Article

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Size, Value, and Momentum Effects in Stock Returns: Evidence from India

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Abstract

We examine in this article if stock returns show a pattern which indicates certain anomalies predominantly size, value, and momentum effects. We also examine whether asset pricing models capture mean excess returns on portfolios constructed based on size–value and size–momentum factors. We find that average stock returns exhibit patterns that have size, value, and momentum effects. We also show evidence that the empirical results do not fully support asset-pricing models. Capital asset-pricing model (CAPM) does not capture average returns on portfolios. Fama–French three-factor model partly explains average returns on size–value sorted portfolios while Carhart four-factor model captures returns on size–momentum sorted portfolios mainly small size-winner portfolio. Hence, size, value and momentum factors continue to exist in Indian stock market and they are found to be profitable investment strategies which would maximize invested wealth of the investors.

Key Words

Stock returns, CAPM, Fama–French, Momentum effect

Introduction

Financial literature on asset-pricing documents that stock returns are determined by several factors that include market (β), size, value and momentum (see Fama & French, 1996). Recent researches in asset pricing bring out some new factors such as liquidity, accruals, asset growth that can also explain stock returns (see Cooper, Gulen, & Schill, 2008; Fama & French, 2008). However, our study is confined to only four factors mentioned in the beginning. Capital asset-pricing model (CAPM) founded by Sharpe (1964) speaks up of market β_s which can capture stock returns. This empirical finding is subsequently supported by Lintner (1965) and Black (1972). Banz (1981) discovers a new factor which is popularly called as size effect. The study strongly documents that small size firms (small stocks in terms of market capitalization) are characterized to give higher returns vis-à-vis big size firms (big stocks in terms of market capitalization). Keim (1983) argues that stock returns are negatively related with firm size as big size stocks perform better than small size stocks by providing extra risk-adjusted returns. The study also shows that excess returns on stocks are more pronounced in the first week of January of every year during the study period. In 1980s, researches in investment management establish relation between corporate fundamentals and stock returns. Basu (1977) finds that portfolios with low price-to-earning (PE) ratios yield higher risk-adjusted returns than portfolios of high PE ratios. Basu's empirical results do not support the efficient market hypotheses as stock returns are inversely related with PE ratios. Bhandari (1988) makes revelation that stock returns are positively related with leverage (debt-ratio of firms). Further, the study shows the evidence for a positive relation of stock returns with leverage once beta, size and January factors are controlled. Stattman's (1980) study divulges positive relation of book equity to market equity ratio (BE/ME) with stock returns. Rosenberg, Reid, and Lanstein (1985) experiment two investment strategies based on BE/ME and specific stock return reversal. Their study suggests to buy stocks with high BE/ME ratios and sell stocks with low BE/ME ratios while specific stock return reversal is again an investment strategy which calculates return on stocks for previous month and its relation with stock market factors. They find the strategies to be

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profitable and viable. Chan, Hamao, and Lakonishok (1991) document the existence of positive relation between stock returns and financial variables for Japanese market. Their study encapsulates the ability of corporate fundamentals and financial variables, namely, BE/ME, dividend yield, cash yield and size in capturing cross-sectional differences in stock returns. Chui and Wei (1998) experiment the relation between stock returns and market beta, BE/ME and size for five Pacific Basin equity markets and document that there is weak relation between stock returns and market beta in all five countries while BE/ME and size have robustness in terms of explaining stock returns. Fama and French (1992) verify whether stock return pattern has any systematic differences due to the risk factors and find that average stock returns are captured by two important factors namely size and BE/ME. Lakonishok, Shleifer, and Vishny (1994) develop investment strategies based on value stocks (out of favour) and glamour stocks. The investment strategies suggest that value stocks tend to outperform glamour stocks as latter have low earnings and cash flow. De Bondt and Thaler (1985) record new evidence on investors' overreaction to new information. They find a weak form of market inefficiency due to stock prices being impacted by investors' overreaction. De Bondt and Thaler (1987) find that excess returns on winner stocks (stocks that yielded higher returns in the past) have negative correlation with excess returns on losers stocks (stocks that provided lower returns in the past). They conclude that systematic reversals in stock returns are due to investors' overreaction but not the factor of market risk as documented by CAPM. Fama and French (1993) bring a prominent asset-pricing model which is popularly called three-factor model which comprises market factor (β), size and BE/ME. The three-factor model identifies two new risk proxies namely SMB and HML that stand for small minus big and high minus low, respectively. SMB is meant to mimic the risk factor in relation to returns on size while HML is meant to mimic the risk factor in relation to returns on BE/ME. They *inter alia* conclude that the three-factor model seems a better asset-pricing model as it captures average stock returns. Fama and French (1995) verify if firm's earnings and returns respond to market, size and BE/ME factors, and find that market and size factors explain earnings and returns but no link is found between BE/ME and earnings and returns. Jegadeesh and Titman (1993) discover an investment strategy namely momentum strategy which is basically a trading technique of buying stocks that gave higher returns in the past and selling stocks that yielded poor returns in the past is used. They (authors) form portfolios based on 3–12 months average stock returns and hold the portfolios for the same periods. They earn significant returns on the portfolio. Fama and French (1996) introduce multifactor model which comprises market, size, value and momentum factors. They show evidence that their multifactor model explains almost all stock return anomalies including long-term momentum returns but fails to capture short-term momentum profits discovered by Jegadeesh and Titman (1993). Carhart (1997) tests the persistence of one-year momentum effect in equity mutual funds with a four-factor model which adds Jegadeesh and Titman's (1993) momentum factor over and above Fama–French (1993) three-factor model. The study sheds light that buying the previous year's good performing mutual funds and selling previous year's badly performing mutual funds is a profitable investment strategy and mean returns on mutual fund portfolios are attributable to market beta, size, value and momentum. Daniel, Hirshleifer, and Subrahmanyam (1998) demonstrate that investors do overreact to private information and underreact to public information. The investors' continuous overreaction triggers returns autocorrelation. Fama and French (2008) document new stock returns anomalies namely accruals, micro-size effect (tiny stock), net stock issues, profitability and asset growth etc. are associated with abnormal stock returns. They find a strong micro-size effect, value effect, momentum profit but less robustness is found with profitability and asset growth. Chui, Titman, and Wei (2010) evaluate the impacts of cultural differences in momentum profits and document that cultural differences are positively related with magnitude of momentum profits, trading volume and volatility. They also show that momentum profits have positive relation with analyst forecast deviation and negative relation with firm size. Fama and French (2012) experiment an extensive study on the presence of size, value and momentum effects in stock returns for the equity markets of North America, Europe, Japan and Asia Pacific markets. They find a strong momentum effects in all regions excepting Japan, value effect is larger for small size stocks. Pan, Tang, and Xu (2013) demonstrate weekly momentum effects in emerging markets and conclude that short-term momentum effect prevails everywhere. In Indian environment, limited studies have been done. Connon and Sehgal (2003) evaluate the Fama–French three-factor model in Indian stock market and find that size and value factors are pervasive in the market and three-factor model is found to be a better descriptor. Sehgal and Jain (2011) find a strong short-term momentum pattern in stock returns and the momentum profits are not captured by CAPM, Fama–French model, and Carhart four-factor model. Sehgal and Balakrishnan (2013) re-examine and uphold the presence of size and value effects in Indian stock market. Their empirical findings suggest that average returns on stocks are substantially explained by Fama–French three-factor model (1993) vis-à-vis one-factor CAPM. Balakrishnan (2014) re-examines size, value, momentum effects in stock returns and the study records evidence that stock returns are integrated with core CAPM anomalies such as size, value and momentum. The study also furthers the evidence that Fama–French model continues to perform well in explaining average stock returns notwithstanding it fails to explain short-term momentum profits. Carhart four-factor model (1997) does not make significant contribution to explain

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stock returns. Recent researches that are undertaken in the matured markets (e.g., Fama & French, 2008, 2014) show the size effect by detailing the size groups into micro, small and big. Similarly, momentum effect is tested by forming portfolios with cumulative stock returns (lagged returns on stock) rather than stocks past returns. In the backdrop of global evidences, this study examines micro-size, value and momentum effects in stock returns for Indian stock market. This study also evaluates the competing asset-pricing models' efficiency to capture stock returns. Most of the previous studies in Indian context experiment the size effect for only small stocks while value effect is tested with a different breakpoints for classifying the stocks. Moreover, momentum strategy is examined by forming portfolios using past average stock returns (prior stock returns). None of the previous studies carried out for Indian market verifies micro-size (tiny stocks) effect and momentum effect with stocks' cumulative returns for constructing portfolios as documented by Fama and French (2008, 2012). Hence, this study fills the above gap.

The study is presented as follows. The second section presents the data and their sources. The third section describes the methodological procedures being used to form portfolios. The next section shows the performance of size–value and size–momentum sorted portfolios in terms of mean excess returns and same section also discusses the empirical results of asset pricing models. The last section offers concluding remarks.

Data

The study uses data for 484 companies. The entire sample companies are listed on Bombay Stock Exchange (BSE) 500 which is broad based one. The data include month end adjusted share prices,[1] market capitalization[2] (MC), and price-to-book (P/B) ratio are from CMIE Prowess. The study period is January 1997 to August 2014. MC represents the company size and calculated as the natural log MC. P/B ratio is taken to be the proxy of company value. The study also uses BSE-200 index return as the proxy of market and its data is also taken from CMIE Prowess. Finally, 91-day T-Bill[3] return is used as proxy of risk-free rate of return. Data source for risk free rate is the website of Reserve Bank of India (RBI).

Methodology for Size–value and Size–momentum Sorted Portfolios

Fama and French (1993) sort the sample stocks on market capitalization and book equity to market equity (BE/ME) by using the same breakpoints being used by NYSE to allocate portfolio. This enables them to avoid sorts that are dominated by micro (tiny) stocks of AMEX and NASDAQ. Generally, in US market, tiny stocks are considered to be less important. Fama and French (2008) sort the sample stocks on market capitalization into three size groups namely micro, small and big. Breakpoints for size classification being used in the study, 20th, 30th and 50th percentiles. Bottom 20th percentile of the stocks are placed in micro group, next 30th percentile of the securities fall in the small group and top 50th percentile of the stocks are put in big group. Fama and French (2012) sort the sample securities on market capitalization using breakpoints of bottom 10th percentile of stocks as small while top 90th percentile of stocks as big stocks. In the case of BE/ME, stocks are sorted using the breakpoints of bottom 30th percentile of the stocks are growth (G), median 40th percentile of the stocks are neutral (N) and top 30th percentile of the stocks are value (V). From the above size classifications, it is noted that micro (tiny) stocks are brought to the mainstream. Hence, in line with Fama and French (2012), we do double sorting technique to form stylized portfolios based on size–value as purely company characteristics measures while size–momentum are of partly company characteristic and partly stocks prior returns measures. As for portfolio construction, we keep a time lag between portfolio formation and financial year closing month. In India, March month happens to be the closing month of every financial year; we keep a three-month gap from the closing of the financial year to the portfolio formation with an assumption that financial statement may reach the investors' hand only after three months from the end of the financial year. In the month of June of year (t), we rank the sample stocks by taking market capitalization as a measure of size and classify the stocks into two groups namely small and big. Bottom 10 per cent of the stocks are named as small (S) while top 90 per cent of the securities are called as big (B). Next, stocks are grouped into three categories based on P/B ratio which is the measure of company value. The value groups are namely low (L), neutral (N) and growth (G). To the above classification based on P/B ratio, we use the following breakpoints. In the month of March of year (t), 30 per cent of the stocks from bottom fall in the low (L) group, next 40 per cent of stocks are in the bracket of neutral (N) group and above 70 per cent of the stocks are put in the growth (G) group. Then from the intersection of two size and three value groups, six portfolios consisting of S/L, S/N, S/G, B/L, B/N and B/G are formed. The S/L portfolio carries small size and low value[4] stocks, while B/G comprises big size and high value[5] (growth) stocks. Next, equally weighted excess returns on each portfolio on monthly basis are calculated from July 1997 (t) to June 1998 (t+1). Then we revise the ranking process in June 1998 and this task continues up to August 2014. Finally, mean excess returns[6] on each portfolio are calculated from July 1997 to August 2014.

Then we form SMB, stands for small minus big, a portfolio which mimics the risk factor of portfolios' returns in relation to company size and it is computed by subtracting monthly simple weighted average returns on three big stock portfolios namely B/L, B/N and B/G from monthly

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simple average returns on three small stock portfolios namely S/L, S/N and S/G. In the SMB specification, we use the abbreviations of N and G which stand for neutral and growth, respectively. The above abbreviations represent medium and high value stocks according to P/B ratio classification and hence, we show SMB as follows:

$$\text{SMB} = (\text{S/L} + \text{S/N} + \text{S/G})/3 - (\text{B/L} + \text{B/N} + \text{B/G})/3 \quad (1)$$

Next, we also construct LMH, stands for low minus high, portfolio which mimics the risk factor of portfolios' returns in relation to company value and LMH is computed by subtracting monthly simple weighted average returns on two growth stock portfolios namely S/G and B/G from monthly simple average returns on low value stock portfolios namely S/L and B/L. In the LMH specification, we use the abbreviation of *G* which construes high value stock in the value classification based on P/B ratio. Hence, we use G in place of H in the LMH specification as under:

$$\text{LMH} = (\text{S/L} + \text{B/L})/2 - (\text{S/G} + \text{B/G})/2 \quad (2)$$

Fama and French (1993) estimate HML, stands for high minus low, mimics the risk factor associated with company value. They form HML using BE/ME while we estimate LMH using P/B ratio which is inversely related to BE/ME. Because, BE/ME ratios for the sample companies are not directly available in the data source. Hence, the interpretation of the results of value factor will be opposite to those of Fama and French model (1993). Next we regress monthly average returns on portfolios for monthly average returns on market portfolio for the whole sample period. We use prominent market model to run CAPM regression. The specification of the market model is stated below.

$$R_{\text{Pt}} - R_{\text{Ft}} = a + b\,(R_{\text{Mt}} - R_{\text{Ft}}) + e_{\text{t}} \quad (3)$$

where

$R_{\text{Pt}} - R_{\text{Ft}}$ = Excess returns on portfolio (portfolio returns are reduced by risk-free rate),
$R_{\text{Mt}} - R_{\text{Ft}}$ = Excess returns on market portfolio (market returns are reduced by risk-free rate),
a = Abnormal returns (portfolio returns in excess of returns on market portfolio),
b = Portfolio's responsiveness to market factor (beta coefficient).

Above Equation (3) is estimated in a hypothesis that widely accepted asset-pricing models like CAPM can absorb variations in stock returns so that intercepts of the time-series regression are zero. If the empirical results reject CAPM, then monthly average returns on portfolios are regressed on Fama and French three-factor model. The three-factor model is stated as below.

$$R_{\text{Pt}} - R_{\text{Ft}} = a + b\,(R_{\text{Mt}} - R_{\text{Ft}}) + s\,\text{SMB}_{\text{t}} + l\,\text{LMH}_{\text{t}} + e_{\text{t}} \quad (4)$$

where

SMB mimics the risk factor in returns relating to size,
LMH mimics the risk factor in returns relating to value,
S and l are the portfolio's responsiveness to (sensitivity coefficients) SMB and LMH factors, respectively.

Next, we present the methodological procedures for the formation of size–momentum sorted portfolios. To sort the stocks on size and momentum, we replicate the breakpoint convention of size–value sort. Then we form monthly momentum portfolios based on stocks' cumulative returns. To sort the securities on momentum, we take monthly cumulative stock's return and classify the sample stocks into three groups namely loser, neutral and winner portfolios. In ascending order, bottom 30 per cent of the stocks based on stocks' cumulative returns are loser portfolios, medium 40 per cent of the stocks are neutral portfolios and top 30 per cent of the stocks are winner portfolios. Then we form portfolios at the end of month t, using the cumulative returns on the stocks (lagged returns) from month t – 1. Then, from the intersection of the two size groups and three momentum groups, six portfolios namely small-loser (S/L), small-neutral (S/N), small-winner (S/W), big-loser (B/L), big-neutral (B/N) and big-winner (B/W) are formed. Next, we compute equally weighted excess returns on each portfolio on monthly basis from July 1997 (t) to June 1998 ($t+1$). Then we revise the ranking process in June 1998 and this task continues up to August 2014. Finally, mean excess returns on each portfolio are computed from July 1997 to August 2014.

Next, we form WML, stands for winner minus loser, portfolio which mimics the risk factor in returns in relation to momentum factor. The $\text{WML}_{\text{S}} = \text{SW} - \text{SL}$ and $\text{WML}_{\text{B}} = \text{BW} - \text{BL}$ and WML is the simple average of WML_{S} and WML_{B}. WML is expressed as follows:

$$\text{WML} = (\text{SW} - \text{SL})/2 + (\text{BW} - \text{BL})/2 \quad (5)$$

Then as we did for returns on size–value sorted portfolios, we regress monthly excess returns on each portfolio for four-factor model. The Carhart's four-factor model's specification is given below:

$$R_{\text{Pt}} - R_{\text{Ft}} = a + b\,(R_{\text{Mt}} - R_{\text{Ft}}) + s\,\text{SMB}_{\text{t}} + l\,\text{LMH}_{\text{t}} + w\,\text{WML}_{\text{t}} + e_{\text{t}} \quad (6)$$

where

WML is mimicking portfolio that proxies for momentum factor in returns,
w is the sensitivity coefficient. All other terms in equation have been described earlier.

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Explanatory Returns

Table 1 presents monthly mean excess return on market which is calculated as market return is reduced by risk-free return (return on 91-day T-Bill). Table 1 shows that there is an equity premium of 0.9 per cent (t = 2.05) per month for the study period. A strong size premium is observed in Indian stock market. It is confirmed from the fact (Table 1) that average SMB returns are 2.5 per cent (t = 5.59) per month. The results of size premium contradict to the recent global findings (see Fama & French, 2012). Next, LMH exhibits a negative value effect by providing a negative returns of –1.6 per cent (t = –3.26) per month. Again the results of value premium are inconsistent with recent global findings (see Fama & French, 2012). Finally, average returns on WML indicate that there is a strong momentum effect in Indian market. This is supported by the evidence that monthly average return on WML is 7.3 per cent (t = 12.35). The results of momentum effects are consistent with recent global findings (see Fama & French, 2012).

Mean Excess Returns (Risk Unadjusted Returns) on Size–value Sorted Portfolios

Table 2 shows mean excess returns on size–value sorted portfolios. SL portfolio consists of small stocks sorted on market capitalization and low value stocks sorted on PB ratio. It is found that SL portfolio fetches average returns of 4.6 per cent per month while BG the portfolio which contains big size stocks and high value stocks provides average returns of 3.4 per cent per month. Further, SL portfolio does outperform other portfolios by yielding the highest average returns. Further, size and value effects are spread in all portfolios except BL portfolio. Hence, it is concluded that stock returns are highly influenced by strong size and value factors.

Table 1. Descriptive Statistics Shows Mean and Standard Deviation for Explanatory Variables

	Market	SMB	LMH	WML
Mean	0.009	0.025	–0.016	0.073
Standard deviation	0.080	0.086	0.096	0.112
T-statistics*	2.059	5.596	–3.265	12.350

Source: Author's analysis.
Note: *T-statistics = Mean/(Standard deviation/212$^{1/2}$).

Table 3. CAPM Results for Size–value Sorted Portfolios

$$R_{Pt} - R_{Ft} = a + b\,(R_{Mt} - R_{Ft}) + e_t \quad (3)$$

Portfolio	A	b	t(a)	t(b)	R^2
SL	0.036	1.149	4.173	10.634	0.350
SN	0.027	1.058	3.616	11.233	0.375
SG	0.034	0.831	2.993	5.796	0.137
BL	–0.011	1.004	–3.107	21.509	0.687
BN	0.008	0.951	3.116	27.490	0.782
BG	0.024	1.183	7.777	30.656	0.817

Source: Author's analysis.

Empirical Results of Size–value Sorted Portfolios

Table 3 presents regression results of CAPM for size–value sorted portfolios. The results clearly show that alpha (intercept) values of all portfolios in general and in particular SL portfolio are (is) bigger, otherwise, distinguishable from zero. Besides, $t(a)$ of SL and other portfolios are statistically significant (at 5 per cent level). More importantly, R^2 (goodness of fit) values of SL and other portfolios are weak. Hence, it is concluded that abnormal returns on size–value sorted portfolios are inexplicable by CAPM. Table 4 summarizes regression results of three-factor Fama–French model. The results shed light that the alphas (intercepts) of all portfolios remain larger except SN and BN portfolios. However, SL portfolio's alpha is down from 0.036 for the CAPM to 0.022 for the three-factor Fama–French model. Next, it is also noted from the results that size and value factors load heavily, indicating the presence of strong size and value effects in Indian stock market. Finally, the results show that R^2 value of SL portfolio improves to 0.88 from 0.35 for the CAPM. Therefore, the Fama–French model partly captures the average returns on size–value sorted portfolios. Table 5 reports regression results of four-factor model. The results reveal that the model does not contribute significantly in explaining average return on SL portfolio as alpha value is distinguishable from zero. Moreover, there is no major change in the value of R^2 of SL portfolio compared to the Fama–French model.

Table 2. Descriptive Statistics Shows Mean, Standard Deviation and t-mean for Size–value Sorted Portfolios

Portfolio	SL	SN	SG	BL	BN	BG
Mean	0.046	0.036	0.041	–0.002	0.016	0.034
Standard deviation	0.155	0.137	0.178	0.096	0.085	0.104
T-statistics*	5.669	5.020	4.400	–0.398	3.596	6.245

Source: Author's analysis.
Note: *T-statistics = Mean/(Standard deviation/212$^{1/2}$).

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Table 4. Fama—French Three-factor Model Results for Size–value Sorted Portfolios

$$R_{Pt} - R_{Ft} = a + b\,(R_{Mt} - R_{Ft}) + s\,SMB_t + l\,LMH_t + e_t \quad (4)$$

Portfolio	*a*	*b*	*s*	*l*	*t*(*a*)	*t*(*b*)	*t*(*s*)	*t*(*l*)	R^2
SL	0.022	1.123	1.171	0.954	5.785	24.310	26.120	23.571	0.881
SN	0.009	1.071	0.884	0.238	1.473	15.139	12.866	3.844	0.647
SG	–0.012	0.931	1.265	–0.833	–2.670	17.204	24.060	–17.571	0.877
BL	–0.012	0.994	0.158	0.215	–3.311	22.953	3.758	5.676	0.731
BN	0.009	0.945	0.097	0.141	3.109	28.801	3.052	4.887	0.804
BG	0.022	1.186	0.065	0.003	6.955	30.742	1.727	0.082	0.818

Source: Author's analysis.

Table 5. Four–factor Model Results for Size–value Sorted Portfolios

$$R_{Pt} - R_{Ft} = a + b\,(R_{Mt} - R_{Ft}) + s\,SMB_t + l\,LMH_t + w\,WML_t + e_t \quad (6)$$

Portfolio	*a*	*b*	*s*	*l*	*w*	*t*(*a*)	*t*(*b*)	*t*(*s*)	*t*(*l*)	*t*(*w*)	R^2
SL	0.014	1.070	1.132	1.007	0.147	3.296	23.092	25.575	24.481	4.076	0.890
SN	0.015	1.112	0.914	0.197	–0.114	2.265	15.207	13.087	3.045	–2.004	0.652
SG	–0.006	0.972	1.294	–0.874	–0.113	–1.116	17.484	24.387	–17.732	–2.612	0.881
BL	–0.003	1.048	0.198	0.161	–0.152	–0.855	24.322	4.812	4.210	–4.531	0.754
BN	0.011	0.958	0.107	0.128	–0.036	3.382	28.106	3.278	4.222	–1.354	0.805
BG	0.016	1.147	0.036	0.042	0.108	4.555	29.371	0.970	1.198	3.552	0.827

Source: Author's analysis.

Mean Excess Returns (Risk Unadjusted Returns) on Size–momentum Sorted Portfolios

Table 6 provides mean excess returns on size–momentum sorted portfolios. SW portfolio comprises small stocks in terms of market capitalization and winner stocks sorted on stocks' cumulative returns. Monthly average returns on SW portfolio is 9.2 per cent while average returns on BW portfolio is 3.4 per cent per month. BW portfolio is formed with the combination of big stocks and winner stocks. Average returns on SW portfolio clearly indicate that a strong momentum effect exists in Indian stock market. Moreover, momentum effect is pervasive across the portfolios with the exception of SL and BL portfolios. Possible explanation for this could be SL and BL portfolios contain loser portfolios and strong size premium could be set off by badly performing momentum (loser) portfolio.

Empirical Results of Size–momentum Sorted Portfolios

Regression results for size–momentum sorted portfolios are presented in Table 7. First, CAPM results suggest that model does not capture the average returns on SW portfolio. This could be interpreted from the facts that alpha of SW portfolio remains larger, and t(a) is also statistically significant (at 5 per cent level). Next, Fama–French model results are shown in Table 8. It is clearly observed that the Fama–French model also fails to capture the average returns on any of the size–momentum sorted portfolios specifically SW portfolio. Finally, Table 9 records the regression results of four-factor model. The model produces piquant results; it absorbs partly momentum returns on SW portfolio. The

Table 7. CAPM Results for Size–momentum Sorted Portfolios

$$R_{Pt} - R_{Ft} = a + b\,(R_{Mt} - R_{Ft}) + e_t \quad (3)$$

Portfolio	*a*	*b*	*t*(*a*)	*t*(*b*)	R^2
SL	–0.022	0.774	–2.395	6.694	0.175
SN	0.028	1.008	4.873	13.819	0.476
SW	0.081	1.241	6.485	7.896	0.228
BL	–0.011	1.004	–3.107	21.509	0.687
BN	0.008	0.951	3.116	27.490	0.782
BW	0.024	1.183	7.777	30.656	0.817

Source: Author's analysis.

Table 6. Descriptive Statistics for Size–momentum Sorted Portfolios

Portfolio	SL	SN	SW	BL	BN	BW
Mean	–0.015	0.037	0.092	–0.002	0.016	0.034
Standard deviation	0.147	0.116	0.207	0.096	0.086	0.104
T-statistics*	–1.940	6.093	8.491	–0.398	3.554	6.245

Source: Author's analysis.
Note: *T-statistics = Mean/(Standard deviation/$212^{1/2}$).

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Table 8. Fama–French Three-factor Model Results for Size–momentum Sorted Portfolios

$$R_{Pt} - R_{Ft} = a + b\,(R_{Mt} - R_{Ft}) + s\,\mathrm{SMB}_t + l\,\mathrm{LMH}_t + e_t \quad (4)$$

Portfolio	*a*	*b*	*s*	*l*	*t*(*a*)	*t*(*b*)	*t*(*s*)	*t*(*l*)	R^2
SL	–0.043	0.786	1.060	0.348	–5.865	8.885	12.339	4.493	0.518
SN	0.019	1.011	0.534	0.222	3.555	16.178	8.805	4.055	0.616
SW	0.036	1.308	1.682	–0.158	4.844	14.751	19.535	–2.039	0.754
BL	–0.012	0.994	0.158	0.215	–3.311	22.953	3.758	5.676	0.731
BN	0.009	0.945	0.097	0.141	3.109	28.801	3.052	4.887	0.804
BW	0.022	1.186	0.065	0.003	6.955	30.742	1.727	0.082	0.818

Source: Author's analysis.

Table 9. Four–factor Model Results for Size–momentum Sorted Portfolios

$$R_{Pt} - R_{Ft} = a + b\,(R_{Mt} - R_{Ft}) + s\,\mathrm{SMB}_t + l\,\mathrm{LMH}_t + w\,\mathrm{WML}_t + e_t \quad (6)$$

Portfolio	*a*	*b*	*s*	*l*	*w*	*t*(*a*)	*t*(*b*)	*t*(*s*)	*t*(*l*)	*t*(*w*)	R^2
SL	0.007	1.099	1.292	0.032	–0.878	1.488	22.816	28.071	0.756	–23.498	0.868
SN	0.030	1.082	0.587	0.150	–0.200	5.209	17.266	9.804	2.701	–4.108	0.643
SW	–0.013	1.000	1.454	0.152	0.862	–2.813	19.662	29.915	3.363	21.848	0.925
BL	–0.003	1.048	0.198	0.161	–0.152	–0.855	24.322	4.812	4.210	–4.531	0.754
BN	0.011	0.958	0.107	0.128	–0.036	3.382	28.106	3.278	4.222	–1.354	0.805
BW	0.016	1.147	0.036	0.042	0.108	4.555	29.371	0.970	1.198	3.552	0.827

Source: Author's analysis.

alpha value of SW portfolio has become smaller than that of Fama–French model, and R^2 value improves to 0.92. Besides, size and momentum factors load heavily, thus confirming the presence of size and momentum effects in stock returns. We therefore, conclude that four-factor model is found to be a better asset-pricing model in capturing average returns on size–momentum sorted portfolios.

Concluding Remarks

Average returns on portfolios formed on the basis of size–value show up the presence of strong size and value effects in Indian stock market. The results of size effect are inconsistent with recent global findings (see Fama & French, 2012). Moreover, size premium is found in all portfolios with the exception of BL portfolio which yields a negative return of –0.02 per cent per month. We also find a strong value effect in stock returns. Value premium in stock returns is spread in all size groups but it is more pronounced in size group. Next, average returns on size–momentum sorted portfolios exhibit the strong momentum effect in stock returns as the average return on SW portfolio outperforms other portfolios by giving the highest returns of 9.2 per cent per month. Next, our tests on the efficacy of asset-pricing models in capturing average returns indicate that CAPM grossly fails to capture the average returns on size–value and size–momentum sorted portfolios. The Fama–French three-factor model partly explains average returns on size–value sorted portfolios while the four-factor model fails to explain the average stock returns size–value sorted portfolios. The empirical results of size–momentum sorted portfolios do not back CAPM and Fama–French model. But more interestingly, four-factor model partly explains average returns on size–momentum sorted portfolios. The results are consistent with Fama and French (2012). We therefore find that stock return anomalies such as size, value and momentum effects continue to exist in Indian stock market and these anomalies are left substantially unexplained by asset-pricing models. Further the above asset-pricing results cast a shadow over the efficiency of asset-pricing models whether they will be able to capture the average returns on portfolios even one forms portfolios using different methods. Finally, we conclude that size, value and momentum factors continue to be vibrant investment strategies which would maximize invested wealth of the investors. This study would be beneficial to investors, market practitioners, and fund managers who are on the lookout for trading techniques/strategies that would consistently generate significant returns on investment. Albeit, there is a strong implication, the study has a limitation that it does not construct portfolio in value-momentum combination and the same could be experimented to know whether value-momentum based portfolios can yield significant returns.

Notes

1. Month end share prices are reported after the adjustment of changes like stock split, stock dividend and right issue in the equity capital.
2. Market capitalization (price times shares outstanding), given in crore values in the original data source. But we have converted it to natural logarithmic values so that the data of

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market capitalization are even out with other variables which are in small values.
3. 91-day Treasury bill (T-Bill) is a money market instrument being issued by RBI. We take last week of the month value of implicit yield cut-off price (per cent in annualized) of T-bill and divide it by 1,200 and obtain risk-free return (on monthly basis). The risk-free return is not sensitive to any external risk factors. Hence, we take return on 91-day T-Bill as risk-free rate of return as is the common practice of research in asset pricing,
4. Companies with low P/B ratios are characterized to have low earnings. Hence they are called low value stocks (see Lakonishok et al., 1994).
5. High value stocks are otherwise called as growth stocks which are opposite to low value stocks according to Lakonishok et al. (1994).
6. Mean excess returns are the average returns on stocks in excess of risk-free rate of return.

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