Macrothink Institute™

**Asian Journal of Finance & Accounting**
ISSN 1946-052X
2017, Vol. 9, No. 2

# Profitability of Style based Investment Strategies: Evidence from India

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Received: June 2, 2017 Accepted: July 15, 2017 Published: December 1, 2017

doi:10.5296/ajfa.v9i2.11456 URL: https://doi.org/10.5296/ajfa.v9i2.11456

**Abstract**

In this paper, we aim to identify profitable investment styles on the Indian stock market by using various combinations of important stock pricing anomalies consisting of. size, value, volume, profitability, earnings surprises, short term and long term prior returns. Using NSE200 stocks, three different investment styles viz. univariate, independent bivariate and conditional bivariate are constructed for the period July 2005-June 2016.Results show that on an absolute return basis, bivariate strategies do not seem to outperform univariate strategies. The unifactor CAPM is able to absorb 42% of the returns owing to the explanatory power of beta. After adjusting for risk using the three factor Fama and French (1993) model, 42% of the alphas are explained. However, additional risk factors from the Carhart (1997) model and Fama and French (2015) model do not provide any incremental explanatory power over the three factor model, recommending the use of the latter as a baseline to evaluate investment strategies in India. The highest supernormal returns of 1.1% per month are obtained from combining attributes and employing the conditional bivariate investment strategy viz.E2L1 (earnings momentum-Liquidity), M2S1 (price momentum-size), E2M3 (earnings momentum-price momentum). The findings are pertinent to portfolio managers, financial regulators and other stakeholders.

**Keywords:** CAPM, Fama French model, stock pricing anomalies, investment strategies, NSE200

## 1. Introduction

The relationship between risk and return of a security which was first quantified by the single factor CAPM of Sharpe (1964) and Lintner (1965) proposes that the risk, return relation is linear, only a fraction of total risk is systematic and measured by beta. However, the inadequacy of beta in explaining stock returns paved the way for the development of multifactor asset pricing models most popular of which are Fama and French (1993), Carhart (1997), Fama and French (2015).

Empirical results which are not consistent with asset pricing models are called anomalies and they indicate that the market is inefficient (Schwert, 2003). Hence portfolio managersand market analysts are always hunting for such anomalies which can be used to design investment strategies to earn consistent and superior risk adjusted returns.

Prior empirical research shows that stock return anomalies exist on the following dimensions/firm characteristics, i.e.size (Banz, 1981), value (book to market-Stattman, 1980), volume/liquidity(Amihud & Mendelson, 1986), profitability (Haugen & Baker, 1996); Fama & French, 2008), earnings surprises(Ball & Brown, 1968), net stock issues(Fama & French, 2008) and prior returns-momentum (Jegadeesh & Titman, 1993), reversal (De Bondt &Thaler, 1985, 1987)

The broad categories like size, value, etc. into which investors group assets in the process of portfolio allocation decision are called styles and the process of investing between styles is called style investing (see Barberis & Shleifer, 2003).

Abundant literature confirms that stock return anomalies exist and thus it is feasible to exploit them to construct profitable trading strategies/styles. However, the ability of the above company characteristics in providing anomalous returns should be verified both independently and in combinations. Several refinements to a single style can earn higher returns than that obtained from the univariate style itself. Chen, Chen, Hsin and Lee (2010) in their study of price, revenue and earnings momentum strategies point out that strategies based on multiple styles will give higher profits than from a single style provided each style has additional information content different from information content provided by other styles and that stock prices have not included this information i.e each measure provides anomalous returns. Taylor (2011) points out the possibility of enhancing the returns and reducing the risks from holding an underdiversified portfolio by combining the information on a single style with additional public information (attributes) associated with it in the context of size and earnings momentum. It is also likely that investors react differently to joint information on various company attributes. Hence, combining information on two/more different attributes to construct an investment style, could possibly generate higher risk adjusted returns. Existing research shows that bivariate/trivariate investment styles using some of the above-mentioned attributes generate superior returns than univariate investment stylefor some markets (Chen, Chen, Hsin& Lee,2010;Lee& Swaminathan, 2000, Asness, Moskowitz &Pederson, 2013; Sagi & Seasholes, 2007; Teixeira, 2011).

Analogous research of the Indian stock market is thin, since it has focused for the most part on prior return patterns, i.e. momentum and contrarian (Sehgal & Balakrishnan, 2008; Sehgal & Jain 2011; Polak &Ejaz, 2012; Rastogi, Chaturvedula & Bang,2009 and on earnings momentum, revenue momentum, volume momentum (Sehgal & Jain,2015: Sehgal &Vasishth,2015).

Literature on the trading strategies constructed from combinations of company attributes/styles like size, value, liquidity, profitability, earnings surprises and prior returns for India is limited. The present research adds to the existing literature on investment strategies in the Indian context in the following ways. Firstly, the most recent sample period from July 2005-June 2016 is studied. The sample period was chosen to avoid thinness of data. Since this period encompasses the global financial crisis of 2008-2009, it was decided to take few data points prior to the crisis to cover market upturns and downturns. Secondly, the data set comprises of NSE200 stocks, a narrow basket (Note 1) which is chosen to remove problems arising out of illiquidity whereas existing papers have always studied a larger basket of 500 stocks. Thus, by including the size, value and volume parameter we are in effect studying relative size, relative value and the relative liquidity (small among large, low PB among high PB, low volume among high volume). Next profitability from constructing investment styles by using univariate and two types of bivariate combinations on all prominent stock return anomalies viz. size, value, liquidity, profitability, earnings surprises and prior returns (Note 2) is investigated in this paper which till now had been unexplored. This is done by first building a univariate investment style, followed by bivariate independent and bivariate conditional investment styles to explore the joint information content of attributes. Since data set consists of 200 stocks, constructing trivariate strategy would reduce the number of stocks in each portfolio drastically. As a diversified portfolio, should contain between 8-10 stocks (see Evans &Archer,1968), a trivariate strategy was not constructed. Lastly, we verify if standard risk models can explain the abnormal returns generated by these investment strategies.

This paper attempts to answer the following closely related questions:

1. Is it possible to construct profitable investment strategies/styles based on the following company characteristics/investment styles viz. size, value, volume, prior returns patterns, earnings surprises and profitability on a univariate basis (single sorted)? Do some of these anomalies which have been earlier documented persist or have they disappeared?

2. Do bivariate investment strategies outperform univariate investment style (single sorted)? Does constructing a conditional bivariate investment strategy give higher returns than that obtained from independent bivariate strategy?

3. Can the returns on the sample strategies so designed be absorbed by risk models vizuni-factor CAPM or multifactor models like Fama and French (1993), Carhart (1997), Fama and French (2015)?

This paper is structured as follows. The following section discusses the rationale for using various anomalies to construct investment styles. Section 3 gives details on the data and methodology is explained in the fourth section. The empirical results are discussed in Section

5. The final section contains conclusions and policy implications.

## 2. The rationale of various investment styles

If return on a security cannot be explained by the amount of risk as defined by the selected asset pricing model, then the stock market is said to be informationally inefficient and investment strategies can be constructed to consistently outperform the market.

Literature on both mature and emerging markets, including India shows that profitable investment styles can be formed if the market is inefficient with respect to the following attributes - size, value, liquidity, profitability, earnings surprises and prior returns which are discussed below.

***2.1.*** *Size* - Banz (1981) documented that firms which are small in size provide superior risk adjusted returns as compared to their larger counterparts. Several causes of this size anomaly identified in the literature are infrequent trading (Roll, 1981)), transaction costs (Stoll &Whaley, 1983), January effect (Keim, 1983), different risk and return characteristics (Chan &Chen, 1991), illiquidity (Amihud & Mendelson, 1986), business cycles (Chan. Chen & Hseih, 1985)), Perez-Quiros & Timmermann, 2000)), presence of micro stocks (Fama & French, 2008). Over the past few years size anomaly seems to have weakened for a few markets or become insignificant (Schwert (2003); Gaunt (2004); Nartea, Ward & Djajadikerta, 2009; Horowitz, Loughran & Savin, 2000; Crain, 2011; Michou et al, 2010).Nevertheless, in the Indian stock market a significant size premium has been obtained consistently over varying time periods. (Mohanty, 2002;Kumar & Sehgal,2004; Behl, 2006;Sehgal & Tripathi, 2007; Sehgal & Balakrishnan, 2013; Sehgal et al, 2012; Pandey &Sehgal, 2016). This makes it imperative to explore if information contained in size to could be used to develop investment strategies which promise abnormal profits.

*2.2 Value*-Value stocks are stocks which have low prices compared to fundamentals and perform better than growth stocks i.e. stocks which have high prices compared to fundamentals, also called value anomaly.  Tests of the value anomaly using book to market measure was performed by Stattman (1980).Reasons for the value anomaly consist of risk (Fama & French, 1992, 1996), overreaction hypothesis (DeBondt &Thaler, 1987;Lakonishok, Shleifer and Vishny, 1994), stock characteristics (Daniel &Titman, 2006). Research on value anomaly for other stock markets include Chan and Chen (1991), Gaunt (2004), Nartea, Ward and Djajadikerta (2009), Chen and Fang (2009), Bundoo (2008), Groot and Verschoor(2002). Evidence of a significant value premium in the Indian market is found in Kumar and Sehgal (2004), Behl (2006), Sehgal and Tripathi (2006), Nair et al, 2009), Gupta and Kumar (2009),) and Sehgal et al, 2012).

*2.3Prior return patterns (Momentum/Contrarian*) **-** Prior return patterns are of two types: momentum and contrarian. Momentum trading strategies mean that winners over the past 3-12 months continue to be winners and losers over the same period remain losers (Jegadeesh & Titman, 1993). Contrarian trading strategies imply that past losers become future winners and vice versa (De Bondt & Thaler, 1985, 1987). Risk based explanations for momentum include past trading volume (Lee and Swaminathan (2000)), sectoral returns (Moskowitz and

Grinblatt, 1999; Liu &Zhang, 2008)), macro economic factors (Chordia & Shivkumar, 2002), investor bias in processing information could also lead to momentum profits (Barberis, Shleifer & Vishny, 1998; Daniel, Hirshleifer & Subrahmanyam, 1998;Hong& Stein, 1999).Nevertheless, momentum remains a puzzle generating high risk adjusted returns and hence capturing the attention of investment managers. Risk based explanation for contrarian is that stocks that had low past returns (losers) tended to be smaller and relatively more distressed while those that had high past returns (winners) were bigger and relatively less distressed (Fama &French, 1995).

Momentum and contrarian strategies have been tested for several mature and emerging markets (Rouwenhorst, 1998; Griffin, Ji &Martin, 2003; Chui, Titman & Wei, 2010, McInish, Ding, Pyun & Wongchoti, 2008; Hameed & Kusnadi, 2002; Antoniou, Lam & Paudyal, 2007; Swanson& Lin, 2005, Schiereck, DeBondt &Weber, 1999; Vu, 2012). Momentum has consistently emerged as a profitable investment strategy in the Indian market over various time periods. (Sehgal and Jain, 2011;Sehgal &Jain,2015;Polak &Eiaz,2012; Sehgal &Balakrishnan ,2004, 2008). Contrarian investment strategy was found to generate high returns (Rastogi, Chaturvedula &Bang 2009; Sehgal & Balakrishnan,2002; Tripathi & Gupta, 2009; Dhankar & Maheswari, 2014).

### *2.4. Liquidity/volume*

Returns are negatively related to liquidity since investors need to be compensated for holding illiquid stocks. Amihud and Mendelson (1986) documented role of liquidity in asset pricing models and were followed by Brennan and Subrahmanyam (1996), Datar, Naik and Radcliffe (1998), Lee and Swaminathan (2000), Liu (2004). The negative relationship between liquidity and returns has been established in the literature for various mature and emerging markets (Gharghori, Lee &Veeraraghavan, 2009; Hwang &Lu, 2007; Drew, Mardsen &Veeraraghavan, 2006; Unlu, 2013; Machado & Mediros, 2012; Rahim &Mohd. Nor, 2006). Sehgal, Subramaniam and Morandiere(2012) and Sehgal and Vasishth (2015) confirm the presence of liquidity anomaly for the Indian stock market.

### *2.5. Profitability*

Research on mature markets documents a positive relationship between profitability and stock returns (Haugen & Baker, 1996; Cohen, Gompers & Vuolteenaho, 2002; Fama& French, 2008;Artmann, Fintner & Kempf, 2011; Fitzpatrick & Ogden, 2009; Novy Marx, 2013).However, it is found that more profitable firms have lower returns for the Indian market (Sehgal &Subramaniam, 2012; Singh & Yadav, 2015). It is plausible the investors find a profitable firm to be less risky and hence are satisfied with low returns.

### *2.6. Earnings momentum*

Ball and Brown (1968) recognized that stock prices move in the direction of earnings surprises. Chan, Jegadeesh & Lakonishok (1996) termed the strategy based on earnings surprises as earnings momentum. Persistent profits from earnings momentum strategy is obtained by Hong, Lee and Swaminathan (2003), Leippold and Lohre (2009),Chan, Chen, Hsin and Lee (2010). Literature attributes the existence of this anomaly to macroeconomic factors (Chordia & Shivkumar, 2005, 2006),liquidity (Sadka, 2006), limited investor attention (Hirschleifer et al 2009) and role of information (Vega, 2006)). Nevertheless, earnings momentum strategy has been in conflict with market efficiency for around four decades. Significant profits have been found from employing the earnings momentum strategy in Indian markets (Sehgal& Jain, 2015).

### 3. Data and their sources

The paper uses data for 200 companies which comprise NSE200 equity index. The time period considered is from July 2005 to June 2016. Month-end closing share prices after adjusting for capitalization changes such as bonus shares, rights issues, stock splits, etc. Stock prices are transformed into percentage return series for further evaluation. The National Stock Exchange's NSE200 index is used as a proxy for the market factor. We measure company size by using the log of market capitalization i.e. the natural log of price multiplied by shares outstanding. Price to book value is used as a surrogate for value. Average daily trading volume is used as a substitute for liquidity. Profitability is measured by return on total assets. Investments is calculated as the change in total assets over the previous year.

Quarterly earnings (i.e., earnings per share, excluding extraordinary items) have been used to calculate standardized unexpected earnings (SUE). SUE is estimated as earnings of the current quarter ($E_{iq}$) minus average earnings of previous eight quarters($E_{iq-8}$),divided by the standard deviation of the earnings changes in previous eight quarters ($SD_{iq}$)

$$SUE = (E_{iq} - E_{iq-8})/SD_{iq} \qquad (1)$$

Implicit yields on 91-day treasury bills are used a proxy for risk free rate.

The source of data for share prices, company attributes and market index is CMIE Prowess. 91-day T-bill rates have been sourced from the Reserve Bank of India website.

### 4. Methodology

In this section, we discuss the methodology followed firstly in constructing various investment styles-based portfolios that may be univariate (based on one style), independent bivariate (based on two styles) and conditional bivariate. Then we discuss the estimation of risk adjusted returns by employing standard risk models such as CAPM and select multifactor models.

To construct the univariate investment style /single sorted strategy, single ranking style is adopted for portfolio formation. The portfolios are constructed on (i months/j months) strategy where i and j are periods of portfolio formation and portfolio holding respectively. We estimate 6-6 investment style based on all company characteristics and momentum (M) and 48-12-6(Note 3) strategy for contrarian(C). The 6 months/6 months investment strategies are constructed on the following attributes viz. size(S), value (V), volume (L), profitability (P), earnings surprises (E) as follows. Starting in July of the year t, we rank the securities based on the value of the chosen attribute. July is the starting date for portfolio formation by sorting on the end-of-June values on the attributes identified by us. June-end quarter is chosen to smoothen the impact of the large changes that might occur in the share prices of the firms after the declarations and disclosures at the end of the financial year (for India) on 31st March. Attributes are then sorted into quintiles-named P1 to P5.Next equally-weighted monthly excess returns are calculated for the next 6 months (year t). 20% of companies with lowest attribute would fall in P1 while P5 consists of top 20% companies with highest chosen attribute. The portfolios are re-balanced in January based on values for six months up to December of the year t, wherein all securities are again ranked into quintiles on the basis of the characteristic and equally weighted monthly excess returns are estimated for the next six months from Jan to June (year t+1). We repeat the process till June 2016.In case of momentum past six months average returns are used as the sorting criterion.

Next, two types of bivariate styles are constructed viz. independent bivariate and conditional bivariate. Under both categories, 2*3 and 3*2 sorting is adopted. In independent bivariate sorted strategy, securities are ranked separately based on any 2 characteristics and the intersection of the two independently formed groups is used to form portfolios. For instance, to form a 3*2 bivariate strategy comprising of size and value we proceed as follows. Stocks are sorted independently on market cap at the end of June of year t and divided into terciles S1 to S3, S1 being the smallest size tercile and S3 being the largest size tercile. A similar exercise is to create portfolio V1 and V2 based on value. Then from the intersection of these two characteristics we form 6 bivariate independent sorted portfolios. S1V3 consists of a combination of stocks which are in bottom 33 1/3 % in terms of size and top 50% in terms of value. In contrast S3V2 consists of stocks with high 33 1/3% in terms of size and bottom 50% in terms of value. Monthly excess returns are then calculated for these six equally weighted portfolios for the next six months and the process is repeated half yearly till June 2016.Distribution of NSE 200 shares is limited to terciles to prevent loss of informational content, especially in the initial years of portfolio formation when we have about 30% less stocks for portfolio formation on the chosen attributes. Too many smaller combinations of portfolios will be less diversified and may also have non-systematic risk. For the same reason3*3 formations in bivariate strategies are avoided so as have a sizeable portfolio in the initial years of this study.

To construct a bivariate conditionally sorted strategy, the securities are ranked on the chosen attribute and then subgroups are formed within each group based on another attribute. This is done on both 3*2 and 2*3 formations as described earlier. For instance, to form a bivariate strategy of size conditional on value on 3*2 basis, we proceed as follows. Stocks are ranked on the basis of market cap at the end of June of year t and divided into terciles S1 to S3. Within each tercile stocks are again ranked on the basis of previous six months of value characteristic and two groups V1 and V2 are formed. So, in 3*2 conditional bivariate S1V2 implies lowest 33.3% companies in terms of size and within these companies the top 50% the of stocks having the highest value. Then the equal weighted returns for these 6 portfolios are observed for the subsequent six months, i.e. till Dec of year t. This process is repeated for the entire sample period. Portfolios using other characteristics are formed using the same procedure. The same procedure is followed to obtain 2*3 formations as well.

Results on returns are reported only for the corner portfolios, which are the winners and losers in each case. Since there are restrictions on short-selling in the Indian market, we focus our study on only long strategies. Results for intermediate portfolios not reported due to space constraints can be obtained from the authors.

Thus, a total of two hundred and sixty-six investment stylized portfolios are considered comprising of fourteen univariate investment styles, sixty bivariate unconditional investment styles and one hundred ninety-two bivariate conditional investment styles.

We next estimate the returns on the above portfolios. First, the unadjusted mean excess returns are calculated for all the portfolios and their statistical significance is tested. Next to see if risk factors can be identified to explain these abnormal returns, we use asset pricing models viz. CAPM, Fama and French (1993), Carhart (1997), Fama and French (2015).

The "excess return" form of the market model is used for estimating CAPM regression

$$R_{Pt} - R_{Ft} = a + b(R_{Mt} - R_{Ft}) + e_t \quad (2)$$

where $R_{Pt} - R_{Ft}$ denotes the portfolio monthly excess return

$R_{Mt} - R_{Ft}$ is the market excess return,

$e_t$is the error term and b shows sensitivity of market factor.

If the intercept (a) is positive (negative) significant, it implies that the strategy constructed generates extra-normal profits (losses).This is an indicator that the CAPM has failed to explain the returns of the portfolios.

Next it is evaluated if these excess returns can be absorbed by the Fama and French (1993) (FF 1993) model which uses size and value as additional variables to explain returns as follows,

$$R_{Pt} - R_{Ft} = a + b\ (R_{mt} - R_{ft}) + s\ (SMB_t\ ) + h\ (LMH_t\ ) + e_t \quad (3)$$

Where $SMB_t$ is the difference in returns on small and big stocks and $LMH_t$ is the difference in returns on the low price to book and high price to book portfolio. Since price to book is used as the value proxy, LMH is used in the FF model instead of HML and the intersection of two independent size sorted portfolios and three independent value sorted portfolios gives the SMB and LMH.s and h denote the sensitivity coefficients of $SMB_t$ and $LMH_t$

The other two terms are same as defined in equation (2).

Insignificant intercepts from the FF (1993) model regressions means that the three factor FF model is good in explanation of returns. Presence of statistically significant intercepts leads us to employ the Carhart(1997) four factor model.

Carhart (1997) four-factor model adds one-year return momentum to the Fama French factors, to capture patterns in returns as follows:

$$R_{pt} - R_{ft} = a + b\ (R_{mt} - R_{ft}\ ) + s\ (SMB_t\ ) + h\ (LMH_t\ ) + w\ (WML_t\ ) + e_t \quad (4)$$

Where WML is the difference between the returns of the winner and loser portfolios.The other terms are same as in equation (3).

If the Carhart model fails to explain the abnormal returns, then we use the Fama and French (2015) (FF 2015)five factor model. This model augments the three factor model with profitability and investment as additional explanatory variables.

$$R_{pt} – R_{ft} = a + b\ (R_{mt} - R_{ft}) + s\ (SMB_t) + h\ (LMH_t) + \quad r\ (RMW_t) + c\ (CMA)_t + e_t \qquad (5)$$

RMW is the difference in returns on portfolios with high and low profitability. CMA is the difference in returns on stocks with low and high investment. The other terms are same as in the previous equation.

## 5. Empirical results

Table 1, panel a, presents the empirical results of the univariate strategies. Results of Bivariate independent and bivariate conditional strategies are reported in panels b and c in Table 1 respectively. Results on univariate strategies in panel a, show that unadjusted returns vary inversely with firm size, price to book value, volume and directly with short term prior returns and earnings surprises which is in line with prior research for the Indian market. More profitable firms generate higher returns vis a vis less profitable ones which is consistent with international findings (Note 4). Long term momentum patterns are weaker and dominated by short term momentum so we abandon long term prior returns for further construction of the investment strategies (Note 5). Thus, after abandoning contrarian strategies the total estimated strategies are reduced by two to264. On an unadjusted basis, significant returns are obtained on winner portfolios of all univariate investment styles among which size sorted portfolios provided the highest monthly returns (2.7%)followed by volume (2.2%) and momentum (1.86%).

Based on unadjusted returns from univariate analysis, winners are identified in each style group. This combination of winners used to construct bivariate strategies is found to give highest returns among that group and are designated as winners. For instance, in the univariate analysis smallest size, S1, and highest prior returns M5 are winner portfolios. So, the combination of smallest size and highest momentum in bivariate strategies i.e. S1M2/S1M3 strategy has been classified as a ‘winner’ strategy.

Highest monthly returns in the bivariate independent investment styles are provided by S1E2(2.63%), S1M2 (2.60%) and S1L1 (2. 5%).M2S1 (2.7%), L1S1 (2.7%) and S1L1 (2.6%)are the investment styles in the conditional bivariate category providing highest monthly risk unadjusted returns.

The above empirical results indicate that on an absolute return basis bivariate strategies do not outperform univariate strategies. The highest unadjusted returns of 2.7% per month is obtained from employing S1 (small size sorted strategy) on a standalone basis as well as bivariate M2S1 (Momentum-size) and L1S1(Liquidity-size).

Next, we assess if returns can be explained by standard risk models. Employing risk models, we find that CAPM market factor is able to explain 42% (110/264) of the returns, proving that beta stand alone has an explanatory power. However, market beta is unable to account for remaining 154 strategies of which 114 are winners and 40 are losers. Since, the average alpha for CAPM loser strategies is 0.34% per month (4.08% p.a.), a long-short strategy seems feasible.

The size and value factors of the FF (1993) model explain 65/154 (42%) strategies, thus it can be inferred that the FF three factor model is a better description of a cross section of average stock returns in line with existing research for Indian stock market(Sehgal et al 2012; Sehgal & Balakrishnan, 2013). Nevertheless, the FF (1993) model is unable to explain returns on 89/154portfolios, which comprises of 79 winner portfolios and 10 loser portfolios.

Thus, there are substantial winners at the three factor model level. Out of this the Carhart model augmented with a momentum factor is able to explain alphas in only 7cases, whereas the five-factor model with profitability and investment as additional factors explain only three strategies completely. Thus, there are still 79 strategies which defy the risk argument, consisting of 70 winners and 9 losers. This shows that the four factor Carhart model and five factor FF model are redundant in providing a risk based explanation and the FF three factor model should be considered as the benchmark for portfolio evaluation in the Indian context for NSE200 universe.

The failure of the risk models in completely explaining extra normal returns in about 31%(82/264) of the cases suggests missing risk factors or search for a behavioral reason. Yet these unexplained alphas of the strategies show the potential for superior returns in the Indian stock market. The highest risk adjusted returns among all strategies considered are obtained from constructing the conditional bivariate investment strategy viz. E2L1 (earnings momentum-liquidity), M2S1 (price momentum-size), E2M3 (earnings momentum- price momentum) (1.1% per month). This shows that conditional bivariate investment strategies provide higher risk adjusted returns than independent bivariate and univariate strategies.

Table 1. Unadjusted and risk adjusted returns on univariate, independent bivariate and conditional bivariate strategies.

| PANEL a--UNIVARIATE | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Unadjusted | | CAPM | | | Fama French-3 Factor | | | Carhart | | | Fama French-5 Factor | | |
| P# | I.S.* | Mean Return | t-stat | α | t-stat | adj-R2 | α | t-stat | adj-R2 | A | t-stat | adj-R2 | A | t-stat | adj-R2 |
| W | S1 | 0.027 | 3.437 | 0.020 | 5.634 | 0.801 | 0.007 | 3.574 | 0.951 | 0.007 | 3.628 | 0.951 | 0.007 | 3.530 | 0.951 |
| | S5 | 0.005 | 0.800 | -0.001 | -1.424 | 0.978 | | | | | | | | | |
| W | V1 | 0.015 | 1.584 | 0.006 | 1.548 | 0.821 | | | | | | | | | |
| | V5 | 0.013 | 2.326 | 0.007 | 3.744 | 0.866 | 0.004 | 2.483 | 0.940 | 0.004 | 2.356 | 0.940 | 0.004 | 2.421 | 0.940 |
| | M1 | 0.014 | 1.710 | 0.007 | 1.756 | 0.795 | | | | | | | | | |
| W | M5 | 0.019 | 2.698 | 0.012 | 4.291 | 0.832 | 0.006 | 2.336 | 0.872 | 0.003 | 1.914 | 0.956 | | | |
| W | L1 | 0.022 | 3.719 | 0.017 | 6.073 | 0.787 | 0.008 | 3.829 | 0.899 | 0.008 | 3.964 | 0.899 | 0.008 | 3.714 | 0.899 |
| | L5 | 0.006 | 0.729 | -0.002 | -0.773 | 0.902 | | | | | | | | | |
| | E1 | 0.013 | 1.660 | 0.005 | 1.882 | 0.857 | | | | | | | | | |
| W | E5 | 0.018 | 2.558 | 0.011 | 5.770 | 0.926 | 0.007 | 3.823 | 0.942 | 0.007 | 3.623 | 0.942 | 0.007 | 3.752 | 0.946 |
| | P1 | 0.013 | 1.666 | 0.006 | 2.219 | 0.902 | -0.001 | -0.449 | 0.951 | | | | | | |

| PANEL a--UNIVARIATE | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Unadjusted** | | **CAPM** | | | **Fama French-3 Factor** | | | **Carhart** | | | **Fama French-5 Factor** | | |
| **P#** | **I.S.*** | **Mean Return** | **t-stat** | **α** | **t-stat** | **adj-R2** | **α** | **t-stat** | **adj-R2** | **A** | **t-stat** | **adj-R2** | **A** | **t-stat** | **adj-R2** |
| W | P5 | 0.017 | 2.545 | 0.010 | 4.693 | 0.887 | 0.005 | 2.655 | 0.914 | 0.005 | 2.634 | 0.913 | 0.004 | 3.024 | 0.958 |
| **PANEL b—Independent Bivariate, 2x3** | | | | | | | | | | | | | | | |
| | | **Unadjusted** | | **CAPM** | | | **Fama French-3 Factor** | | | **Carhart** | | | **Fama French-5 Factor** | | |
| **P#** | **I.S.*** | **Mean Return** | **t-stat** | **α** | **t-stat** | **adj-R2** | **α** | **t-stat** | **adj-R2** | **α** | **t-stat** | **adj-R2** | **A** | **t-stat** | **adj-R2** |
| | S2V3 | 0.010 | 1.664 | 0.004 | 2.311 | 0.912 | 0.003 | 2.113 | 0.946 | 0.003 | 2.220 | 0.946 | 0.003 | 2.043 | 0.946 |
| W | S1V1 | 0.018 | 2.057 | 0.010 | 2.597 | 0.810 | -0.001 | -0.798 | 0.978 | | | | | | |
| W | S1M3 | 0.022 | 3.046 | 0.012 | 3.354 | 0.799 | 0.005 | 2.062 | 0.908 | 0.003 | 1.486 | 0.934 | | | |
| | S2M1 | 0.008 | 1.000 | 0.001 | 0.166 | 0.829 | | | | | | | | | |
| W | S1L1 | 0.022 | 3.324 | 0.016 | 5.446 | 0.806 | 0.005 | 2.823 | 0.934 | 0.006 | 3.080 | 0.935 | 0.005 | 2.703 | 0.934 |
| | S2L3 | 0.005 | 0.648 | -0.002 | -1.290 | 0.935 | | | | | | | | | |
| W | S1E3 | 0.022 | 3.087 | 0.015 | 5.123 | 0.824 | 0.006 | 2.480 | 0.915 | 0.006 | 2.550 | 0.915 | 0.005 | 2.339 | 0.920 |
| | S2E1 | 0.005 | 0.717 | -0.002 | -0.972 | 0.925 | | | | | | | | | |
| W | S1P3 | 0.020 | 2.965 | 0.014 | 4.541 | 0.798 | 0.004 | 1.804 | 0.905 | | | | | | |
| | S2P1 | 0.006 | 0.752 | -0.002 | -0.783 | 0.917 | | | | | | | | | |
| W | V1M3 | 0.017 | 2.014 | 0.009 | 2.722 | 0.845 | 0.002 | 0.773 | 0.891 | | | | | | |
| | V2M1 | 0.009 | 1.288 | 0.003 | 0.819 | 0.782 | | | | | | | | | |
| W | V1L1 | 0.022 | 2.868 | 0.015 | 4.450 | 0.809 | 0.005 | 1.990 | 0.908 | 0.006 | 2.278 | 0.911 | 0.005 | 1.890 | 0.908 |
| | V2L3 | 0.008 | 1.279 | 0.002 | 1.046 | 0.919 | | | | | | | | | |
| W | V1E3 | 0.018 | 2.175 | 0.010 | 3.290 | 0.862 | 0.005 | 2.239 | 0.928 | 0.005 | 2.325 | 0.927 | 0.005 | 2.103 | 0.928 |
| | V2E1 | 0.013 | 1.969 | 0.006 | 3.093 | 0.896 | 0.001 | 0.733 | 0.926 | | | | | | |
| | M1P1 | 0.013 | 1.543 | 0.005 | 1.598 | 0.863 | | | | | | | | | |
| W | M2P3 | 0.015 | 2.517 | 0.010 | 4.330 | 0.871 | 0.005 | 2.552 | 0.893 | 0.003 | 2.064 | 0.937 | 0.005 | 2.434 | 0.916 |
| | M1E1 | 0.011 | 1.434 | 0.004 | 1.224 | 0.834 | | | | | | | | | |
| W | M2E3 | 0.018 | 2.715 | 0.011 | 5.095 | 0.882 | 0.007 | 3.307 | 0.909 | 0.005 | 2.969 | 0.940 | 0.006 | 3.173 | 0.916 |
| | P1E1 | 0.012 | 1.529 | 0.004 | 1.624 | 0.876 | | | | | | | | | |
| W | P2E3 | 0.018 | 2.851 | 0.012 | 5.720 | 0.892 | 0.007 | 3.771 | 0.917 | 0.007 | 3.607 | 0.917 | 0.007 | 3.804 | 0.930 |
| W | L1P3 | 0.019 | 3.121 | 0.013 | 5.334 | 0.832 | 0.006 | 2.990 | 0.909 | 0.006 | 3.137 | 0.902 | 0.005 | 3.029 | 0.926 |
| | L2P1 | 0.011 | 1.260 | 0.003 | 0.875 | 0.883 | | | | | | | | | |
| W | L1M3 | 0.021 | 3.220 | 0.015 | 5.264 | 0.811 | 0.008 | 3.132 | 0.882 | 0.006 | 2.730 | 0.913 | 0.007 | 3.035 | 0.888 |
| | L2M1 | 0.010 | 1.244 | 0.003 | 0.750 | 0.824 | | | | | | | | | |
| W | V1P3 | 0.016 | 1.865 | 0.008 | 2.096 | 0.795 | 0.002 | 0.794 | 0.904 | | | | | | |
| | V2P1 | 0.011 | 1.587 | 0.005 | 1.739 | 0.868 | | | | | | | | | |
| W | L1E3 | 0.022 | 3.393 | 0.016 | 6.311 | 0.850 | 0.010 | 4.477 | 0.904 | 0.010 | 4.439 | 0.903 | 0.009 | 4.394 | 0.909 |
| | L2E1 | 0.009 | 1.166 | 0.002 | 0.586 | 0.869 | | | | | | | | | |
| **Independent Bivariate, 3x2** | | | | | | | | | | | | | | | |

| PANEL a--UNIVARIATE | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Unadjusted | | CAPM | | | Fama French-3 Factor | | | Carhart | | | Fama French-5 Factor | | |
| P# | I.S.* | Mean Return | t-stat | α | t-stat | adj-R2 | α | t-stat | adj-R2 | A | t-stat | adj-R2 | A | t-stat | adj-R2 |
| | | Unadjusted | | CAPM | | | Fama French-3 Factor | | | Carhart | | | Fama French-5 Factor | | |
| P# | I.S.* | Mean Return | t-stat | α | t-stat | adj-R2 | α | t-stat | adj-R2 | α | t-stat | adj-R2 | A | t-stat | adj-R2 |
| | S3V2 | 0.007 | 1.215 | 0.001 | 0.923 | 0.942 | | | | | | | | | |
| W | S1V1 | 0.023 | 2.711 | 0.015 | 4.066 | 0.807 | 0.003 | 1.764 | 0.966 | | | | | | |
| W | S1M2 | 0.026 | 3.621 | 0.020 | 6.025 | 0.799 | 0.009 | 3.683 | 0.913 | 0.007 | 3.343 | 0.932 | 0.008 | 3.645 | 0.918 |
| | S3M1 | 0.006 | 0.866 | -0.001 | -0.359 | 0.909 | | | | | | | | | |
| W | S1L1 | 0.025 | 3.568 | 0.018 | 6.422 | 0.833 | 0.007 | 4.687 | 0.958 | 0.007 | 4.813 | 0.958 | 0.007 | 4.599 | 0.960 |
| | S3L2 | 0.006 | 0.818 | -0.022 | -1.196 | 0.975 | | | | | | | | | |
| W | S1E2 | 0.026 | 3.667 | 0.020 | 6.386 | 0.817 | 0.009 | 4.263 | 0.925 | 0.009 | 4.269 | 0.925 | 0.009 | 4.151 | 0.930 |
| | S3E1 | 0.004 | 0.586 | -0.003 | -1.948 | 0.955 | | | | | | | | | |
| W | S1P2 | 0.025 | 3.505 | 0.019 | 5.754 | 0.799 | 0.007 | 3.407 | 0.923 | 0.008 | 3.569 | 0.924 | 0.007 | 3.375 | 0.934 |
| | S3P1 | 0.005 | 0.737 | -0.002 | -1.083 | 0.944 | | | | | | | | | |
| W | V1P2 | 0.013 | 1.403 | 0.005 | 1.069 | 0.786 | | | | | | | | | |
| | V3P1 | 0.013 | 1.847 | 0.006 | 2.376 | 0.857 | 0.001 | 0.288 | 0.906 | | | | | | |
| | M1P1 | 0.014 | 1.735 | 0.007 | 1.932 | 0.828 | | | | | | | | | |
| W | M3P2 | 0.017 | 2.650 | 0.011 | 4.529 | 0.860 | 0.007 | 2.880 | 0.884 | 0.005 | 2.563 | 0.941 | 0.006 | 2.745 | 0.896 |
| W | L1M2 | 0.019 | 3.160 | 0.014 | 4.773 | 0.778 | 0.006 | 2.586 | 0.873 | 0.005 | 2.165 | 0.889 | 0.006 | 2.472 | 0.877 |
| | L3M1 | 0.007 | 0.779 | -0.001 | -0.432 | 0.854 | | | | | | | | | |
| W | V1M2 | 0.016 | 0.178 | 0.007 | 2.131 | 0.847 | 0.002 | 0.691 | 0.909 | | | | | | |
| | V3M1 | 0.011 | 1.588 | 0.005 | 1.504 | 0.802 | | | | | | | | | |
| W | V1L1 | 0.021 | 2.538 | 0.013 | 4.025 | 0.844 | 0.004 | 1.776 | 0.929 | | | | | | |
| | V3L2 | 0.008 | 1.388 | 0.003 | 1.298 | 0.895 | | | | | | | | | |
| W | V1E2 | 0.017 | 1.942 | 0.008 | 2.603 | 0.854 | 0.004 | 1.721 | 0.942 | | | | | | |
| | V3E1 | 0.010 | 1.655 | 0.004 | 2.110 | 0.895 | 0.000 | -0.104 | 0.927 | | | | | | |
| W | L1E2 | 0.022 | 3.629 | 0.017 | 6.230 | 0.813 | 0.009 | 4.316 | 0.894 | 0.010 | 4.376 | 0.894 | 0.009 | 4.205 | 0.898 |
| | L3E1 | 0.006 | 0.745 | -0.002 | -0.604 | 0.877 | | | | | | | | | |
| | P1E1 | 0.012 | 1.513 | 0.004 | 1.662 | 0.892 | | | | | | | | | |
| W | P3E2 | 0.017 | 2.734 | 0.011 | 4.984 | 0.873 | 0.006 | 3.028 | 0.899 | 0.006 | 2.885 | 0.899 | 0.005 | 3.050 | 0.924 |
| | M1E1 | 0.013 | 1.540 | 0.005 | 1.401 | 0.803 | | | | | | | | | |
| W | M3E2 | 0.018 | 2.724 | 0.012 | 4.723 | 0.868 | 0.006 | 2.866 | 0.898 | 0.004 | 2.436 | 0.932 | 0.006 | 2.730 | 0.904 |
| W | L1P2 | 0.022 | 3.567 | 0.016 | 6.076 | 0.812 | 0.009 | 4.179 | 0.900 | 0.009 | 4.379 | 0.901 | 0.008 | 4.253 | 0.916 |
| | L3P1 | 0.007 | 0.811 | -0.001 | -0.488 | 0.897 | | | | | | | | | |
| Panel c-Conditional bivariate, 2x3 | | | | | | | | | | | | | | | |
| | | Unadjusted | | CAPM | | | Fama French-3 Factor | | | Carhart | | | Fama French-5 Factor | | |
| P# | I.S.* | Mean Return | t-stat | α | t-stat | adj-R2 | α | t-stat | adj-R2 | α | t-stat | adj-R2 | A | t-stat | adj-R2 |

| PANEL a--UNIVARIATE | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Unadjusted | | CAPM | | | Fama French-3 Factor | | | Carhart | | | Fama French-5 Factor | | |
| P# | I.S.* | Mean Return | t-stat | α | t-stat | adj-R2 | α | t-stat | adj-R2 | A | t-stat | adj-R2 | A | t-stat | adj-R2 |
| W | E1S1 | 0.021 | 2.645 | 0.014 | 3.678 | 0.777 | 0.002 | 0.845 | 0.908 | | | | | | |
| | E1S3 | 0.004 | 0.609 | -0.003 | -1.258 | 0.915 | | | | | | | | | |
| W | E2S1 | 0.025 | 3.605 | 0.019 | 5.800 | 0.785 | 0.009 | 3.481 | 0.875 | 0.009 | 3.441 | 0.874 | 0.009 | 3.353 | 0.880 |
| | E2S3 | 0.007 | 1.150 | 0.001 | 0.591 | 0.918 | | | | | | | | | |
| W | M1S1 | 0.019 | 2.392 | 0.012 | 3.082 | 0.766 | 0.001 | 0.228 | 0.896 | | | | | | |
| | M1S3 | 0.005 | 0.721 | -0.002 | -0.626 | 0.866 | | | | | | | | | |
| W | M2S1 | 0.027 | 3.890 | 0.021 | 5.981 | 0.750 | 0.011 | 3.753 | 0.842 | 0.010 | 3.407 | 0.866 | 0.011 | 3.658 | 0.846 |
| | M2S3 | 0.008 | 1.193 | 0.001 | 0.675 | 0.882 | | | | | | | | | |
| | S1M1 | 0.020 | 2.421 | 0.012 | 3.304 | 0.792 | 0.001 | 0.485 | 0.928 | | | | | | |
| W | S1M3 | 0.023 | 3.185 | 0.016 | 5.176 | 0.810 | 0.006 | 2.562 | 0.910 | 0.004 | 2.068 | 0.935 | 0.006 | 2.455 | 0.912 |
| | S2M1 | 0.007 | 0.976 | 0.000 | 0.101 | 0.835 | | | | | | | | | |
| W | S2M3 | 0.009 | 1.398 | 0.003 | 1.296 | 0.890 | | | | | | | | | |
| | E1M1 | 0.010 | 1.210 | 0.003 | 0.643 | 0.753 | | | | | | | | | |
| W | E2M3 | 0.021 | 3.196 | 0.015 | 4.988 | 0.791 | 0.011 | 3.722 | 0.820 | 0.009 | 3.397 | 0.862 | 0.011 | 3.590 | 0.825 |
| W | L1S1 | 0.027 | 3.640 | 0.020 | 6.058 | 0.799 | 0.007 | 3.869 | 0.940 | 0.008 | 3.938 | 0.939 | 0.008 | 3.809 | 0.939 |
| | L2S3 | 0.005 | 0.836 | -0.001 | -1.062 | 0.973 | | | | | | | | | |
| W | S1L1 | 0.023 | 3.701 | 0.017 | 5.736 | 0.762 | 0.007 | 3.323 | 0.911 | 0.007 | 3.397 | 0.911 | 0.006 | 3.192 | 0.913 |
| | S2L3 | 0.005 | 0.618 | -0.003 | -1.252 | 0.918 | | | | | | | | | |
| | M1E1 | 0.009 | 1.093 | 0.001 | 0.395 | 0.811 | | | | | | | | | |
| W | M2E3 | 0.020 | 2.920 | 0.013 | 4.977 | 0.843 | 0.010 | 3.571 | 0.861 | 0.008 | 3.213 | 0.880 | 0.009 | 3.450 | 0.863 |
| | S1E1 | 0.019 | 2.475 | 0.012 | 2.342 | 0.780 | 0.002 | 0.837 | 0.897 | | | | | | |
| W | S1E3 | 0.023 | 3.230 | 0.017 | 5.472 | 0.825 | 0.008 | 3.125 | 0.893 | 0.008 | 3.112 | 0.892 | 0.008 | 3.023 | 0.896 |
| | S2E1 | 0.005 | 0.668 | -0.002 | -0.921 | 0.895 | | | | | | | | | |
| W | S2E3 | 0.001 | 1.667 | 0.005 | 2.321 | 0.912 | 0.005 | 2.573 | 0.912 | 0.005 | 2.546 | 0.911 | 0.005 | 2.500 | 0.911 |
| W | E1L1 | 0.016 | 2.414 | 0.010 | 3.231 | 0.784 | 0.002 | 0.710 | 0.854 | | | | | | |
| | E1L3 | 0.004 | 0.573 | -0.003 | -0.971 | 0.854 | | | | | | | | | |
| W | E2L1 | 0.023 | 3.873 | 0.018 | 6.125 | 0.765 | 0.011 | 4.338 | 0.851 | 0.011 | 4.330 | 0.850 | 0.010 | 4.231 | 0.855 |
| | E2L3 | 0.010 | 1.372 | 0.003 | 1.217 | 0.887 | | | | | | | | | |
| W | M1L1 | 0.017 | 2.338 | 0.011 | 3.145 | 0.780 | 0.003 | 0.822 | 0.840 | | | | | | |
| | M1L3 | 0.004 | 0.508 | -0.003 | -1.050 | 0.837 | | | | | | | | | |
| W | M2L1 | 0.020 | 3.463 | 0.015 | 4.984 | 0.732 | 0.008 | 3.110 | 0.810 | 0.007 | 2.732 | 0.836 | 0.008 | 3.004 | 0.814 |
| | M2L3 | 0.012 | 1.552 | 0.004 | 1.564 | 0.849 | | | | | | | | | |
| | L1M1 | 0.017 | 2.215 | 0.010 | 3.097 | 0.830 | 0.002 | 0.662 | 0.887 | | | | | | |
| W | L1M3 | 0.022 | 3.430 | 0.016 | 5.827 | 0.815 | 0.009 | 3.773 | 0.879 | 0.007 | 3.474 | 0.912 | 0.009 | 3.698 | 0.887 |
| | L2M1 | 0.009 | 1.105 | 0.002 | 0.420 | 0.819 | | | | | | | | | |
| W | L2M3 | 0.010 | 1.359 | 0.003 | 1.164 | 0.884 | | | | | | | | | |
| | L1E1 | 0.015 | 2.202 | 0.009 | 3.235 | 0.849 | 0.001 | 0.416 | 0.917 | | | | | | |
| W | L1E3 | 0.022 | 3.346 | 0.016 | 6.409 | 0.861 | 0.009 | 4.553 | 0.912 | 0.009 | 4.475 | 0.911 | 0.009 | 4.458 | 0.916 |

| PANEL a--UNIVARIATE | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Unadjusted | | CAPM | | | Fama French-3 Factor | | | Carhart | | | Fama French-5 Factor | | |
| P[#] | I.S.[*] | Mean Return | t-stat | α | t-stat | adj-R2 | α | t-stat | adj-R2 | A | t-stat | adj-R2 | A | t-stat | adj-R2 |
| | L2E1 | 0.009 | 1.203 | 0.002 | 0.686 | 0.865 | | | | | | | | | |
| W | L2E3 | 0.012 | 1.625 | 0.005 | 2.237 | 0.917 | 0.002 | 1.028 | 0.934 | | | | | | |
| W | E1V1 | 0.011 | 1.242 | 0.003 | 0.719 | 0.779 | | | | | | | | | |
| | E1V3 | 0.011 | 1.792 | 0.005 | 2.327 | 0.872 | 0.001 | 0.637 | 0.898 | | | | | | |
| W | E2V1 | 0.018 | 2.125 | 0.009 | 3.020 | 0.848 | 0.005 | 1.990 | 0.922 | 0.005 | 1.975 | 0.922 | 0.005 | 1.880 | 0.922 |
| | E2V3 | 0.017 | 3.025 | 0.012 | 4.365 | 0.763 | 0.008 | 3.572 | 0.857 | 0.008 | 3.379 | 0.858 | 0.008 | 3.460 | 0.860 |
| W | M1V1 | 0.011 | 1.250 | 0.003 | 0.726 | 0.759 | | | | | | | | | |
| | M1V3 | 0.010 | 1.512 | 0.004 | 1.324 | 0.796 | | | | | | | | | |
| W | M2V1 | 0.017 | 2.060 | 0.009 | 2.804 | 0.841 | 0.005 | 1.535 | 0.806 | | | | | | |
| | M2V3 | 0.016 | 2.742 | 0.011 | 3.838 | 0.771 | 0.007 | 2.950 | 0.853 | 0.005 | 2.525 | 0.896 | 0.007 | 2.874 | 0.854 |
| W | S1V1 | 0.018 | 2.052 | 0.010 | 2.530 | 0.799 | 0.000 | 0.044 | 0.937 | | | | | | |
| | S2V3 | 0.009 | 1.552 | 0.003 | 1.625 | 0.834 | | | | | | | | | |
| W | L1V1 | 0.022 | 2.736 | 0.014 | 4.699 | 0.856 | 0.005 | 2.510 | 0.936 | 0.006 | 2.658 | 0.936 | 0.005 | 2.391 | 0.937 |
| | L2V3 | 0.008 | 1.374 | 0.002 | 1.410 | 0.922 | | | | | | | | | |
| | V1E1 | 0.010 | 1.312 | 0.003 | 0.889 | 0.804 | | | | | | | | | |
| W | V1E3 | 0.017 | 2.131 | 0.010 | 3.112 | 0.856 | 0.006 | 2.238 | 0.913 | 0.006 | 2.167 | 0.913 | 0.005 | 2.121 | 0.913 |
| | V2E1 | 0.012 | 2.003 | 0.006 | 2.980 | 0.878 | 0.003 | 1.380 | 0.894 | | | | | | |
| W | V2E3 | 0.016 | 2.595 | 0.010 | 3.932 | 0.821 | 0.006 | 2.797 | 0.887 | 0.006 | 2.772 | 0.886 | 0.006 | 2.732 | 0.892 |
| | V1M1 | 0.013 | 1.550 | 0.005 | 1.376 | 0.781 | | | | | | | | | |
| W | V1M3 | 0.018 | 2.235 | 0.011 | 3.263 | 0.843 | 0.006 | 2.016 | 0.877 | 0.004 | 1.475 | 0.904 | | | |
| | V2M1 | 0.019 | 1.469 | 0.004 | 1.275 | 0.820 | | | | | | | | | |
| W | V2M3 | 0.019 | 3.057 | 0.013 | 4.253 | 0.740 | 0.009 | 3.178 | 0.808 | 0.007 | 2.796 | 0.865 | 0.009 | 3.116 | 0.811 |
| W | V1S1 | 0.023 | 2.737 | 0.015 | 3.767 | 0.762 | 0.003 | 1.270 | 0.903 | | | | | | |
| | V2S3 | 0.006 | 1.012 | 0.000 | 0.132 | 0.903 | | | | | | | | | |
| W | V1L1 | 0.020 | 2.734 | 0.013 | 4.160 | 0.811 | 0.005 | 1.825 | 0.884 | | | | | | |
| | V2L3 | 0.009 | 1.415 | 0.003 | 1.344 | 0.880 | | | | | | | | | |
| | P1E1 | 0.012 | 1.539 | 0.005 | 1.548 | 0.853 | | | | | | | | | |
| W | P2E3 | 0.018 | 0.740 | 0.012 | 4.675 | 0.854 | 0.008 | 2.979 | 0.875 | 0.007 | 2.830 | 0.875 | 0.007 | 2.980 | 0.888 |
| | P1M1 | 0.012 | 1.441 | 0.004 | 1.208 | 0.820 | | | | | | | | | |
| W | P2M3 | 0.019 | 2.898 | 0.013 | 4.322 | 0.789 | 0.010 | 3.188 | 0.805 | 0.007 | 2.848 | 0.876 | 0.009 | 3.055 | 0.817 |
| W | P1L1 | 0.015 | 2.231 | 0.009 | 2.779 | 0.772 | 0.001 | 0.323 | 0.838 | | | | | | |
| | P1L3 | 0.006 | 0.705 | 0.000 | 0.000 | 0.888 | | | | | | | | | |
| W | P2L1 | 0.022 | 3.720 | 0.016 | 5.870 | 0.771 | 0.010 | 4.001 | 0.849 | 0.010 | 4.040 | 0.849 | 0.010 | 4.025 | 0.868 |
| | P2L3 | 0.008 | 1.173 | 0.002 | 0.585 | 0.834 | | | | | | | | | |
| W | P1S1 | 0.023 | 2.874 | 0.016 | 4.225 | 0.784 | 0.005 | 1.687 | 0.898 | | | | | | |
| | P2S3 | 0.007 | 1.146 | 0.001 | 0.572 | 0.912 | | | | | | | | | |
| | P1S3 | 0.005 | 0.677 | 0.000 | -1.037 | 0.917 | | | | | | | | | |
| W | P2S1 | 0.024 | 3.475 | 0.018 | 5.363 | 0.770 | 0.008 | 2.968 | 0.870 | 0.008 | 3.037 | 0.870 | 0.007 | 2.947 | 0.886 |

| PANEL a--UNIVARIATE | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Unadjusted | | CAPM | | | Fama French-3 Factor | | | Carhart | | | Fama French-5 Factor | | |
| P[#] | I.S.[*] | Mean Return | t-stat | α | t-stat | adj-R2 | α | t-stat | adj-R2 | A | t-stat | adj-R2 | A | t-stat | adj-R2 |
| | L1P1 | 0.017 | 2.294 | 0.010 | 3.606 | 0.862 | 0.002 | 0.968 | 0.914 | | | | | | |
| W | L1P3 | 0.020 | 3.327 | 0.015 | 5.944 | 0.840 | 0.008 | 3.749 | 0.907 | 0.008 | 3.945 | 0.908 | 0.007 | 3.805 | 0.925 |
| | L2P1 | 0.011 | 1.231 | 0.002 | 0.787 | 0.882 | | | | | | | | | |
| W | L2P3 | 0.011 | 1.565 | 0.004 | 1.949 | 0.909 | | | | | | | | | |
| | S1P1 | 0.020 | 2.473 | 0.012 | 3.723 | 0.830 | 0.003 | 1.200 | 0.905 | | | | | | |
| W | S1P3 | 0.021 | 3.167 | 0.015 | 4.739 | 0.772 | 0.006 | 2.353 | 0.856 | 0.006 | 2.300 | 0.855 | 0.006 | 2.270 | 0.880 |
| | S2P1 | 0.006 | 0.763 | 0.000 | -0.646 | 0.899 | | | | | | | | | |
| W | S2P3 | 0.010 | 1.647 | 0.004 | 2.068 | 0.892 | 0.005 | 2.084 | 0.891 | 0.004 | 1.945 | 0.890 | | | |
| | E1P1 | 0.011 | 1.420 | 0.004 | 1.268 | 0.863 | | | | | | | | | |
| W | E2P3 | 0.017 | 2.846 | 0.012 | 4.352 | 0.805 | 0.008 | 2.855 | 0.832 | 0.007 | 2.860 | 0.833 | 0.007 | 2.854 | 0.871 |
| | M1P1 | 0.012 | 1.398 | 0.004 | 1.135 | 0.835 | | | | | | | | | |
| W | M2P3 | 0.018 | 2.911 | 0.012 | 4.619 | 0.816 | 0.009 | 3.378 | 0.832 | 0.007 | 3.008 | 0.873 | 0.008 | 3.305 | 0.854 |
| W | P1V1 | 0.015 | 1.662 | 0.006 | 1.768 | 0.831 | | | | | | | | | |
| | P1V3 | 0.011 | 1.696 | 0.005 | 1.905 | 0.843 | | | | | | | | | |
| W | P2V1 | 0.013 | 1.534 | 0.005 | 1.339 | 0.780 | | | | | | | | | |
| | P2V3 | 0.015 | 2.781 | 0.010 | 4.303 | 0.815 | 0.007 | 3.599 | 0.892 | -0.318 | -8.204 | 0.891 | | | |
| | V1P1 | 0.015 | 1.756 | 0.007 | 2.198 | 0.867 | 0.001 | 0.327 | 0.949 | | | | | | |
| W | V1P3 | 0.015 | 1.775 | 0.007 | 2.002 | 0.822 | 0.001 | 0.395 | 0.925 | | | | | | |
| | V2P1 | 0.010 | 1.458 | 0.002 | 1.415 | 0.875 | | | | | | | | | |
| W | V2P3 | 0.016 | 2.861 | 0.011 | 4.979 | 0.853 | 0.007 | 3.735 | 0.915 | 0.007 | 3.661 | 0.914 | 0.006 | 3.991 | 0.942 |
| **Conditional bivariate, 3x2** | | | | | | | | | | | | | | | |
| | | Unadjusted | | CAPM | | | Fama French-3 Factor | | | Carhart | | | Fama French-5 Factor | | |
| P[#] | I.S.[*] | Mean Return | t-stat | α | t-stat | adj-R2 | α | t-stat | adj-R2 | α | t-stat | adj-R2 | A | t-stat | adj-R2 |
| | S1E1 | 0.021 | 2.597 | 0.014 | 3.725 | 0.951 | 0.001 | 0.524 | 0.951 | | | | | | |
| W | S1E2 | 0.026 | 3.579 | 0.019 | 6.318 | 0.825 | 0.008 | 4.180 | 0.935 | 0.008 | 4.183 | 0.935 | -0.014 | -0.402 | 0.935 |
| | S3E1 | 0.004 | 0.607 | 0.000 | -1.770 | 0.952 | | | | | | | | | |
| W | S3E2 | 0.021 | 2.597 | 0.013 | 3.725 | 0.797 | 0.001 | 0.524 | 0.951 | | | | | | |
| W | E1S1 | 0.019 | 2.370 | 0.012 | 3.272 | 0.804 | 0.000 | 0.290 | 0.943 | | | | | | |
| | E1S2 | 0.005 | 0.720 | 0.000 | -0.949 | 0.924 | | | | | | | | | |
| W | E3S1 | 0.022 | 3.120 | 0.016 | 5.440 | 0.840 | 0.007 | 2.949 | 0.918 | 0.006 | 2.940 | 0.927 | 0.006 | 2.820 | 0.925 |
| | E3S2 | 0.011 | 1.769 | 0.005 | 3.286 | 0.945 | 0.005 | 3.135 | 0.944 | 0.005 | 3.123 | 0.943 | 0.005 | 3.048 | 0.944 |
| W | S1L1 | 0.026 | 3.752 | 0.020 | 5.845 | 0.763 | 0.007 | 3.450 | 0.917 | 0.008 | 3.622 | 0.918 | 0.007 | 3.328 | 0.918 |
| | S3L2 | 0.004 | 0.539 | -0.003 | -0.915 | 0.944 | | | | | | | | | |
| | L1E1 | 0.017 | 2.535 | 0.011 | 3.669 | 0.807 | 0.002 | 0.759 | 0.896 | | | | | | |
| W | L1E2 | 0.022 | 3.470 | 0.016 | 5.860 | 0.812 | 0.008 | 3.872 | 0.898 | 0.008 | 3.963 | 0.898 | 0.008 | 3.761 | 0.903 |
| | L3E1 | 0.006 | 0.760 | -0.001 | -0.536 | 0.870 | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Unadjusted | | CAPM | | | Fama French-3 Factor | | | Carhart | | | Fama French-5 Factor | | |
| P# | I.S.* | Mean Return | t-stat | α | t-stat | adj-R2 | α | t-stat | adj-R2 | A | t-stat | adj-R2 | A | t-stat | adj-R2 |
| W | L3E2 | 0.009 | 1.139 | 0.001 | 0.540 | 0.907 | | | | | | | | | |
| W | E1L1 | 0.015 | 2.199 | 0.009 | 3.245 | 0.852 | 0.000 | 0.387 | 0.924 | | | | | | |
| | E1L2 | 0.008 | 1.089 | 0.000 | 0.375 | 0.866 | | | | | | | | | |
| W | E3L1 | 0.022 | 3.450 | 0.016 | 6.324 | 0.843 | 0.010 | 4.455 | 0.899 | 0.010 | 4.492 | 0.899 | 0.010 | 4.379 | 0.903 |
| | E3L2 | 0.012 | 1.642 | 0.005 | 2.351 | 0.915 | 0.002 | 0.979 | 0.934 | | | | | | |
| W | L1S1 | 0.024 | 3.382 | 0.018 | 5.276 | 0.781 | 0.006 | 2.560 | 0.922 | 0.006 | 2.901 | 0.926 | 0.005 | 2.480 | 0.922 |
| | L3S2 | 0.002 | 0.345 | -0.004 | -2.852 | 0.949 | | | | | | | | | |
| | E1M1 | 0.012 | 1.442 | 0.004 | 1.213 | 0.822 | | | | | | | | | |
| W | E3M2 | 0.018 | 2.699 | 0.012 | 4.939 | 0.876 | 0.007 | 3.240 | 0.907 | 0.005 | 2.890 | 0.938 | 0.007 | 3.103 | 0.913 |
| | S1M1 | 0.021 | 2.569 | 0.014 | 3.669 | 0.798 | 0.001 | 0.670 | 0.946 | | | | | | |
| W | S1M2 | 0.026 | 3.590 | 0.020 | 6.015 | 0.803 | 0.008 | 3.683 | 0.923 | 0.007 | 3.331 | 0.936 | 0.008 | 3.603 | 0.926 |
| | S3M1 | 0.006 | 0.820 | 0.000 | 0.000 | 0.913 | | | | | | | | | |
| W | S3M2 | 0.006 | 0.932 | -0.003 | -0.156 | 0.916 | | | | | | | | | |
| | L1M1 | 0.019 | 2.653 | 0.012 | 3.875 | 0.800 | 0.004 | 1.351 | 0.872 | | | | | | |
| W | L1M2 | 0.020 | 3.288 | 0.004 | 1.351 | 0.872 | | | | | | | | | |
| | L3M1 | 0.006 | 0.661 | -0.002 | -0.680 | 0.839 | | | | | | | | | |
| W | L3M2 | 0.009 | 1.244 | 0.002 | 0.828 | 0.885 | | | | | | | | | |
| | M1E1 | 0.013 | 1.604 | 0.006 | 1.535 | 0.799 | | | | | | | | | |
| W | M3E2 | 0.018 | 2.700 | 0.012 | 4.718 | 0.863 | 0.007 | 3.001 | 0.895 | 0.005 | 2.595 | 0.929 | 0.007 | 2.870 | 0.900 |
| W | M1L1 | 0.018 | 2.331 | 0.011 | 3.358 | 0.827 | 0.003 | 1.102 | 0.890 | | | | | | |
| | M1L2 | 0.010 | 1.212 | 0.002 | 0.664 | 0.804 | | | | | | | | | |
| W | M3L1 | 0.021 | 3.242 | 0.015 | 5.348 | 0.813 | 0.008 | 3.257 | 0.881 | 0.006 | 2.870 | 0.913 | 0.007 | 3.170 | 0.889 |
| | M3L2 | 0.011 | 1.462 | 0.004 | 1.404 | 0.870 | | | | | | | | | |
| W | M1S1 | 0.020 | 2.411 | 0.012 | 3.770 | 0.806 | 0.001 | 0.631 | 0.930 | | | | | | |
| | M1S2 | 0.008 | 1.020 | 0.000 | 0.212 | 0.833 | | | | | | | | | |
| W | M3S1 | 0.023 | 3.210 | 0.016 | 5.110 | 0.799 | 0.006 | 2.520 | 0.899 | 0.004 | 2.023 | 0.927 | 0.006 | 2.422 | 0.903 |
| | M3S2 | 0.009 | 1.320 | 0.002 | 1.040 | 0.881 | | | | | | | | | |
| W | L1V1 | 0.021 | 2.890 | 0.014 | 4.715 | 0.828 | 0.005 | 2.085 | 0.914 | 0.005 | 2.346 | 0.916 | 0.005 | 2.032 | 0.915 |
| | L3V2 | 0.008 | 1.121 | 0.000 | 0.503 | 0.926 | | | | | | | | | |
| | V1E1 | 0.011 | 1.200 | 0.003 | 0.639 | 0.810 | | | | | | | | | |
| W | V1E2 | 0.016 | 1.957 | 0.008 | 2.704 | 0.862 | 0.004 | 1.991 | 0.952 | 0.004 | 1.957 | 0.952 | | | |
| | V3E1 | 0.001 | 1.648 | 0.004 | 2.116 | 0.897 | -0.001 | -0.311 | 0.940 | | | | | | |
| W | V3E2 | 0.017 | 2.867 | 0.011 | 4.562 | 0.820 | 0.007 | 3.678 | 0.910 | 0.007 | 3.560 | 0.910 | 0.007 | 3.558 | 0.912 |
| W | E1V1 | 0.011 | 1.240 | 0.003 | 0.728 | 0.803 | | | | | | | | | |
| | E1V2 | 0.013 | 1.983 | 0.007 | 3.196 | 0.900 | 0.002 | 1.118 | 0.921 | | | | | | |
| W | E3V1 | 0.017 | 2.212 | 0.010 | 3.620 | 0.881 | 0.005 | 2.326 | 0.930 | 0.006 | 2.471 | 0.931 | 0.005 | 2.208 | 0.932 |
| | E3V2 | 0.017 | 2.790 | 0.011 | 4.440 | 0.826 | 0.006 | 3.516 | 0.913 | 0.006 | 3.342 | 0.913 | 0.006 | 3.413 | 0.920 |
| | M1V2 | 0.011 | 1.515 | 0.004 | 1.393 | 0.814 | | | | | | | | | |

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| | | Unadjusted | | CAPM | | | Fama French-3 Factor | | | Carhart | | | Fama French-5 Factor | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P[#] | I.S.[*] | Mean Return | t-stat | α | t-stat | adj-R2 | α | t-stat | adj-R2 | A | t-stat | adj-R2 | A | t-stat | adj-R2 |
| W | M1V1 | 0.016 | 1.850 | 0.008 | 2.035 | 0.787 | 0.001 | 0.365 | 0.931 | | | | | | |
| W | M3V1 | 0.018 | 2.195 | 0.010 | 3.255 | 0.853 | 0.004 | 1.275 | 0.898 | | | | | | |
| | M3V2 | 0.014 | 2.432 | 0.009 | 3.231 | 0.777 | 0.004 | 1.798 | 0.864 | | | | | | |
| W | S1V1 | 0.024 | 2.870 | 0.016 | 4.292 | 0.793 | 0.003 | 1.739 | 0.957 | | | | | | |
| | S3V2 | 0.005 | 0.676 | -0.002 | -1.503 | 0.954 | | | | | | | | | |
| | M1P1 | 0.013 | 1.603 | 0.006 | 1.161 | 0.827 | | | | | | | | | |
| W | M3P2 | 0.017 | 2.624 | 0.011 | 4.420 | 0.857 | 0.007 | 2.940 | 0.878 | 0.005 | 2.640 | 0.939 | 0.007 | 2.798 | 0.890 |
| | S1P1 | 0.023 | 2.784 | 0.015 | 4.440 | 0.827 | 0.003 | 1.594 | 0.951 | | | | | | |
| W | S1P2 | 0.025 | 3.408 | 0.018 | 5.593 | 0.803 | 0.006 | 3.233 | 0.936 | 0.007 | 3.472 | 0.937 | 0.006 | 3.204 | 0.943 |
| | S3P1 | 0.004 | 0.552 | -0.003 | -1.830 | 0.943 | | | | | | | | | |
| W | S3P2 | 0.008 | 1.309 | 0.002 | 1.492 | 0.957 | | | | | | | | | |
| | L1P1 | 0.016 | 2.367 | 0.010 | 3.263 | 0.804 | 0.005 | 0.211 | 0.895 | | | | | | |
| W | L1P2 | 0.022 | 3.707 | 0.010 | 4.500 | 0.890 | 0.010 | 4.689 | 0.891 | 0.009 | 4.605 | 0.907 | 0.009 | 4.606 | 0.908 |
| | L3P1 | 0.006 | 0.717 | -0.002 | -0.706 | 0.893 | | | | | | | | | |
| W | L3P2 | 0.009 | 1.246 | 0.002 | 0.805 | 0.868 | | | | | | | | | |
| | P1E1 | 0.014 | 1.670 | 0.006 | 2.205 | 0.878 | 0.000 | -0.225 | 0.934 | | | | | | |
| W | P3E2 | 0.018 | 2.817 | 0.012 | 5.570 | 0.890 | 0.008 | 3.725 | 0.912 | 0.007 | 3.560 | 0.912 | 0.007 | 3.770 | 0.927 |
| | V1M1 | 0.014 | 1.570 | 0.006 | 1.481 | 0.808 | | | | | | | | | |
| W | V1M2 | 0.014 | 1.558 | 0.005 | 1.620 | 0.858 | | | | | | | | | |
| | V3M1 | 0.012 | 1.932 | 0.006 | 2.512 | 0.845 | 0.002 | 0.825 | 0.880 | | | | | | |
| W | V3M2 | 0.015 | 2.487 | 0.009 | 3.423 | 0.789 | 0.005 | 2.098 | 0.880 | 0.003 | 1.493 | 0.923 | | | |
| W | V1S1 | 0.020 | 2.132 | 0.011 | 2.751 | 0.807 | 0.000 | -0.565 | 0.972 | | | | | | |
| | V3S2 | 0.009 | 1.462 | 0.003 | 1.591 | 0.906 | | | | | | | | | |
| W | V1L1 | 0.019 | 2.248 | 0.011 | 3.260 | 0.840 | 0.002 | 0.987 | 0.956 | | | | | | |
| | V3L2 | 0.009 | 1.572 | 0.004 | 1.962 | 0.908 | 0.001 | 0.719 | 0.947 | | | | | | |
| | E1P1 | 0.011 | 1.421 | 0.004 | 1.339 | 0.947 | | | | | | | | | |
| W | E3P2 | 0.018 | 2.876 | 0.012 | 5.306 | 0.870 | 0.007 | 3.409 | 0.895 | 0.007 | 3.219 | 0.895 | 0.007 | 3.431 | 0.914 |
| | P1M1 | 0.015 | 1.720 | 0.007 | 2.049 | 0.859 | 0.001 | 0.452 | 0.926 | | | | | | |
| W | P3M2 | 0.016 | 2.538 | 0.010 | 4.295 | 0.864 | 0.006 | 2.681 | 0.890 | 0.004 | 2.239 | 0.935 | 0.005 | 2.547 | 0.904 |
| W | P1S1 | 0.021 | 2.561 | 0.014 | 4.090 | 0.844 | 0.003 | 1.365 | 0.938 | | | | | | |
| | P1S2 | 0.080 | 1.061 | 0.005 | 3.323 | 0.942 | 0.004 | 2.807 | 0.942 | 0.004 | 2.795 | 0.942 | 0.004 | 2.780 | 0.957 |
| W | P3S1 | 0.020 | 3.005 | 0.014 | 4.090 | 0.844 | 0.003 | 1.365 | 0.938 | | | | | | |
| | P3S2 | 0.011 | 1.795 | 0.005 | 3.323 | 0.942 | 0.004 | 2.807 | 0.942 | 0.004 | 2.795 | 0.942 | 0.004 | 2.780 | 0.957 |
| W | P1L1 | 0.019 | 2.520 | 0.012 | 4.035 | 0.848 | 0.004 | 1.673 | 0.895 | | | | | | |
| | P3L2 | 0.011 | 1.549 | 0.004 | 1.925 | 0.912 | | | | | | | | | |
| | P1L2 | 0.011 | 1.253 | 0.003 | 0.831 | 0.873 | | | | | | | | | |
| W | P3L1 | 0.021 | 3.414 | 0.015 | 6.051 | 0.902 | 0.008 | 3.927 | 0.902 | 0.008 | 4.048 | 0.902 | 0.007 | 4.003 | 0.920 |
| W | P1V1 | 0.017 | 1.880 | 0.008 | 2.423 | 0.851 | 0.002 | 1.005 | 0.950 | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Unadjusted | | CAPM | | | Fama French-3 Factor | | | Carhart | | | Fama French-5 Factor | | |
| P# | I.S.* | Mean Return | t-stat | α | t-stat | adj-R2 | α | t-stat | adj-R2 | A | t-stat | adj-R2 | A | t-stat | adj-R2 |
| | P1V2 | 0.013 | 1.726 | 0.006 | 2.088 | 0.863 | 0.005 | 0.196 | 0.886 | | | | | | |
| W | P3V1 | 0.016 | 2.074 | 0.009 | 2.963 | 0.856 | 0.003 | 0.120 | 0.920 | | | | | | |
| | P3V2 | 0.015 | 2.874 | 0.010 | 4.984 | 0.815 | 0.007 | 4.158 | 0.914 | 0.007 | 4.117 | 0.913 | 0.006 | 4.296 | 0.935 |
| | V1P1 | 0.015 | 1.729 | 0.007 | 2.089 | 0.862 | 0.001 | 0.379 | 0.961 | | | | | | |
| W | V1P2 | 0.012 | 1.393 | 0.004 | 1.054 | 0.791 | | | | | | | | | |
| | V3P1 | 0.013 | 1.924 | 0.006 | 2.645 | 0.866 | 0.001 | 0.383 | 0.924 | | | | | | |
| W | V3P2 | 0.014 | 2.709 | 0.009 | 4.589 | 0.853 | 0.006 | 3.797 | 0.924 | 0.006 | 3.706 | 0.924 | 0.005 | 3.910 | 0.943 |

#Column 1 named 'P' shows the Portfolios where 'W' represents the 'winner' portfolios as per the trends identified by the authors from studying the univariate attributes.

*Column 2 named 'I.S.' indicates the Investment Strategies

## 6. Conclusions

In this paper, we try to identify profitable investment styles on the Indian stock market by using various combinations of important asset pricing anomalies. Using NSE 200 stocks, three different investment styles, i.e.- univariate, independent bivariate and conditional bivariate are created with the following attributes-size, value, volume, profitability, earnings surprises and prior returns. We start with the best performing univariate investment style and then augment it with attributes to explore the possibility of an improvement in returns.

The results indicate that on an absolute return basis bivariate strategies do not outperform univariate strategies. The highest unadjusted returns of 2.7% per month is obtained from employing S1 (small size sorted strategy) on a standalone basis as well as bivariate M2S1(price momentum-size) and L1S1(liquidity-size). Employing risk models, we find that the unifactor CAPM can explain returns only in 42% of the investment strategies. The size and value factors of the Fama &French(1993) model perform better as they explain 42% of the alphas. However, additional momentum factor (Carhart, 1997) and profitability, investment factors (Fama &French, 2015) do not have any incremental power in explaining the alphas. Hence, we suggest the three factor FF model as the benchmark for evaluating investment strategies in the Indian context.

In sum, the highest risk adjusted returns are obtained from constructing the conditional bivariate investment strategies viz. E2L1 (earnings momentum-Liquidity), M2S1 (price momentum-size), E2M3 (earnings momentum-price momentum). (1.1% per month). This means that these unexplained strategies hold a potential for supernormal returns.

Results obtained in this paper have significant policy implications and are of immense value to portfolio managers, market regulator and other stakeholders. Portfolio managers and asset management companies who are in pursuit of earning supernormal returns, could use this information on designing portfolios from top 200 stocks by combining company attributes.

Short selling restrictions exist in the Indian stock market. However, in view of the low returns on the short side portfolio (losers), such restrictions should be relaxed to facilitate execution of long-short strategy given their low implicit financing cost. Thus, a policy recommendation to the market regulator is to withdraw short selling restrictions.

On the other hand, presence of significantly positive alphas even at the multifactor risk models stage implies violations of the efficient market hypothesis. Thus, strengthening corporate governance standards, better corporate disclosures and investor education would help in making markets informationally efficient. In addition, from a research perspective the unexplained alphas prompt a search for new risk factors or a behavioral justification.

The paper contributes to the literature on market efficiency and style based trading strategies for the Indian stock market.

**Notes**

1. NSE200 market cap as percentage of total market cap=82% as of June, 2016

2. Net stock issues have not provided anomalous returns in the Indian stock market (Sehgal et al, 2012).

3. In the contrarian strategy, returns from previous 48 months have been used for formation of portfolios, 6 months is the holding period. In case of contrarian portfolios, the middle number of 12 months implies the period which is skipped between portfolio holding and portfolio formation periods, in order to control for short term momentum patterns in stock returns (See Fama and French, 1996).

4. An inverse relationship between returns and investment was obtained.

5. Monthly average unadjusted returns on contrarian strategy, P1 = 0.013(t-stat=1.76), P5 = 0.018(t-stat=2.36).

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