Does the stock market overreact? Empirical evidence of contrarian returns from Indian markets*

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Abstract

The study documents the presence of contrarian returns in Indian markets. The study is based on the monthly return data of listed companies on NSE for the period of 1995 to 2008. The results show an evidence of momentum profits for shorter periods of six months and one year, whereas contrarian returns are evident in a longer test period of three years. It is also found that the presence of momentum and contrarian returns cannot be associated with risk adjustments only. The study provides enough evidence against weak form of market efficiency-which claims that superior returns cannot be produced on the basis of investment strategies based on historical data and if any such returns are earned it may be a mere compensation for the higher risk taken. The study confirms the behavioral explanation of overreaction due to activity of momentum traders followed by reversal in long run as explained by *Hong and Stein*. The results of the study also are consistent with *De Bondt and Thaler* overreaction hypothesis and short term momentum followed by reversal as documented by *Jegadeesh and Titman*. The study provides evidence of overreaction led momentum profits in short run followed by contrarian profits in long run.

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Introduction

Contrarian investments strategy claims that "Today's losers are tomorrow's winners and today's winners are tomorrow's losers' and hence the investment strategy based on buying today's losers and selling today's winners should generate superior returns. Against that momentum investment strategy supports the famous saying of "never swims against the tide" and suggests that "Today's winners will be tomorrow's winners and today's losers will be tomorrow's losers" and hence the investment strategy based on buying today's winners and selling today's losers will generate superior returns. But as per the weak form of EMH it is not possible for investors to make excess returns by using trading strategies based on historical price information. This implies that the momentum/contrarian strategy which is entirely based on historical returns should not generate excess returns. However empirical evidence found in developed and emerging markets is not consistent with the weak form of EMH. In fact it has shown sufficient evidence of over-reaction and momentum both in various studies. So here is an attempt to find an empirical evidence of overreaction hypothesis from Indian markets.

Literature Review

The first evidence of market overreaction and superior investment returns achieved by using contrarian investment strategy which calls for buying today's "losers" and selling today's "winners" was found by *De Bondt and Thaler* (1985, 1987). Their study shows that the U.S. stock market tend to overreact to some big news events regardless of whether the events are positive or negative, and the overreaction leads to abnormal price movements.. Their findings support the overreaction hypothesis which suggests that contrarian strategies of selling past "winners" and buying past "losers" generate abnormal positive returns.

Jegadeesh and Titman (1993) using US market data from 1965-1989 found not only the evidence of long term success of contrarian investment strategy but also found that momentum strategies generate significant positive returns in short run over 3–12-month holding periods. They documented the reversal of momentum after about nine months. Their study suggests that in short run for about 3-12 months holding period momentum strategy generate significantly positive returns while in long run for the holding period of 1-3 years contrarian strategy generates significantly positive returns. They again found the same evidence of non sustainable momentum beyond 12 months period in their study (*Jegadeesh and Titman* (2001)) using data from 1990-98.

Conrad and Kaul (1993), who found evidence from US market that the contrarian strategy is profitable for short-term (weekly, monthly) and long-term (2–5 years, or longer) intervals, while the momentum strategy is profitable for medium-term (3–12-month). Interestingly, the results of

Jegadeesh and Titman (1993) had thrown a new light on seminal study of *De Bondt & Thaler* (1985, 1987) and found evidence of short term momentum precedes long term reversal. Although all the results provided strong evidence of market inefficiency, different studies documented different explanations for such returns.

Several behavioural explanations were found and presented to jointly explain the short-run cross-sectional momentum in stock returns documented by *Jegadeesh and Titman* (1993) and the long-run cross-sectional reversal in stock returns documented by *DeBondt and Thaler (1985). Daniel, Hirshleifer, and Subrahmanyam (1998)* assume that investors are overconfident about their private information and overreact to it. If these investors also have a self-attribution bias, then investors attribute success to their own skills more than they should and attribute failures to external noise more than they should. The consequence of this behaviour is that investors' overconfidence increases following the arrival of confirming news. The increase in overconfidence furthers the initial overreaction and generates return momentum. The overreaction in prices will eventually be corrected in the long-run as investors observe future news and realize their errors. Hence, increased overconfidence results in short-run momentum and long-run reversal.

Hong and Stein (1999) present a model that is based on initial under-reaction to information and subsequent overreaction, which eventually leads to stock price reversal in the long-run. The model employs two types of investors, "news-watchers" or let us say "fundamental analysts" and "momentum traders" or let us say "chartists". The news-watchers rely purely on their private information; momentum traders rely exclusively on the information in past price changes. Hence price is driven initially by the news-watchers as they receive and react to their private information as soon as they come. Then the news gradually gets transmitted to the market where chartists may get breakouts on their charts and react to the news, which leads to initial under-reaction till the time momentum traders are not reacting to the news and subsequent overreaction when momentum traders react to the news. In long run however this overreaction disappears and price reverts to its fundamental in long run.

As against the above cited behavioral explanation to short term momentum and long term reversal, some scholars argue that the returns from these strategies are just compensation for taking additional risk or may be the product of the data mining. Most noteworthy of all - *Conard and Kaul (1998)* argue that the profitability of momentum strategies may be the result of data-mining and momentum portfolio shows positive returns in any post ranking period is true irrespective of the length of test period. Thus *Conard and Kaul* (1998) suggest that there is no

case of long term reversal. This is diagonally opposite to what the behavioral models suggests where after short term momentum prices will reverse to more fundamental levels.

In fact, the criticism of *Conard and Kaul* (1998) led to another study by *Jegadeesh and Titman* (2001) where they used out of the sample test by using data from 1991 to 1998 - an overlapping test period compared to their 1993 study where they used data form 1965-89. Their study also eliminated small firms from the study to check whether the earlier momentum returns were actually dominated by small, high-risk and illiquid stock or otherwise. Though they focus on short term momentum in their study choosing two year holding period post formation but they also tested post holding period returns from the period of two to five years after formation.

They present some very interesting results. The momentum profits of *Jegadeesh and Titman* (1993) continued in 2001 also with almost same magnitude for same holding period, that actually has proved that the earlier momentum profits were not the result of data-mining. It also suggests that unlike small firm effect where after the published research on superior returns on small firms compared to their large counterparts, superior returns on small firms disappeared in subsequent studies using data from the periods after the small firm effect from earlier studies got published, that means market has learnt quickly and hence such superior returns disappeared however momentum returns were still present with the same magnitude in 2001 as they were in 1993 study suggest that momentum returns are not just the temporary anomaly but it may have to do with some systemic cognitive bias which sustains for a long time. It also proves that momentum profit is just not the result of some small, illiquid and risky stocks and most noteworthy the reversal found in their post holding period cumulative returns, which render support to the explanations of behavioral theorists and provides evidence against the *Conard and Kaul* hypothesis.

As far as studies in Asian markets are concerned *Chang* (1995) found abnormal profits of contrarian strategies in the Japanese markets. *Chui* (2000) found significant positive abnormal returns with contrarian investment strategy in Japanese and Korean markets. *Hameed & Ting* (2000) found evidence of market overreaction hypothesis (contrarian strategy) in Malaysia. *Kang* (2002) found significant short term positive returns with contrarian strategy in Chinese markets.

On the other end, *Hameed & Kusandi* (2002) found no evidence of contrarian profits in six Pacific Basin markets. While *Rouwenhorst* (1998) and *Griffin & Martin* (2005) found existence of momentum in many non-US countries, the quantum of momentum returns in non-US countries was small, and in the case of Asia, insignificant. For example, *Griffin* (2005) estimates average

monthly returns of 0.78%, 0.77% and 0.40% for the Americas (excluding the US), Europe and Asia respectively.

Objectives of the study

The following major objectives are set for the study.

1.   To test the validity of market overreaction hypothesis and presence of contrarian profits in Indian Markets.

2.   To find out the point of reversal for existing momentum, in case if evidence of long term contrarian profit is found.

Data and Methodology

The overreaction hypothesis implies the two well-known consequences: (1) extreme movements in stock prices will be followed by subsequent price movements in the opposite direction; and (2) the more extreme the initial movement, the greater will be the subsequent adjustment. This paper examines the evidence of overreaction hypothesis from Indian markets.

To test the above objectives, the study follows the methodology used by *De Bondt and Thaler* (1985, 1987) and *Jegadeesh and Titman* (1993). Monthly adjusted return data for all companies listed on NSE for the period of January 1995 to December 2008 is used from CMIE's Prowess and all stocks with non missing returns during portfolio formation period are considered for analysis.

The analysis is performed using six years of data, first three years' data for portfolio formation and next three years of portfolio testing period. As study uses fourteen years' data, this analysis is repeated for nine times using twelve months overlapping period starting from January 1995. The similar analysis is done for the shorter testing periods using one year data - 6 months of formation period and 6 months of holding period. Twenty nine such six months overlapping periods for the analysis starting from January 1995 are used. An analysis using two year data - one year formation period and one year of holing period is also done with thirteen overlapping formation and test periods. Using overlapping data provides dual advantage. First, it works against the overreaction hypothesis and hence provides rigor to the testing process. Second, it allows using more number of sample testing periods and hence increases reliability of the study.

Steps in methodology are explained using three year formation - three year testing period.

In the first step, the winner and loser stocks are determined by the past abnormal returns over 36 - months portfolio formation period by simply ranking the stocks in terms of their performance as indicated by the three-year *CAR* (Cumulative Abnormal Returns) data. The top deciles stocks are assigned to the winner portfolio *W*, while the bottom deciles stocks make up the loser portfolio *L*. both winner portfolio and loser portfolio are equal weighted portfolios of the member stocks in respective deciles.

This step is repeated eight times for overlapping 12 - month periods starting in January 1995 and ending on January, 2003 as mentioned above. This method of ranking is widely accepted and used in past studies (see *De Bondt & Thaler* (1985) and *Conrad & Kaul* (1993). Therefore, for every stock *i* in the sample, the cumulative abnormal returns for the prior 36 months will be calculated:

$$\text{CAR} = \sum_{t=-35}^{0} AR_{it} \qquad (1)$$

The second step of testing contrarian profits involves measuring the performance of winner and loser portfolios over the next 36 months. For both portfolios in each of the nine overlapping three-year periods, the Average Abnormal Returns (*AAR*s) is obtained by taking the mean of abnormal return of average the selected stocks. The monthly AARs are used to calculate the Cumulative Average Abnormal Returns (*CAAR*s) in each *t*, where *t*=1,…, 36 during test period, this step is repeated nine times and average the *CAARs* for these nine test periods are used to get Mean Cumulative Average Abnormal Returns (*MCAARs*).

$$\text{AAR}_{W,t} = \frac{1}{N} \sum_{i=1}^{n} AR_{it} \qquad \text{AAR}_{L,t} = \frac{1}{N} \sum_{i=1}^{n} AR_{it} \qquad (2)$$

$$\text{CAAR}_{W,t} = \sum_{t=1}^{36} AAR_{W,t} \qquad \text{CAAR}_{L,t} = \sum_{t=1}^{36} AAR_{L,t} \qquad (3)$$

$$\text{MCAAR}_{W,t} = \frac{1}{K} \sum_{i=1}^{K} CAAR_{W,it} \qquad \text{MCAAR}_{L,t} = \frac{1}{K} \sum_{i=1}^{K} CAAR_{L,it} \qquad (4)$$

Where n= number of stocks in each portfolio

t= 1 to 36

k = no of times test repetition (9 in our case)

Test of Significance

Therefore, $MCAAR_W$ ($MCAAR_L$) indicates how much cumulated excess returns stocks in the winner (loser) portfolio earn on an average during 36 months in test period. If markets are efficient and weak form of EMH is in force then $MCAAR_L - MCAAR_W$ must be equal to zero. The overreaction hypothesis implies that $MCAAR_W < 0$ and $MCAAR_L > 0$. Alternatively, the null hypothesis can be written as $MCAAR_L - MCAAR_W > 0$. In order to assess whether there is any statistically significant difference in investment performance, we need a pooled estimator of population variance in $CAAR_t$

$$S_t^2 = [\sum_{i=1}^{k}(CAAR_{W,it} - MCAAR_{W,t})^2 + \sum_{i=1}^{k}(CAAR_{L,it} - MCAAR_{L,t})^2]/2\,(K\text{-}1) \qquad (5)$$

With two samples of equal size K, the variance of difference of sample means equals $2S_t^2/K$ and the t statistics is therefore

$$T_t = (MCAAR_{L,t} - MCAAR_{W,t})/ \text{SQRT }(2S_t^2/K). \qquad (6)$$

Relevant t statistics can be found for the each of the 36 post formation months but they don't represent independent variance.

In order to judge whether, for any month t, the average residual return makes a contribution to either $MCAAR_{W,}$ or $MCAAR_{L,t}$, we can test whether it is significantly different from zero. The sample standard deviation of the winner portfolio is equal to

$$S_t = \text{SQRT }(\sum_{i=1}^{k}(AAR_{W,it} - MAAR_{W,t})^2/2(K\text{-}1) \qquad (7)$$

Since S_t/SQRT (K) represents the sample estimate of the standard error of $MAAR_{w,t}$ the t-statistic equals

$$T_t = MAAR_{w,t} / \{S_t/\text{SQRT }(K)\} \qquad (8)$$

The significance of correlation between monthly returns of winner and loser protfolios is tested to see whether pooled estimator of varinance should have a covarinace term or not. The results of the

study has confirmed that though the the coefficient of correlation is negative between winner and loesr portfolio it is not significantally differnt than zero and hence no covariance term is used while calculating pooled estimator of variance.

Similar procedures apply for the residuals of loser portfolio.

Run test is also employed as a test of market efficiency on MAAR and MCAAR of winner and loser portfolio. That helps finding any evidence against market inefficiency in average monthly excess returns of winner and loser portfolios during the test period. The test is widely employed to test the market efficiency and its better than serial correlation test as it does not get affected by extreme values. Gupta (1990) employed correlation and run test to test the randomness in share price using BSE share price data.

To test the randomness using run test following process is followed

$$\mu = (2n_1n_2/\ n_{1+}n_2) + 1 \tag{9}$$

$$\sigma = \text{SQRT} \ \{2n_1n_2 \ (2n_1n_2 - n_1 - n_2)/ \ ((n_{1+}n_2)^2 \ (n_{1+}n_2+1) \tag{10}$$

$$z = (r - \mu)/\ \sigma \tag{11}$$

Where r = number of runs, n_1= number of positive returns, n_2 = number of negative returns

Now to test whether the momentum or contrarian profits are the outcome of higher compensation for risk only and not due to market inefficiency, this study calculates average beta for winner and loser portfolios using individual beta of each of the nine winner and loser portfolios. The individual portfolio beta is calculated using average return of all the stocks during each formation period as a proxy to market return, which provides near perfect representation of the market during the respective period. If any evidence of contrarian profit is found during the study, and if it is due to the compensation of risk only, then the beta of loser portfolio during test period should be significantly higher than the beta of the winner portfolio.

Results and analysis

As shown in table 2.1, MCAAR of winner portfolio continues to remain positive till 16th month and then reverses its sign and remains negative till the very end. Though it is statistically significant only from 30th month with MCAAR of - 12.26% and it remains significant from thereon. MCAAR of loser portfolio changes sign from negative to positive in seventh month of

the test period itself (much faster than winner portfolio) and becomes statistically significant from 25th month with MCAAR of 17.89% and it remains significantly positive from thereon. When we look at the MCAAR $_{L,t}$ - MCAAR $_{W,t}$ (long loser portfolio and short winners portfolio) during test period the sign change from negative to positive happens in 12th month of test period and becomes significantly positive in the 20th month with MCAAR of 18.44% - of which 11.46% contributed by long loser portfolio and 6.98% contributed by short winner portfolio. MCAAR remains positive from there on and reaches its pick in the 35th month of the test period with MCAAR of 34.46% - almost equally contributed by loser and winner portfolio with contributions of 18.43% and 16.03% respectively. These results provide enough evidence about the existence of long term contrarian profits in Indian markets. Figure-1 shows the MCAAR of winner and loser portfolios where the reversal in fortunes can be clearly seen.
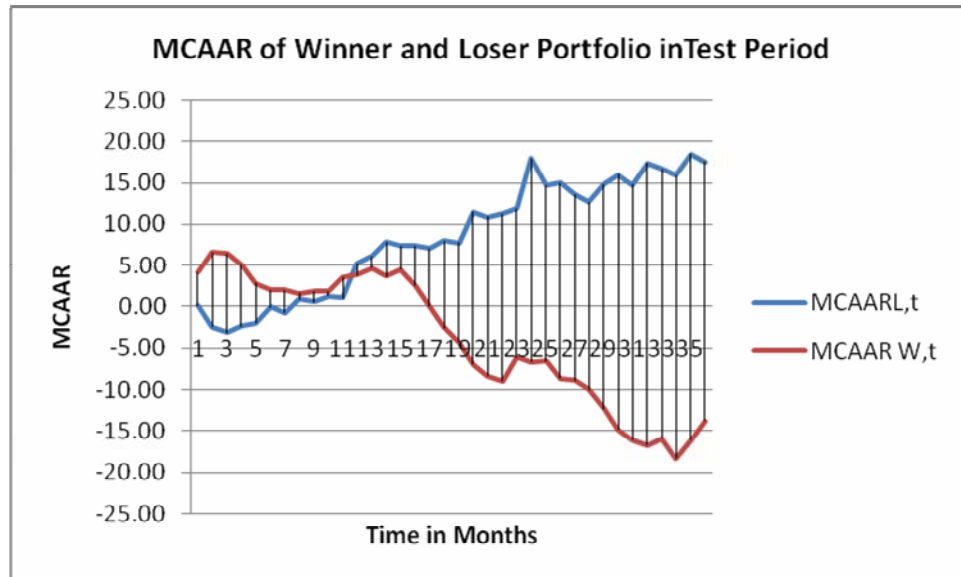
Figure 1

Now the question is whether the superior returns derived by investing in loser portfolio are just the compensation of higher risk or there is a case for genuine contrarian profits. This is tested by calculating beta of winner and loser portfolios during the test period. As it can be seen from the table-3 that the average beta of nine loser portfolios is 1.16 vs. 1.03 for corresponding winner portfolios and are not significantly different from each other. Hence the superior returns observed in loser portfolio cannot be overlooked by compensation for higher risk only. The other thing is that the positive MCAAR at the end of three years of test period on long loser and short winner portfolio is almost equally contributed by long loser and short winner portfolio. If the high positive returns on loser portfolio are just because of compensation of higher risk (which is not

the case as we have seen from beta test) - how do we explain the negative returns observed in winner portfolios during the test period? This further strengthens the evidence of contrarian profits in long run in Indian markets due to overreaction and not due to differential risk of the different portfolios.

Now we have seen that the reversal in portfolio is observed but it takes time. So to test whether the contrarian profits do exist in shorter formation and test period also or momentum prevails before reversal takes place, the study is done for shorter duration formation and test periods of six months and one year also. The results are presented in table 2.2 and 2.3 for one year formation - one year test period and six months formation - six months test period respectively. As presented in table 2.2, there is a strong momentum observed through the entire test period of twelve months especially with winner portfolio where MCAAR is moving up from 5.4% in the first month of test period to 15.55% in the 12th month of test period with MCCAR for all twelve months are positive and significant. The same is the case for MCAAR for loser portfolio where the negative returns continue and raising to the level of -14.37% in the ninth month from the level of -3.03% in the first month of test period and ends the twelve month test period at -8.77% all are statistically significant and negative shows clear sign of continuing momentum. However, it can be observed that form ninth month onwards MCAAR of loser portfolio is continuously falling which shows the sign of reversal which was not visible in the winner portfolio's case. When we look at the MCAAR of long loser & short winner portfolio, we can see that it has consistently gone up from the level of -8.43% in the first month of test period to -29.44% in the ninth month of test period with almost equal contribution from both the winner and loser portfolio and ends the test period at substantially negative MCAAR of -24.32% in the 12th month of test period. All of them are statistically significant and negative which provides strong evidence of momentum in one year formation - one year test period. In other words, the portfolio with long winner & short loser will generate MCAAR with positive sign. MCAAR for winner and loser portfolios are shown in figure-2.
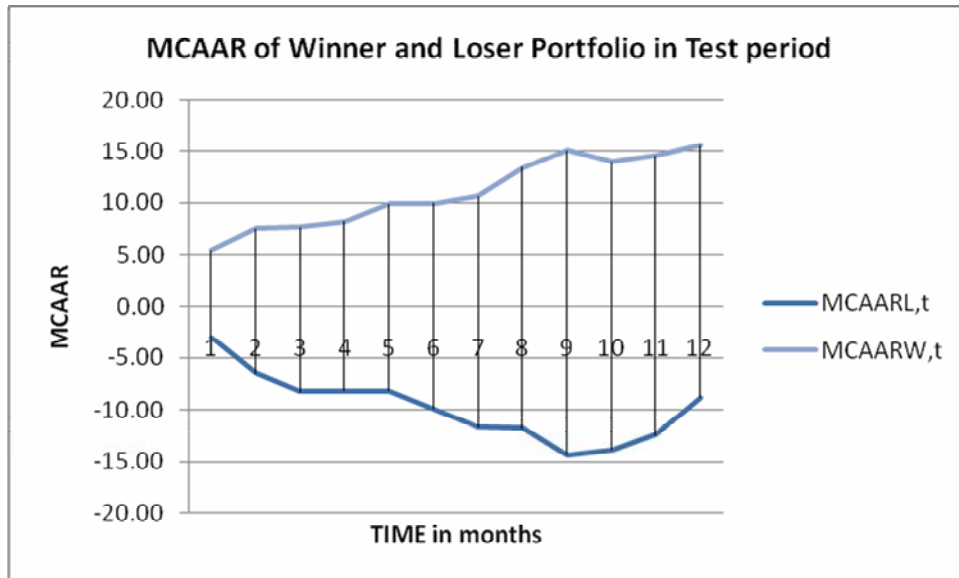
Figure 2

The similar results are found for six months formation - six months test period as presented in table 2.3. Here also there is a strong momentum seen through the entire test period in winner portfolio and for the first four months for the loser portfolio, afterwards the MCCAR for loser portfolio started showing signs of reversal and turned positive in the sixth month of test period, albeit small and not significant but probably indicates the reversal of the tide. The contrarian portfolio consisting of long loser portfolio and short winner portfolio has shown significant negative returns through the entire test period dominated by negative contribution from short winner portfolio especially in the last two months of test period. This shows that momentum is evident in shorter formation and test period of one year and six months; also, momentum in winner portfolio is much stronger and continues for a longer duration whereas negative momentum associated with loser portfolio start showing the signs of reversal much early. MCAAR for winner and loser portfolios are shown in figure-3.
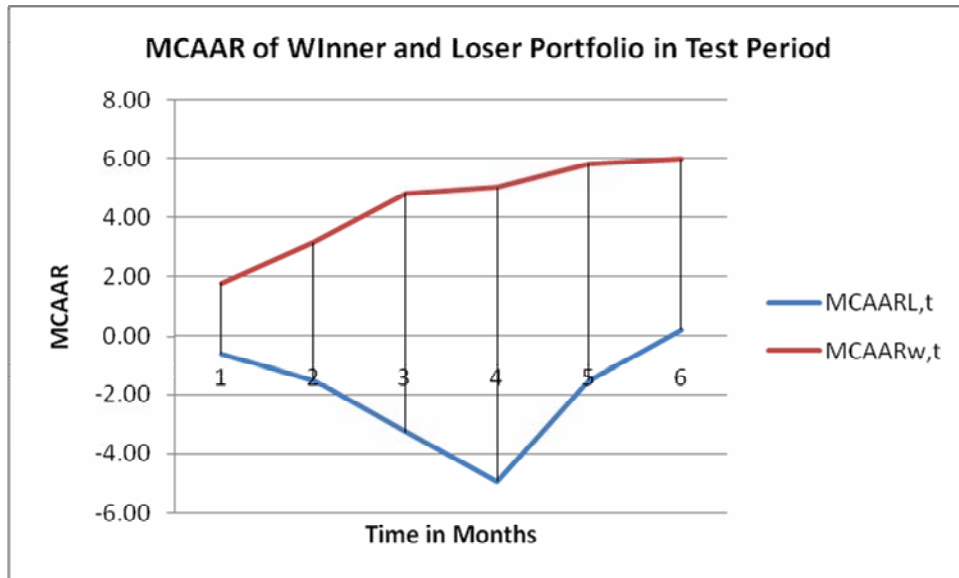
Figure 3

When tested for the superior momentum returns as a result of higher risk associated with winner portfolio or otherwise. The results are presented in table-3, it has been observed that for one year formation - test period, the beta for winner portfolio is 1.05 during the test period as against beta of a loser portfolio during the same period is 1.08 and there is no significant difference between the two of them. A very interesting result was found when beta was compared for winner and loser portfolios for six months formation - test period. Though winner portfolio has shown superior positive returns compared to their loser counterpart, the beta of winner portfolio is significantly lower at 0.88 compared to beta of loser portfolio of 1.09. This is quite unique: Higher return at lower risk. This may be due to strong momentum continuation in the short run especially with winner portfolio.

Average monthly MAARs presented in table-4 shows the average monthly excess return earned by winner, loser and a contrarian portfolio consists of long loser and short winner portfolios. For 3 year formation - test period, monthly MAAR of 0.87% on a contrarian portfolio was found during the test period, which was contributed by 0.49% from long loser portfolio and 0.38% from winner portfolio, all are statistically significant. For 1 year formation and test period monthly MAAR on our contrarian portfolio of -2.03% was found during the test period, which was contributed by -1.3% from short winner portfolio and -0.73% by long loser portfolio, loser portfolio returns are not statistically significant. This provides a strong evidence for momentum

dominated by contribution from winner portfolio. For six months formation - test period, monthly MAAR is -0.96% was found in which short winner portfolio contributed -1% and long loser portfolio contributed 0.04%. Winner portfolio has shown very significant positive returns but returns on contrarian portfolio and loser portfolio are not significant. The reason is that the loser portfolio has started reversing its momentum from fifth month onwards and ultimately resulted in positive MAAR. This shows strong evidence of momentum profits but only in winner portfolio.

As presented in table 5.1, table 5.2 and table 5.3 respectively, no substantial evidence is found in any of the three contrarian portfolios having three years, one year and six months test period, wherein a specific month contributing significantly to MCAAR of the portfolios under consideration. For most of the months, MAAR values are statistically not significant. However, it has been found from the MCAAR and monthly average MAAR that there is substantial evidence available for contrarian profits for three year portfolio, whereas substantial evidence of momentum is found in both one year and six months portfolio. Hence, it can be interpreted that not a particular month has dominated in contributing to momentum and contrarian returns in a big significant way but the combined result of every month returns have resulted in producing substantial contrarian and momentum returns for long term (3 year) and short term (6 months and1 year) respectively.

If that is the case then the MAARs and MCAARs should not follow random distribution. Hence a run test for testing the randomness was employed and the results are shown in table-6. As we can see that MAARs and MCAARs have shown significant evidence against the randomness. i.e. for MAAR for three year contrarian portfolio out of 36 month returns 23 are positive and only 13 are negative and number of runs are 21, which provides evidence against randomness at 10% significance level. For MAAR of one year contrarian portfolio and MCAAR for both three year and one year contrarian portfolio, the evidence against the randomness is extremely significant. This explains why MCCAR and average monthly MAAR has shown clear evidence in favor of contrarian and momentum profits in various portfolios despite of not a particular month has dominated the contribution to such profits. This also provides sufficient evidence against the seasonality in Indian markets at least in this case. Coefficient of correlation of -0.18, -0.39 and -0.36 was found between the winner and loser portfolio's mean average abnormal returns for three year, one year and six months test period respectively. Though all of them are negative, none of them is statistically significant. However, the negative correlation between the winner and loser portfolio if taken into consideration while calculation the pooled estimator of the variance it

would further reduced the variance and will result into lower standard error and provides even stronger evidence to the contrarian and momentum profits found in this study for various length of test period. But as none of the coefficient of correlation is statistically significant, there is no need for the covariance term to be added to pooled estimator of variance.

Conclusion

There is strong evidence found against the randomness and weak form of market efficiency from Indian markets. For the short term formation - test period of six months and one year, strong evidence of momentum profit was found. Further, it has been found that momentum profits are contributed almost equally by winner and loser portfolio, the contribution of winner portfolio is much more then loser portfolio, especially in six months portfolio. Reversal in momentum is much faster in case of loser portfolio. When it comes to a longer duration formation and test period of three years, strong evidence of contrarian profit is quite evident. It has also been found that none of these momentum and contrarian profits was due to 'glamour stock' or for compensation of higher risk in that portfolio. The results are consistent with the result of seminal studies of *Jegadeesh and Titman* (1993, 2001) and *De Bondt & Thaler* (1985, 1987and 1990). Results of the study provide evidence for the behavioural theory, which explains initial under-reaction due to a delayed response by chartist/momentum traders followed by an overreaction on their delayed response and momentum. However, this over-reaction effect gets fizzled out in the long run and that leads to contrarian profits. To conclude, the study provides a strong evidence of short term momentum and long term contrarian profits. It also proves that market overreaction followed by initial under-reaction actually leads to short term momentum profits. Subsequently in the long run, market adjusts itself to the overreaction, resulting into long term contrarian profits.

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Table-1

Number of NSE listed companies qualified for the study	
Year	No. of companies
1995	260
1996	335
1997	434
1998	442
1999	462
2000	473
2001	526
2002	556
2003	576
2004	576
2005	576
2006	576
2007	576
2008	576

Table-2.1: MCAAR for Winner & Loser Portfolio- 3 year formation-test period

Test period (months)	MCAAR $_{W,t}$ (%)	t-value	MCAAR $_{L,t}$ (%)	t-value	MCAAR $_{L,t}$-MCAAR $_{W,t}$ (%)	t-value
1	4.06	*1.65*	0.08	0.00	-3.98	-1.28
2	6.58	1.25	-2.49	-0.89	-9.07	*-1.52*
3	6.47	1.01	-3.12	-0.82	-9.59	-1.29
4	5.07	0.85	-2.42	-0.62	-7.49	-1.05
5	2.81	0.52	-2.00	-0.48	-4.81	-0.69
6	1.94	0.31	-0.02	-0.05	-1.96	-0.26
7	1.97	0.31	-0.74	-0.18	-2.71	-0.36
8	1.58	0.25	0.86	-0.145	-0.72	-0.08
9	1.81	0.24	0.58	0.09	-1.23	-0.12
10	1.75	0.29	1.27	0.17	-0.48	-0.05
11	3.49	0.80	1.06	0.16	-2.42	-0.31
12	3.80	0.98	5.19	0.56	1.39	0.13
13	4.63	1.06	6.12	0.69	1.48	0.15
14	3.60	0.69	7.83	0.8	4.23	0.38
15	4.49	0.69	7.36	0.76	2.87	0.25
16	2.47	0.36	7.40	0.77	4.93	0.42
17	0.00	0.00	7.05	0.74	7.05	0.60
18	-2.57	-0.34	7.99	0.81	10.55	0.85
19	-4.28	-0.52	7.78	0.85	12.07	0.98
20	-6.98	-0.96	11.46	1.01	18.44	*1.37*
21	-8.32	-1.04	10.90	1	19.22	*1.43*
22	-8.95	-1.13	11.27	1.05	20.22	*1.51*
23	-6.08	1.62	11.86	1.04	17.94	*1.33*
24	-6.65	-0.97	17.89	*1.52*	24.54	**1.80**
25	-6.57	-0.97	14.67	*1.37*	21.24	*1.68*
26	-8.59	-1.22	14.95	*1.35*	23.54	**1.80**
27	-8.87	-1.20	13.57	*1.3*	22.44	**1.76**
28	-9.94	-1.25	12.67	*1.29*	22.60	**1.78**
29	-12.26	*-1.43*	14.82	*1.43*	27.08	**2.02**
30	-14.85	**-1.71**	15.99	*1.64*	30.84	**2.37**
31	-15.98	**-1.81**	14.70	*1.53*	30.68	**2.36**
32	-16.65	**-1.85**	17.35	**1.82**	34.00	**2.60**
33	-15.96	**-1.91**	16.69	**1.7**	32.64	**2.53**
34	-18.21	**-2.18**	15.93	*1.59*	34.13	**2.62**
35	-16.03	**-2.11**	18.43	*1.68*	34.46	**2.58**
36	-13.70	**-1.70**	17.56	*1.62*	31.25	**2.32**

Note: t-values shown in bold are significant at 5%, and bold & italics are significant at 10%

Table 2.2: MCAAR for Winner & Loser Portfolio- 1 year formation-test period

Test period (months)	MCAAR$_{W,t}$	t-vallue	MCAAR$_{L,t}$	t-value	MCAAR$_{L,t}$-MCAAR$_{W,t}$	t-value
1	5.40	**2.00**	-3.03	**-2.59**	-8.43	**-2.86**
2	7.48	**1.93**	-6.50	**-5.53**	-13.99	**-3.46**
3	7.66	**1.71**	-8.23	**-3.45**	-15.89	**-3.14**
4	8.17	**2.18**	-8.18	**-2.79**	-16.34	**-3.44**
5	9.81	**2.23**	-8.16	**-3.20**	-17.97	**-3.53**
6	9.91	**2.27**	-9.91	**-3.85**	-19.81	**-3.9**
7	10.62	**2.42**	-11.69	**-4.46**	-22.31	**-4.36**
8	13.37	**2.89**	-11.83	**-4.38**	-25.20	**-4.71**
9	15.07	**2.55**	-14.37	**-5.30**	-29.44	**-4.53**
10	13.88	**2.33**	-13.83	**-3.87**	-27.71	**-4.00**
11	14.54	**2.22**	-12.42	**-3.40**	-26.96	**-3.37**
12	15.55	**2.07**	-8.77	**-2.31**	-24.32	**-2.9**

Note: t-values shown in bold are significant at 5% and bold & italics are significant at 10%

Table-2.3: MCAAR for Winner & Loser Portfolio- 6 months formation-test period

Test period (months)	MCAAR$_{W,t}$	t-value	MCAAR$_{L,t}$	t-value	MCAAR$_{L,t}$-MCAAR$_{w,t}$	t-value
1	1.78	1.15	-0.57	-0.56	-2.35	*-1.28*
2	3.15	*1.41*	-1.48	-1.24	-4.64	**-1.83**
3	4.82	**1.90**	-3.25	**-1.73**	-8.08	**-2.56**
4	5.01	**2.47**	-4.94	**-2.40**	-9.96	**-3.44**
5	5.82	**2.14**	-1.50	-0.67	-7.32	**-2.08**
6	5.97	**2.19**	0.24	0.09	-5.74	*-1.52*

*t-values shown in bold are significant at 5% and bold & italics are significant at 10%

Table-3: Beta of Winner and Loser portfolios during test period

Beta Test	βL	βw	t-value for βL- βw
3yrs. Formation-3yrs. test period	1.16	1.03	1.31
1yr. Formation-1yr test period	1.08	1.05	0.3
6m formation-6m test period	1.09	0.88	**1.84**

Note: t-values shown in bold are significant at 5% and bold & italics are significant at 10%

Table-4: Average Monthly MAAR during the test period

Average Monthly MAAR for 3yrs formation and test period					
Monthly MAAR$_W$	t- value	Monthly MAAR$_L$	t-value	Monthly MAAR$_L$-MAAR$_w$	t-value
-0.38	*-1.32*	0.49	**1.61**	0.87	**1.91**
Average Monthly MAAR for 1 year formation and test period					
Monthly MAAR$_W$	t value	Monthly MAAR$_L$	t-value	Monthly MAAR$_L$-MAAR$_w$	t-value
1.3	**2.7**	-0.73	-1.23	-2.03	**-2.26**
Average Monthly MAAR for 6 months formation and test period					
Monthly MAAR$_W$	t value	Monthly MAAR$_L$	t-value	Monthly MAAR$_L$-MAAR$_w$	t-value
1	**3.38**	0.04	0	-0.96	-0.95

Note: t-values shown in bold are significant at 5% and bold & italics are significant at 10%

Table-5.1: MAAR of Winner and Loser Portfolio for 3 year formation-test period

	MAAR w,t	t-value	MAAR L,t	t-vlaue	MAARL,t -MAARW,t	t-value
1	4.06	**1.65**	0.08	-0.04	-3.98	-1.27
2	2.52	0.76	-2.57	**-1.68**	-5.09	*-1.4*
3	-0.11	-0.04	-0.64	-0.34	-0.52	-0.16
4	-1.40	-0.57	0.70	0.45	2.10	0.74
5	-2.26	**-1.70**	0.42	0.33	2.68	*1.46*
6	-0.87	-0.33	1.98	1.00	2.85	0.87
7	0.03	-0.02	-0.72	-0.42	-0.75	-0.28
8	-0.39	-0.21	1.60	0.52	1.99	0.55
9	0.24	0.12	-0.27	-0.31	-0.51	-0.23
10	-0.06	-0.03	0.69	0.38	0.75	0.27
11	1.74	0.67	-0.21	-0.15	-1.95	-0.66
12	0.31	0.19	4.12	1.00	3.81	0.85
13	0.83	1.18	0.93	0.50	0.10	0.05
14	-1.03	-0.71	1.71	1.38	2.74	*1.43*
15	0.88	0.41	-0.47	-0.32	-1.35	-0.51
16	-2.01	**-2.00**	0.04	0.04	2.06	*1.37*
17	-2.47	**-1.33**	-0.36	-0.22	2.12	0.86
18	-2.57	-1.27	0.94	0.94	3.51	1.55
19	-1.71	**-1.57**	-0.20	-0.23	1.51	1.09
20	-2.70	-1.11	3.68	1.23	6.37	1.65
21	-1.34	-1.12	-0.56	-0.41	0.78	0.43
22	-0.63	-0.26	0.37	*1.66*	1.00	0.3
23	2.88	1.32	0.59	0.35	-2.29	-0.82
24	-0.57	0.31	6.04	1.31	6.60	*1.34*
25	0.08	-0.07	-3.22	**-1.95**	-3.30	*-1.61*
26	-2.02	**-2.63**	0.28	0.35	2.30	2.09
27	-0.28	-0.20	-1.38	*-1.33*	-1.10	-0.64
28	-1.07	-0.94	-0.90	-0.69	0.17	0.09
29	-2.32	*-1.38*	2.15	**2.72**	4.48	2.4
30	-2.59	*-1.36*	1.17	1.03	3.76	1.7
31	-1.13	-1.27	-1.29	*-1.65*	-0.16	-0.12
32	-0.67	-0.69	2.65	1.19	3.33	*1.37*
33	0.70	0.53	-0.67	-0.74	-1.36	-0.85
34	-2.25	*-2.42*	-0.76	-0.68	1.49	1.02
35	2.18	*1.58*	2.51	**1.84**	0.33	0.16
36	2.33	*1.47*	-0.88	-0.94	-3.21	*-1.73*

Note: t-values shown in bold are significant at 5% and bold & italics are significant at 10%

Table 5.2: MAAR of Winner and Loser Portfolio for 1 year formation-test period

Test period (months)	MAAR$_{w,t}$	t-value	MAAR$_{L,t}$	t-value	MAAR$_{L,t}$-MAAR$_{w,t}$	t-value
1	5.40	**2.00**	-3.03	**-2.59**	-8.43	**-2.86**
2	2.08	1.01	-3.47	**-3.60**	-5.55	**-2.45**
3	0.17	0.12	-1.73	-0.97	-1.90	-0.83
4	0.51	0.26	0.06	0.05	-0.45	-0.2
5	1.65	0.91	0.01	0.01	-1.63	-0.78
6	0.09	0.06	-1.75	-2.08	-1.84	-1.03
7	0.72	0.48	-1.78	-1.27	-2.49	-1.22
8	2.74	***1.64***	-0.14	-0.14	-2.89	***-1.48***
9	1.71	0.97	-2.54	-3.39	-4.24	**-2.22**
10	-1.19	-1.23	0.53	0.36	1.73	0.97
11	0.66	0.41	1.41	0.72	0.75	0.29
12	1.01	0.60	3.65	2.37	2.64	1.16

*t-values shown in bold are significant at 5% and bold & italics are significant at 10%

Table-5.3: MAAR of Winner and Loser Portfolio for 6 months formation-test period

Test period (months)	MAAR$_{w,t}$	t-value	MAAR$_{L,t}$	t-value	MAAR$_{L,t}$-MAAR$_{w,t}$	t-value
1	1.78	1.15	-0.57	-0.56	-2.35	-1.27
2	1.38	1.24	-0.91	-1.04	-2.29	***-1.61***
3	1.67	***1.58***	-1.77	***-1.57***	-3.44	-2.23
4	0.19	1.18	-1.69	**-2.10**	-1.88	***-1.38***
5	0.80	0.67	3.44	**2.00**	2.63	1.26
6	0.16	0.18	1.74	**1.78**	1.58	1.23

Note: t-values shown in bold are significant at 5% and bold & italics are significant at 10%

Table 6: Randomness test during test period

Test of Randomness	Number of Runs	Number of positive returns	Number of negative returns	z-value
3 year×3 year MAAR$_L$-MAAR$_W$	21	23	13	***1.34***
1 year×1 year MAAR$_L$-MAAR$_W$	2	3	9	**-2.89**
3 year×3 year MCAAR$_L$-MCAAR$_W$	2	25	11	**-5.16**
1 year×1 year MCAAR$_L$-MCAAR$_W$	1	0	12	**-infinite**

Note: z-values shown in bold are significant at 5% and bold & italics are significant at 10%