Short Term Momentum Profits And Risk Factors: An Evidence For Indian Stock Market

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ABSTRACT

In this paper, we test the short term momentum strategy in three time windows particularly (1) 3-3 momentum strategy, (2) 6-6 momentum strategy, and (3) 12-12 momentum strategy. We also examine the ability of asset pricing models such as CAPM, Fama-French model, and Carhart four factor model in capturing momentum profits. We observe that among three time windows of momentum profits, 6-6 strategy and 12-12 strategies equally provide higher average returns as winner portfolios yield monthly returns of 3.3 percent. We find from the empirical results that CAPM and Fama-French model are unable to explain short term momentum profits while Carhart four factor model captures average returns on all winner portfolios.

Introduction

Momentum strategy hasbecome one of the centre issues of research in investment management ever since it was invented by Jegadeesh and Titman (1993). They develop a trading technique namely momentum strategythat refers to "buy stocks that provided higher returns in the past and sell stocks that earned lower returns in the past". Such a technique would generate extra-normal returns.Jegadeesh and Titman (1993) form portfolios based on past 1-4 quarters average stock returns and the portfolios are held for the same period. They find that portfolios generate abnormal returns. They also argue that momentum profits are attributable to investors delayed reactions to company oriented specific information. Debondt and Thaler (1985) develop a trading strategy namely contrarian strategy that means "past winners will be the future losers while past losers will be future winners". They develop this strategy based on investors' psychology of overreacting to news and events of the companies. They experiment whether such investors' overreaction impact stock prices and find that empirical evidence favours overreaction hypothesis. Debondt and Thaler (1987) reconfirm the investors' overreaction and also document that winner-loser effect is not an outcome of firm's size effect. Jegadeesh and Titman (2001)uphold their previous findings (1993) in term of momentum profits. However, they strongly argue that the momentum profits are not an outcome of data snooping. They also examine that whether returns on momentum portfolios particularly during the post portfolio holding period and they find that returns for post holding period is negative. Chui, Titman, and Wei (2010) indicate that relation between stock returns and individual cultures is

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less as investors give less weight to information that they receive and they put more weight to the consensus of their peer. Conrad and Kaul (1998) demonstrate that momentum strategies are robust and profitable at the short term and medium time horizon (3 to 12 months) while contrarian strategies are profitable at the long term horizon. They show evidence that cross-sectional variations in stock returns are due to momentum phenomena. Jegadeesh and Titman (2002) indicate that momentum profits are little captured by cross-sectional differences in expected returns. Chan, Jegadeesh, and Lakonishok (1996) show up of strong evidence of subsequent stock price revisions causing positive prior returns are not supported by good news on earnings announcement. They also find that returns on momentum portfolio (winner stocks) are high for only subsequent year and the returns are not significantly different from average returns in second and third years. Fama-French (1996) test whether average returns on portfolios are captured by market, size, and momentum factors. They find that average returns on stocks are well explained by their three factor model (1993) but momentum profits are left unexplained. Barbris, Shleifer, and Vishny (1998) develop a model based on different psychological evidences like people pay more attention to the strength of the evidence they get and pay little attention to its statistical weightage. They also suppose that earnings announcements made by corporate tend to have less strength but more statistical weightage. This proposition is able to predict that stock prices underreact to earnings announcements and similar events. Daniel, Hirshleifer, and Subrahmanyam (1998) document that positive return autocorrelation can be resulted in continuing investors' overreaction. This would cause long-run correction in the stock prices. Rowenhorst (1998) tests momentum strategy for 12 European markets and documents that past winners stocks outperform past losers stocks by 1 percent and also shows that momentum strategies are negatively loaded with traditional risk factors such as size and BE/ME effects. Chordia and Shivakumar (2002) find that stock returns have a pattern which is due to the investors' irrationality and the same can be converted to abnormal returns. Momentum profit is one of such phenomenon. They further document that momentum returns disappear once stock returns are adjusted for macroeconomic factors. Jonathan Lewellen (2002) documents that momentum profits are not totally attributable to firm specific-returns rather momentum is a pervasive characteristic. The study suggests that momentum profits are due to systematic risk factors such as macro-economic factors, firm size, and book equity-to-market equity (BE/ME) effects. Fama-French (2008) show that momentum effect is spread in all size groups namely micro, small, and big. Lui and Zhang (2008) document that momentum profits are positively related with industry production and they find that winner stocks have temporarily higher momentum profits and loser stocks have lower momentum profits. Fama-French (2012) experiment that whether portfolios of size-value and size-momentum yield significantly higher average returns and the returns are captured by asset pricing models. They find that above portfolios provide significant average returns. However, they find that average returns on portfolios are not fully explained by asset pricing models such CAPM, Fama-French three factor model and Carhart four factor model. In addition to above works for matured markets, we also review empirical work carried out for Indian stock market. Sehgal S and Balakrishnan I (2002) find that stock returns exhibit a pattern of short term momentum as well as reversal in long

term returns when short term momentum effect is controlled for. They conclude that momentum profits are not explained by one factor CAPM.Sehgal S and Balakrishnan I (2004) show that momentum profits are from different sources such as company characteristics. Their findings show that momentum profits are left unexplained by CAPM. However, three factor Fama-French model captures momentum profits. Subha (2010) finds that data for global indices are stationary. Sanjay Sehgal and Sakshi Jain (2011) reveal that portfolios are formed based on past six months and twelve month average returns on stocks and record evidence that momentum profits based on six month prior returns are higher than that of twelve month momentum portfolio. The empirical results of their study reveal that short term profits are not explained by CAPM and three factor Fama-French model. From the above review, we find that none of the works carried out in Indian context has experimented of momentum strategy with three months prior stock returns. Hence, this study examines short term momentum profits by constructing portfolios with three month, six month, and twelve month past average stock returns.

The paper is organized as follows. Section 2 presents data and sources of the data. Section 3 describes portfolio construction procedures. Risk factors formation principles are presented in section 4. Empirical results are reported in section 5. Final section records findings and conclusion.

Data

We employ data for 484 companies which are all listed on a broad based index i.e., Bombay Stock Exchange (BSE) 500. The data are employed from July, 1997 to August, 2014. The sample companies' market capitalization is amounted to be more than 90 percent of the total market capitalization of the Indian companies. We use month end adjusted closing share prices[1], market capitalization[2] (MC)(price times shares outstanding) and price to book (P/B) ratio of the sample companiesand they are obtained from CMIE Prowess. MC is used as a measure of company size and, calculated as the natural log of MC for further estimation purpose. 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 return is used as proxy of risk free rate of return[3]. Data source for risk free rate is the website of Reserve Bank of India (RBI).

Methodology

We use single sorting technique to the formation of portfolios. We form three sets of portfolios namely first set of portfolios are formed on the basis of past 3 months average stock returns, second set of portfolios are constructed based on past 6 months average stock returns, and third set of portfolios are formed based on last 12 months average stock returns as suggested by Jegadeesh and Titman (1993). Then we sort the stocks on the basis of their average excess returns[4] over the past 3months. Then we construct five portfolios that are of equally weighted composition. The bottom 20% of the securities are termed as portfolio one (P_1) while top 20% of the securities are called portfolio five (P_5). According to this classification P_1 and P_5 are the loser and winner portfolios respectively. Monthly equally weighted returns are computed on the five portfolios from July of year t to June of year t+1 and the portfolios are reformed in June of year t+1, on the assumption that portfolio holding period is 3 months. Thus we adopt 3month/3 month trading strategy.Next, we sort the stocks on the basis of their average excess

returns over the past 6 months. Then we construct five portfolios that are of equally weighted composition. The bottom 20% of the securities are termed as portfolio one (P_1) whereas top 20% of the securities are called portfolio five (P_5). Based on the above classification, $P_1$is the loser portfolio while $P_5$is the winner portfolio.Then monthly equally weighted returns are computed on the five portfolios from July of year t to June of year t+1 and the portfolios are reformed in June of year t+1. Thus we adopt 6 month/6 month trading strategy. Finally, we sort the stocks on the basis of their average excess returns over the past 12 months. Then we construct five portfolios that have equal weight composition. The bottom 20% of the securities are termed as portfolio one (P_1) whereas top 20% of the securities are called portfolio five (P_5). From thisgrouping P_1 and P_5 are termed as loser and winner portfolios. Monthly equally weighted returns are computed on the five portfolios from July of year t to June of year t+1 and the portfolios are reformed in June of year t+1. Thus we adopt 12 month/12 month trading strategy.

Building of risk factors

We build two risk factors based on company size and value. In the month of June of year (t), we rank the sample stocks based on market capitalization (size measure) and make two groups namely small and big. Bottom 10 percent of the stocks are small (S) stocks while top 90 percent of the securities are big (B) stocks. Next, stocks are ranked based on P/B ratio (value measure) and made three groups.In the month of March of year (t) securities are again ranked on P/B ratio. First 33.33 percent of the stocks from bottom are low (L) value stocks, median33.33 percent of stocks are of medium (M) stocks, and above 66.66 percent of the stocks are ofhigh (H) value stocks. Then from the intersection of two size and three value groups, six portfolios consisting of S/L, S/M, S/H, B/L, B/M and B/H are formed. 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/M, and B/H from monthly simple weighted average returns on three small stock portfolios namely S/L, S/M, and S/H. SMB is calculated as under:

$$SMB = (S/L + S/M + S/H)/3 - (B/L + B/M + B/H)/3 \quad (1)$$

Next, we also construct LMH[5], 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/H and B/H) from monthly simple weighted average returns on low value stock portfolios namely S/L and B/L.

$$LMH = (S/L + B/L)/2 - (S/H + B/H)/2 \quad (2)$$

Then, we run CAPM regressions on returns on portfolios using prominent excess return version of the market model specification.

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

where

$R_{Pt} - R_{Ft}$ = Excess returns (stock return minus risk free return) on portfolio,

$R_{Mt} - R_{Ft}$= Excess returns on the market factor (excess of market returns over risk free return)

a = Measure of abnormal returns and

b = Sensitivity coefficient.

Equation (1) is the CAPM specification which is estimated to verify whether returns on portfolio are fully explained by excess returns on market portfolio. This can be decided on the basis of 'a' (intercept) value. If the value of 'a' (intercept) is indistinguishable from 0, it implies that CAPM explains returns on portfolio otherwise one can presume that it fails to do so.

Equation (2) represents three market related anomalies such as market, size, and value, proposed by Fama-French (1993). Equation (2) is estimated to evaluate if FF three model has explanatory power of returns on momentum sorted portfolio as CAPM fails to explain the portfolio return. Hence, we regress excess returns on portfolios for Fama-French factors being expressed in the way of:

$$R_{Pt} - R_{Ft} = a + b\,(R_{Mt} - R_{Ft}) + sSMB_t + lLMH_t + e_t \quad (4)$$

Where,

SMB and LMH are the risk proxies of company size and value respectively and

S and l represent the sensitivity coefficients of SMB and LMH factors.

If the equation (3) fails to absorb average returns on momentum portfolios, then the average returns on momentum portfolios will be regressed for Carhart four factor model which is constructed by taking an additional momentum factor in addition to Fama-French three factor. Four factor model is expressed as described below.

$$R_{Pt} - R_{Ft} = a + b\,(R_{Mt} - R_{Ft}) + sSMB_t + lLMH_t + wWML + e_t \quad (5)$$

WML stands for winner minus loser

Where w is the sensitivity of the stock against momentum factor

Other variables are elaborated in the above paragraph.

WML is calculated by subtracting the average returns on loser portfolio from the average return on winner portfolio.

Empirical results of momentum portfolio based on 3 months prior average stock returns

Table 1 panel A presents mean excess returns on portfolios formed based on 3 months past average returns (3-3 month strategy). The returns exhibit a strong momentum effect as return differential between winner portfolio (P_5) and loser portfolio (P_1) is 1.7 percent per month. Average returns on momentum portfolios are monotonous in nature. Panel B shows regression results of CAPM and the results reveal that CAPM does not capture returns on any of the portfolios excepting loser portfolio (P_1) as alpha (intercept) of winner portfolio is not indistinguishable from zero. Further, t(a) of winner portfolio is statistically significant at 5 percent level. Panel C records regression results of Fama-French model and the model also does not capture the abnormal returns on winner portfolio (P_5). This is owing to the fact that alpha (intercept) of winner portfolio is distinguishable from zero. The panel D of table 1 also presents regression results of four factor model. It is clearly noted that average return on winner portfolio is explained by four factor model as alpha (intercept) is nonzero. It is also observed that momentum factor loads heavily thus confirming momentum effect in stock returns.

Table 1 Panel A shows mean excess returns (unadjusted returns) on momentum portfolios (3/3 strategy). The momentum strategy of 3/3 is such that portfolio is formed based on 3 months prior average stock returns and the portfolio is held for 3 months.

Portfolio	P_1	P_2	P_3	P_4	P_5	$P_5 - P_1$
Average return	0.013	0.016	0.016	0.018	0.030	0.017

Table 1 Panel B shows regression results for CAPM

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

Portfolio	a	b	t(a)	t(b)	R^2
P_1	0.004	1.159	1.020	23.509	0.733
P_2	0.007	1.014	2.312	25.184	0.759
P_3	0.008	1.002	2.664	27.124	0.785
P_4	0.010	1.037	3.409	28.323	0.800
P_5	0.021	1.094	5.240	22.096	0.708

Table 1 Panel C presents Fama-French model results

$R_{Pt} - R_{Ft} = a + b (R_{Mt} - R_{Ft}) + sSMB_t + lLMH_t + e_t$

Portfolio	a	b	s	l	t(a)	t(b)	t(s)	t(l)	R^2
P_1	0.002	1.143	0.180	0.177	0.416	24.345	3.785	4.269	0.762
P_2	0.006	1.001	0.125	0.138	1.846	25.860	3.185	4.015	0.781
P_3	0.006	0.989	0.137	0.146	2.122	28.348	3.879	4.732	0.812
P_4	0.007	1.027	0.145	0.096	2.484	29.190	4.062	3.093	0.818
P_5	0.012	1.095	0.315	-0.020	3.151	25.048	7.090	-0.520	0.776

Table 1 Panel D presents Four factor model results

$R_{Pt} - R_{Ft} = a + b (R_{Mt} - R_{Ft}) + sSMB_t + lLMH_t + wWML + e_t$

Portfolio	a	b	s	l	w	t(a)	t(b)	t(s)	t(l)	t(w)	R^2
P_1	0.007	1.117	0.253	0.070	-0.544	2.364	31.727	7.008	2.164	-12.53	0.867
P_2	0.008	0.993	0.150	0.102	-0.182	2.460	26.505	3.888	2.964	-3.928	0.797
P_3	0.006	0.988	0.139	0.144	-0.013	2.137	28.217	3.866	4.473	-0.293	0.812
P_4	0.006	1.034	0.127	0.124	0.138	2.047	30.016	3.583	3.912	3.237	0.827
P_5	0.007	1.117	0.254	0.070	0.456	2.361	31.731	7.017	2.168	10.496	0.856

Empirical results of momentum portfolio based on 6 months prior average stock returns

Table 2 panel A presents mean excess returns on portfolios formed based on 6 months past average returns (6-6 month strategy). The average returns on winner portfolio exceed loser portfolio by 2.3 percent per month. Hence, it is clearly observed that there is momentum effect in stock returns.

Panel B shows regression results of CAPM and it is found that CAPM again fails to explain average returns on winner portfolio. This could be confirmed from the facts and causes prescribed above. Panel C presents regression results of Fama-French model and the modeldoes not explain average returns on winner portfolio.The empirical findings are consistent with the previous findings of Sehgal S and Sakshi Jain (2011).

They argue that momentum profits based on 6/6 strategy is robust vis-a-vis 12/12 strategy by giving significant returns. They also find that momentum profits are not captured by CAPM and Fama-French three factor model. Panel D of table 2 also exhibits regression results of four factor model and the model does the expected i.e it explains the average returns on winner portfolio owing to the fact that alpha of winner portfolio is again nonzero.

Table 2 Panel A shows mean excess returns (unadjusted returns) on momentum portfolios (6/6 strategy).. The momentum strategy of 6/6 is such that portfolio is formed based on 6 months prior average stock returns and the portfolio is held for 6 months.

Portfolio	**P_1**	**P_2**	**P_3**	**P_4**	**P_5**	**$P_5 - P_1$**
Average return	0.010	0.017	0.016	0.020	0.033	0.023

Table 2 Panel B shows regression results for CAPM

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

Portfolio	**a**	**b**	**t(a)**	**t(b)**	**R^2**
P_1	0.000	1.158	0.034	20.601	0.682
P_2	0.008	1.020	2.586	25.425	0.766
P_3	0.008	0.976	2.836	28.142	0.800
P_4	0.011	1.008	3.915	28.505	0.804
P_5	0.024	1.119	6.193	23.540	0.737

Table2 Panel C presents Fama-French model results

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

Portfolio	a	b	s	l	t(a)	t(b)	t(s)	t(l)	R^2
P_1	-0.002	1.145	0.163	0.164	-0.387	20.865	2.802	3.246	0.702
P_2	0.007	1.009	0.118	0.131	2.158	25.920	2.848	3.643	0.783
P_3	0.006	0.965	0.162	0.143	2.048	29.770	4.716	4.796	0.828
P_4	0.009	0.996	0.158	0.149	3.229	30.102	4.503	4.888	0.831
P_5	0.014	1.122	0.336	0.007	4.046	27.188	7.671	0.178	0.805

Table2 Panel D presents Four factor model results

$R_{Pt} - R_{Ft} = a + b\,(R_{Mt} - R_{Ft}) + sSMB_t + lLMH_t + wWML + e_t$

Portfolio	a	b	s	l	w	t(a)	t(b)	t(s)	t(l)	t(w)	R^2
P_1	0.009	1.130	0.279	0.059	-0.671	2.849	31.335	7.169	1.727	-16.11	0.872
P_2	0.012	1.003	0.167	0.086	-0.284	3.850	28.751	4.425	2.629	-7.033	0.827
P_3	0.008	0.962	0.186	0.121	-0.139	2.890	30.691	5.507	4.122	-3.852	0.841
P_4	0.009	0.996	0.159	0.149	-0.004	3.167	30.013	4.432	4.765	-0.096	0.831
P_5	0.009	1.130	0.279	0.059	0.329	2.851	31.351	7.180	1.731	7.895	0.852

Empirical results of momentum portfolio based on 12 months prior average stock returns

Table 3 panel A reveals mean excess returns on portfolios constructed on the basis of 12 months past average returns (12-12 month strategy). The winner portfolio achieves higher average returns by 3.3 percent per month and it is more than loser portfolio by 2.1 percent per month. Panel B and C show regression results of CAPM and Fama-French model respectively and the results clearly suggest that CAPM and three factor Fama-French model do not absorb returns on winner portfolio based on the facts mentioned erstwhile. Panel D of the same table provides regression results for four factor model. The empirical results show that four factor model is successful in explaining momentum profits on winner portfolio. Because alpha of winner portfolio is close to zero. Moreover, momentum factor loads heavily in all the three sets of portfolio thus confirming the explanatory power of four factor model in explaining momentum profits. The findings are contradictory to the previous findings of A.Balakrishnan (2014) who documents that short term momentum profits based on 12/12 month strategy are partly captured by Fama-French three factor model Carhart four factor model.

Table 3 Panel A shows mean excess returns (unadjusted returns) on momentum portfolios (12/12 strategy). The momentum strategy of 12/12 is such that portfolio is formed based on 12 months prior average stock returns and the portfolio is held for 12 months.

Portfolio	**P_1**	**P_2**	**P_3**	**P_4**	**P_5**	**P_5 - P_1**
Average return	0.012	0.016	0.017	0.021	0.033	0.021

Table 3 Panel B shows regression results for CAPM

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

Portfolio	**a**	**b**	**t(a)**	**t(b)**	**R^2**
P_1	0.001	1.213	0.219	20.165	0.679
P_2	0.006	1.010	1.847	23.835	0.747
P_3	0.008	0.999	2.564	25.309	0.769
P_4	0.012	0.974	4.094	25.932	0.778
P_5	0.023	1.119	5.872	23.324	0.739

Table3 Panel C presents Fama-French model results

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

Portfolio	**a**	**b**	**s**	**l**	**t(a)**	**t(b)**	**t(s)**	**t(l)**	**R^2**
P_1	-0.001	1.194	0.171	0.192	-0.257	20.387	2.690	3.550	0.702
P_2	0.005	0.992	0.141	0.180	1.362	24.689	3.235	4.860	0.777
P_3	0.005	0.981	0.170	0.171	1.720	26.555	4.252	5.006	0.802
P_4	0.009	0.958	0.189	0.155	2.949	27.438	4.997	4.812	0.812
P_5	0.011	1.122	0.334	-0.048	3.254	27.758	7.639	-1.298	0.818

Table3 Panel D presents Four factor model results

$R_{Pt} - R_{Ft} = a + b\ (R_{Mt} - R_{Ft}) + sSMB_t + lLMH_t + wWML + e_t$

Portfolio	**a**	**b**	**s**	**l**	**w**	**t(a)**	**t(b)**	**t(s)**	**t(l)**	**t(w)**	**R^2**
P_1	0.007	1.145	0.282	0.029	-0.677	2.496	34.219	7.699	0.912	-19.89	0.904
P_2	0.009	0.969	0.195	0.101	-0.329	3.105	29.470	5.418	3.237	-9.826	0.853
P_3	0.008	0.967	0.202	0.124	-0.194	2.650	28.077	5.365	3.781	-5.543	0.829
P_4	0.009	0.959	0.188	0.156	0.003	2.896	27.300	4.912	4.661	0.091	0.812
P_5	0.007	1.145	0.282	0.029	0.323	2.496	34.219	7.699	0.912	9.47E	0.877

Conclusion

Momentum has been one of the highly debatable issues in finance literature particularly in asset pricing. Researchers and academicians popularly call momentum as an anomaly of asset pricing. Because momentum profits remain unexplained by competing asset pricing models (e.g. see Fama-French 1996). Such a highly debatable issue needs to be tested in different financial markets across the globe. As Indian stock market is an emerging market, it is necessitated to evaluating the presence of momentum strategy. In this paper, we test the short term momentum strategy in three time windows particularly (1) 3-3 momentum strategy, (2) 6-6 momentum strategy, and (3) 12-12 momentum strategy. We also examine the ability of asset pricing models such as CAPM,Fama-French model, and Carhart four factor model in capturing momentum profits. We observe that among three time windows of momentum profits, 6-6 strategy and 12-12 strategies equally provide higher average returns as winner portfolios yield monthly returns of 3.3 percent. We find from the empirical results that CAPM and Fama-French model are unable to explain short term momentum profits while Carhart four factormodel captures average returns on all winner portfolios. Further, this study sets new evidence of explaining momentum profits by four factor model.Hence, we conclude that short term momentum profits arise due to the investors' underreaction to the market information and also these profits are attributable to certain risk factors such as market, company characteristics namely size and value.

Notes:

1. Month end adjusted closing share prices are the closing share prices for sample companies and the prices are adjusted for capitalization changes like stock split, bonus issue, and buy back of shares
2. Market capitalization is the taken to be the proxy of company size. For analysis purposes, we take natural log value of market capitalization to ensure that data of this variable are even out with other variables.
3. Risk free return is calculated from the implicit yield at cut-off price of 91 day T-bill (Treasury Bills). The computation of risk free rate of return is as follows. Last week value of each month implicit yield at cut-off price is divided by 1200. The above calculation is done in order to convert the annualized percentage of risk free return to weekly percentage of return.
4. Excess return on stock is the return on stock in excess of return on risk free asset (91 day T-Bills).
5. Fama-French (1993) use HML, an abbreviation of high minus low which mimics the risk factor in relation to return on company value. The HML is derived from book equity to market equity (BE/ME). However, we use LMH, an abbreviation of low minus high which reflects the risk factor in relation to return on company value factor. LMH is obtained from price to book (P/B) ratio which is reverse to (BE/ME).

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