 sorts used by Fama and French (1996). To avoid multi-collinearity, we used transformed variables to proxy for our risk factors.
11. The post-holding return patterns for other sample portfolios were similar and can be obtained on request.
12. Results of momentum portfolios are not shown in the tables. Given that momentum portfolio is the difference between winners and losers, lower values of corrected R^2 for regression involving them are not surprising.

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