The Overreaction Effect in the Indian Stock Market

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Abstract

This paper examines if there is any overreaction effect present in the Indian stock market, using the monthly closing adjusted prices of 500 stocks comprising S&P CNX 500 Equity Index over the period from March 1996 to March 2007 and the methodology in De Bondt and Thaler (1985), and Chan (1988). The findings reveal the presence of statistically significant but asymmetric overreaction effect in the Indian stock market. Contrarian investment strategy has been found to be economically feasible, generating abnormally positive returns on market-adjusted as well as risk-adjusted basis which are largely attributable to the extremely positive returns to loser stocks during the test period. These findings cast serious objections against the informational efficiency of the Indian stock market suggesting that investors can earn superior returns by making use of the information on past prices of securities.

Keywords: Contrarian Investment Strategy, Losers, Overreaction Effect, Winners, Zero-Investment Portfolio

JEL Classification: G14, G15

1. Introduction

Over the past few decades, the Efficient Market Hypothesis (EMH) has been one of the most dominant themes in the financial market research which has generated a substantial interest to financial economists in the area of the efficiency of stock markets. Whilst the efficiency of stock markets was once virtually taken for granted, it is now being seriously questioned again, primarily due to the cumulating evidence on the reversal behaviour

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of stock prices, that is, the prior period's worst stock return performers (losers) outperform the prior period's best stock return performers (winners) in the subsequent period, suggesting that the stock returns are predictable and that the contrarian stock selection strategy that involves forming of a zero-investment portfolio that buys the past losers and sells the past winners achieves abnormally positive returns in the future. De Bondt and Thaler (1985) documented long-term return reversals in the United States. They interpreted their evidence as a result of irrational behaviour of investors and attributed this long-term return reversal phenomenon to the presence of "Overreaction Effect" in the stock market.

Overreaction hypothesis asserts that stock markets are subject to the waves of optimism and pessimism. Stock prices tend to deviate temporarily from their fundamental values; they shoot up over good news while they dive at bad news. However, over a period of time, this initial price reaction is followed by a correction and stock prices gradually revert back to their fundamental values thereby suggesting that the market has overreacted in the initial period and that it subsequently corrects itself. Consequently, the prior losers outperform the prior winners in the subsequent period. If this hypothesis is true, then the contrarian stock selection strategy would yield significant positive returns over a given test period.

Following the findings of De Bondt and Thaler (1985), various studies re-examined the evidence on return reversal phenomenon in the United States, the United Kingdom and other international markets. While some studies reported findings in support of overreaction hypothesis (see, in the United States: Fama & French, 1988; Poterba & Summers, 1988; in the United Kingdom: Power, Lonie & Lonie, 1991; MacDonald & Power, 1991; Clare & Thomas, 1995; Campbell & Limmack, 1997; Dissanaike, 1997, 2002; in Spain: Alonso & Rubio, 1990; in France: Dubois & Bacmann, 1998; in Turkey: Bildik & Gulay, 2002; in China: Wu, 2004; and in Japan: Chiao & Hueng, 2005), there are studies that rejected investor overreaction as the source of contrarian profits and provided alternative explanations behind the successful performance of the contrarian investment strategy.

The first of these explanations relates to the instability of the risk of loser and winner stocks over time and possible leverage option effect. Studies argued that with a fall in the market value of loser stocks, they become riskier than winners in the subsequent period and thus, the positive returns to the contrarian strategy of buying loser stocks are a normal compensation for its corresponding higher level of risk (Chan, 1988; Ball & Kothari, 1989). Further, the overreaction effect has been argued to be another manifestation of size effect (Zarowin, 1990). However, overreaction effect has been shown to be economically significant even after adjusting the

winner and loser portfolios for both risk and size differentials (De Bondt & Thaler, 1987; Chopra, Lakonishok & Ritter, 1992). Various studies have detected errors in the measurement of raw as well as contrarian portfolio returns due to micro-structure/liquidity induced effects, such as bid-ask spreads and the non-synchronous trading. Loser stocks have been observed to be extremely low-priced, exhibiting skewed return distribution, thus causing an upward bias in the returns of zero-investment portfolio that is in no way related to any systematic investor overreaction (Ball, Kothari & Shanken, 1995).

Although the overreaction hypothesis is well documented abroad, there is very limited research on the overreaction effect in the Indian stock market. Sehgal and Balakrishnan (2002) reported that this phenomenon is indeed present in the Indian stock market and that the contrarian strategy generates moderately positive returns to the investors. They formed non-overlapping winner and loser portfolios based on their returns during the past 36 months which were then held for a holding period of one year. To avoid the impact of momentum effect in the short term returns, they skipped one year between portfolio formation and holding period and found a weak reversal pattern in long term returns.[1]

At this point, it seems desirable to provide additional evidence to what already exists and thus, this paper attempts to investigate the validity of overreaction hypothesis in the context of the Indian stock market which is one of the leading emerging capital markets. Our findings reveal that investors can earn statistically significant returns by following contrarian trading rule as opposed to moderately positive payoffs found by Sehgal and Balakrishnan (2002).

As a first step, the overreaction hypothesis has been tested by examining the profitability of contrarian investment strategy on the basis of market-adjusted as well as risk-adjusted excess returns. We also tested if the overreaction effect serves as a proxy for an omitted risk factor in asset pricing models instead of being a profitable stock market anomaly. The remainder of this paper is organised as follows: Section 2 describes the data and methodology employed to test the overreaction hypothesis. The empirical results are provided in Section 3. Finally, Section 4 summarises the results and concludes the paper.

[1] In contrast, we have formed overlapping winner and loser portfolios and taken a long holding period of three years as suggested by De Bondt and Thaler (1985), which is also warranted by a need for testing reversal in long term returns with relatively more number of portfolios.

2. Data and Methodology

2.1 Data

Month-end closing adjusted prices of all the stocks forming part of the NSE 500 Equity Index over 11 year-period from 31st March, 1996 to 31st March, 2007, as compiled by PROWESS, forms the basic data for the study. PROWESS is a financial database offered by the Centre for Monitoring Indian Economy (CMIE) and is widely used in research studies in India.

Over the years, the number of stocks in the index grew from 328 stocks in 1996 to 500 stocks in year 2007. For a given stock to be included in the sample it must have been traded continuously for 36 months previous to the portfolio formation date, the period labelled as the *'formation period'* and then have traded at least for 18 months during the following 36 months, i.e. the *'test period'*.

Monthly return on S&P CNX Nifty Index and the monthly equivalent of the annual interest rates on 91-day Treasury bills are proxies for the market return and risk-free return respectively.

2.2 Methodology

The overreaction hypothesis is tested using the methodology of De Bondt and Thaler (1985). The possibility of change in the risk of winners' and losers' portfolios from the formation period to the test period as an explanation behind the observed return reversals is investigated using the method advanced by Chan (1988).

Firstly, we have identified the stocks that have experienced extreme market-adjusted excess returns during the prior 36 months and formed the two portfolios using the following procedure:

1. Beginning with March 1996, monthly market-adjusted excess returns are obtained for each stock included in our sample for the following 72 months (t = -35,-34,….0,…36), covering both a three-year portfolio "formation period" (t = -35,-34,…., 0) and a three-year portfolio "test period" (t = 1, 2,…., 36):

$$u_{j,t} = R_{j,t} - R_{m,t} \tag{1}$$

where $u_{j,t}$ represents market-adjusted excess return on stock j for the month t, $R_{j,t}$ is the return on stock j for the month t, and $R_{m,t}$ is the return on market index for the month t.

2. The cumulative market-adjusted excess returns (CU_j's) are then computed for each stock in the sample over the 36-month formation period:

$$CU_j = \sum_{t=-35}^{0} u_{j,t} \tag{2}$$

Based on their cumulative excess returns (CU_j's), all the stocks in the sample are ranked from highest to lowest and the portfolios are formed. The top-most 50 stocks with highest CU_j's are assigned to a *winners' portfolio (W)*; and the bottom-most 50 stocks with lowest CU_j's are assigned to a *losers' portfolio (L).* This procedure is repeated every year beginning from March 1996 up to March 2001 so as to give a total of six winners' and six losers' portfolios of 50 securities each (corresponding to six formation-test periods of six years each).

Once the winners-losers portfolios are formed, the next step involves the application of various statistical procedures to test the overreaction hypothesis, i.e. to test whether during the test period, prior losers outperform the prior winners.

3. For both portfolios the average residual returns (AR's) of all the 50 securities in the portfolio are calculated for each of the 36 months of each of the 6 three-year test periods, starting in April 1999 and up to March 2007:

$$AR_{p,i,t} = \sum_{j=1}^{n} \frac{1}{n} u_{j,i,t}\ ;\ \text{t} = 1,2,3,\ldots,36;\ \ \text{i} = 1,2,3,\ldots,6;\ \text{p} = \text{L,W} \tag{3}$$

where p denotes the losers' and the winners' portfolios respectively, n represents the number of stocks included in each portfolio; i.e. n = 50, i refers to a particular test period under consideration and t refers to a particular month of a particular test period.

4. Thereafter, the cumulative average residual returns *(CAR's)* of all the securities are computed for both the portfolios for each of the 36 months of the 6 three-year test periods:

$$CAR_{p,i,t} = \sum_{\tau=1}^{t} AR_{P,i,\tau}\ ;\ \text{t} = 1,2,3,\ldots,36;\ \ \text{i} = 1,2,3,\ldots,6;\ \text{p} = \text{L,W} \tag{4}$$

5. Using the CAR's from all the 6 test periods, the average CAR's *(ACAR's)* are then calculated for each portfolio and for each of the 36 months of all the test periods:

$$ACAR_{p,t} = \frac{1}{N}\sum_{i=1}^{N} CAR_{P,i,t}\ ;\ t = 1, 2, 3\ldots 36;\ p = L, W \qquad (5)$$

where N represents the total number of test periods, i.e. six in this study.

If an overreaction phenomenon exists, one can expect to observe that during the test period, i.e. for $t > 0$, ACAR for losers turns out to be greater than zero and ACAR for winners turns out to be smaller than zero such that, by implication, ACAR of the zero investment portfolio used in the contrarian strategy (CE) comes out to be positive. That is, during the test period:

$ACAR_{L,t} > 0,\ \ t = 1, 2, \ldots., 36;$
$ACAR_{W,t} < 0,\ \ t = 1, 2, \ldots., 36;$
$ACAR_{CE,t} = ACAR_{L,t} - ACAR_{W,t} > 0,\ \ t = 1, 2, \ldots., 36.$

The first two cases are tested using the standard t test on $ACAR_{Lt}$ and $ACAR_{Wt}$, with the variance of population being unknown. The sample standard deviation and the corresponding t-statistic in this case are equal to:

$$s_t = \sqrt{\sum_{i=1}^{N}\left(AR_{P,i,t} - ACAR_{P,t}\right)^2 / N - 1} \qquad (6)$$

$$t_t = \frac{AR_{P,t}}{s_t / \sqrt{N}} \qquad p = L, W \qquad (7)$$

To verify the last case, i.e. whether at any time t, contrarian investment strategy gives statistically significant positive returns, which in fact demonstrates the validity of contrarian strategy and the overreaction hypothesis, we first apply the mean equality test, as applied by De Bondt and Thaler (1985) to test the null hypothesis that both losers and winners have the same ACAR. The t statistic in this case is given as:

$$t_t = \frac{ACAR_{L,t} - ACAR_{W,t}}{\sqrt{2s_t^2 / N}} \qquad (8)$$

where s_t^2 represents pooled estimate of population variance in CAR_t and is given as:

$$s_t^2 = \frac{\sum_{i=1}^{N}\left(CAR_{W,i,t} - ACAR_{W,t}\right)^2 + \sum_{i=1}^{N}\left(CAR_{L,i,t} - ACAR_{L,t}\right)^2}{2(N-1)} \qquad (9)$$

However, Forner and Marhuenda (2000) contended that the mean equality test treats the two samples, $CAR_{W,i,t}$ and $CAR_{L,i,t,}$ as independent from each other and tests whether the losers' mean returns are higher than those of the winners. However, as per the implication of overreaction hypothesis, one should test whether the losers outperform the winners consistently for each test period. Thus, we also test whether the ACAR of zero investment portfolios, $ACAR_{CEt}$ i.e. the difference between $ACAR_{Lt}$ and $ACAR_{Wt}$ is significantly different from zero, as conducted by Forner and Marhuenda (2000):

$$t_{CEt} = \frac{ACAR_{CEt}}{s_{CEt} / \sqrt{N}} \tag{10}$$

where

$$s_{CEt} = \sqrt{\frac{\sum_{i=1}^{N} \left(CAR_{CE,i,t} - ACAR_{CE,t}\right)^2}{N-1}} \tag{11}$$

6. To test the possibility that change of direction observed in the stock returns may in fact be due to the different levels of risk between the winners' and the losers' portfolios, as well as to changes in their risk level, as a consequence of changes in their market value, between the formation period and the test period, as explained by leverage effect, we run the following regression in every formation-test period as proposed by Chan (1988):

$$R_{p,t} - R_{f,t} = \alpha_{p,F}(1-D_t) + \alpha_{p,T} D_t + \beta_{p,F} (R_{m,t} - R_{f,t}) + \beta_{p,D}(R_{m,t} - R_{f,t})D_t + \varepsilon_{p,t} \tag{12}$$
$$t = -36, -35 \ldots 0 \ldots 36; \quad p = L, W$$

where $R_{p,t}$ represents the returns on either the winners' or the losers' portfolios during the month t; $R_{f,t}$ refers to the risk-free rate during the month t; $R_{m,t}$ represent the returns on market index during the month t; $\alpha_{p,F}$ and $\alpha_{p,T}$ represent risk-adjusted abnormal return during the formation period $(t \leq 0)$ and the test period $(t > 0)$ respectively; $\beta_{p,F}$ is the systematic risk of the portfolio p during the formation period; $\beta_{p,D}$ measures the change observed in the systematic risk of the portfolio p between the formation period and the test period, so that the beta for the test period is $(\beta_{p,F} + \beta_{p,D})$; D_t is a dummy variable, with ones during the test period $(t > 0)$ and zeros during the formation period $(t \leq 0)$, which is introduced to estimate different intercepts (α's) and betas (β's) during both periods; and $\varepsilon_{p,t}$ is the error

term, which is assumed to be normally distributed with a zero mean and a variance of $\sigma^2_{p,F}$ during the formation period and $\sigma^2_{p,T}$ during the test period.

To test whether the contrarian strategy provides risk-adjusted abnormal returns or not, we run the following regression:

$$R_{L,t} - R_{W,t} = \alpha_{CE,F}(1 - D_t) + \alpha_{CE,T} D_t + \beta_{CE,F}(R_{m,t} - R_{f,t}) + \beta_{CE,D}(R_{m,t} - R_{f,t}) D_t + \varepsilon_{CE,t} \quad (13)$$

t = -36, -35… 0… 36; CE = Arbitrage Portfolio

Values of $\alpha_{p,T}$ significantly greater than 0 for losers and lower than 0 for winners and the values of $\alpha_{CE,T}$ significantly greater than 0 for zero-investment portfolios would imply a presence of overreaction effect as distinct from the leverage option effect.

As proposed by Chan (1988), we also estimate the aggregated parameters for the entire period of 11 years from 1996 to 2007, using the statistical test, U, which is based on the values of t-statistic obtained in each one of the individual regressions done for a given formation-test period:

$$U = \frac{1}{\sqrt{N}} \sum_{i=1}^{N} t_i \left[\frac{(T_i - 3)}{(T_i - 1)} \right]^{\frac{1}{2}} \sim N(0, 1) \quad (14)$$

where t_i is the t statistic of each regression and T_i is the number of observations in each regression, i.e. 72 in the present study.

7. Finally, we test whether the overreaction effect serves as a proxy for an omitted risk factor in the asset pricing models, instead of an exploitable anomaly. For this purpose, we incorporate another factor, the Loser Minus Winner (LMW) factor, corresponding to the contrarian risk premium, in a standard CAPM equation which will capture the effect of returns from the contrarian strategy in explaining the overall returns from a particular stock or a portfolio[2] and run the following regression in every formation-test period for each of the six winners' and the six losers' portfolios:

$$R_{p,t} - R_{f,t} = \alpha_p + \beta_p (R_{m,t} - R_{f,t}) + \gamma_p (L_{p,t} - W_{p,t}) + \varepsilon_{p,t} \quad (15)$$

t = -36, -35… 0… 36; p = L, W

[2] Incorporation of the LMW factor in standard CAPM to capture the effect of contrarian returns on overall returns from portfolio is governed by the rationale behind the emergence of Multi-Factor Asset Pricing models that popular stock market anomalies such as size-effect and value effect, do not constitute anomalies but represent omitted risk factors in standard asset pricing models, thus leading to the incorporation of additional risk factors like SMB (Small Minus Big) factor corresponding to size effect in the market models.

where, $R_{p,t}$ represents the returns on either the winners' or the losers' portfolio during the month t; $R_{f,t}$ represents the risk-free rate during the month t; $R_{m,t}$ represents the returns on market index during the month t; $L_{p,t}$ represents the average returns on the losers' portfolio p for the month t; $W_{p,t}$ represents the average returns on the winners' portfolio p for the month t; α_p represents the risk-adjusted abnormal return on portfolio p; β_p measures the sensitivity of the portfolio p's returns to the market risk, i.e. it measures the systematic risk of the portfolio p as explained by the market risk; γ_p measures the sensitivity of the portfolio p's returns to the contrarian risk, i.e. it measures the systematic risk of the portfolio p as explained by the risk of entering into a contrarian strategy; and $\varepsilon_{p,t}$ is the error term, which is assumed to be normally distributed with a zero mean and a variance of $\sigma^2_{p,F}$ during the formation period and $\sigma^2_{p,T}$ during the test period. A statistically significant coefficient of LMW factor (γ_p) would imply a significant role of the overreaction effect in explaining the returns from a particular portfolio which could either be attributed to the overreaction effect being an exploitable stock market anomaly (if CAPM is a correct model for determining the returns from a security) or it being an omitted risk factor capturing a significant variation in the portfolio's returns which are not captured by standard CAPM (assuming CAPM to be an insufficient model for measuring the expected returns from a security).

3. Empirical Results

3.1 Descriptive Statistics Pertaining to the Formation and the Test Periods

Descriptive statistics of each of the six losers' and the six winners' portfolios for the formation period as well as the test period are shown in Table 1.

As is expected, during the formation period, the mean return of all the six winners' portfolios is positive and statistically significant, while the losers' mean return is negative and statistically significant for five out of six portfolios. A reversal is observed from the formation period to the test period as the losers' mean return became positive and is statistically significant in four out of six periods, while the winners' mean return declined and became statistically insignificant in four out of six periods; it even became insignificantly negative in the second test period.

A reversal can also be observed in the risk (as measured by the standard deviation) of the losers' and the winners' portfolios from the formation period to the test period. During the formation period, risk of each of the winners' portfolio is higher than the risk of the corresponding

Table 1: Descriptive Statistics of the Six Losers' and the Six Winners' Portfolios for the 36-Month Formation Period as well as the 36-Month Test Period

Portfolio	Descriptive Statistics	Formation Period		Test Period	
		Losers	Winners	Losers	Winners
1	Mean	-0.0387	0.0590	0.0225	0.0088
(Apr' 96-Mar' 02)	Std. Dev.	0.0669	0.1092	0.0794	0.0770
		(-3.47)**	(3.24)**	(1.69)	(0.68)
2	Mean	-0.0330	0.0935	0.0251	-0.0050
(Apr' 97-Mar' 03)	Std. Dev.	0.0689	0.1336	0.0642	0.0856
		(-2.87)**	(4.19)**	(2.34)*	(-0.35)
3	Mean	-0.0268	0.0752	0.0336	0.0201
(Apr' 98-Mar' 04)	Std. Dev.	0.0581	0.1366	0.0829	0.0777
		(-2.76)**	(3.30)**	(2.43)*	(1.55)
4	Mean	-0.0254	0.0559	0.0348	0.0225
(Apr' 99-Mar' 05)	Std. Dev.	0.0562	0.0892	0.0815	0.0540
		(-2.70)**	(3.75)**	(2.55)*	(2.49)*
5	Mean	-0.0265	0.0557	0.0293	0.0260
(Apr' 00-Mar' 06)	Std. Dev.	0.0750	0.0838	0.0729	0.0565
		(-2.12)*	(3.98)**	(2.41)*	(2.75)**
6	Mean	-0.0146	0.0680	0.0167	0.0119
(Apr' 01-Mar' 07)	Std. Dev.	0.0575	0.0972	0.0556	0.0493
		(-1.52)	(4.19)**	(1.80)	(1.44)

Notes: * Statistically significant at 5% level of significance.
** Statistically significant at 1% level of significance.
The period analysed is from March 1996 to March 2007. The losers' and winners' portfolios are formed with fifty stocks each experiencing extreme market returns in either direction during the 36-month formation period. The monthly return on the Nifty index for the same period has been used as a proxy of the market portfolio. Values in parenthesis ( ) represent corresponding *t-statistics*.

losers' portfolio[3]. However, the losers' risk has increased substantially from the formation period to the test period in three portfolios and it has decreased slightly in the other three portfolios. For the winners, their risk has reduced from the formation period to the test period for each of the six

[3] This observation, in fact, is in adherence to risk-return tradeoff theory which postulates that the higher (lower) the risk of a security, the higher (lower) should be the corresponding returns. In this study, stocks with higher (lower) risk have been found to be providing higher (lower) returns and included in winners' (losers') portfolios. This in turn substantiates that our winners' and losers' portfolios are correctly formed.

portfolios such that ultimately the losers became more risky than the winners during the test period in five out of six portfolios.

3.2 Market-Adjusted Excess Returns and the Overreaction Effect

Table 2 contains the *ACARs* of all the contrarian/zero-investment portfolios, the losers' portfolios and the winners' portfolios, at the end of the formation period and during 6, 12, 18, 24, 30, and 36 months of the test period. Figure 1 represents the movement of *ACARs* of all the three types of portfolios as we progress through the test period.

Table 2: Averaged Cumulative Abnormal (Market-Adjusted) Returns (ACAR) of the Contrarian/Zero-Investment Portfolios, the Losers and the Winners' Portfolios at the End of the Formation Period and During the Months 6, 12, 18, 24, 30, 36, of the 36-Month Test Period

Portfolio	CUs at the end of the formation period	ACARs during the test period (t-statistics) [p-values]					
		Months after the Portfolio formation date					
		6	12	18	24	30	36
Contrarian	-3.51	0.124	0.061	0.216	0.279	0.459	0.467
(1)		(1.86)	(0.39)	(1.38)	(2.53)*	(3.68)**	(3.05)**
		[0.06]	[0.70]	[0.17]	[0.03]	[0.00]	[0.00]
(2)		(1.18)	(0.35)	(0.99)	(1.74)	(2.42)*	(2.39)*
		[0.24]	[0.73]	[0.32]	[0.08]	[0.02]	[0.02]
Losers	-0.99	0.273	0.303	0.562	0.655	0.92	0.972
		(4.07)**	(7.05)**	(5.67)**	(9.15)**	(9.21)**	(8.73)**
		[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Winners	2.51	0.149	0.242	0.346	0.376	0.461	0.505
		(1.61)	(1.32)	(1.59)	(2.35)*	(2.54)*	(2.76)**
		[0.12]	[0.19]	[0.06]	[0.02]	[0.01]	[0.00]

Notes: * Statistically significant at 5% level of significance
** Statistically significant at 1% level of significance
(1) The t statistics shown in this row correspond to equation no. (10), with the Null Hypothesis as: H_0: $ACAR_{CE} = 0$
(2) The t statistics shown in this row correspond to equation no. (8), with the Null Hypothesis as: H_0: $ACAR_L = ACAR_W$

Period analysed: March 1996 to March 2007. Losers' and winners' portfolios are formed with fifty stocks each, experiencing extreme market returns in either direction during the 36-month formation period. Monthly return on the Nifty index for the same period has been used as a proxy of the market portfolio. *t-statistics* are shown in parenthesis ( ) and *p-values* in square brackets [ ].

Similar results have been obtained using the methods proposed by De Bondt and Thaler (1985) and Forner and Marhuenda (2000). As is evident, values of cumulative returns from the zero-investment portfolios have performed as predicted; zero-investment portfolios yield a positive cumulative excess returns for all the months of the test period and significantly positive cumulative returns during the later months of the test period. Thirty-six months into the test period, contrarian investment strategy has generated a statistically significant positive cumulative abnormal (market-adjusted) return of 46.73 per cent [*t*-statistic = 3.05 (1), 2.39 (2)]. This means that in those 36 months following the portfolio formation, the losers' portfolios have outperformed the winners' portfolios by an average of 46.73 per cent, thus implying the presence of statistically significant overreaction effect in the Indian Stock market.

The performance of the losers' portfolios also is strongly consistent with the predictions of overreaction hypothesis. A strong reversal can be observed in the returns' pattern of the losers' portfolios; their negative cumulative returns during the formation period have reversed into significantly positive cumulative returns from the second month itself (*t*-statistic = 2.87) after the portfolio formation date (Table 3). Also, the magnitude of return reversal in case of loser stocks seems to be much higher in the Indian stock market than what has been documented for various other world stock markets; the losers' portfolios earned a huge positive ACAR of 97.20 per cent (*t*-statistic = 8.73) by the end of the test period as compared to their negative cumulative return of 99 per cent at the end of

Table 3: Average CARs of the Winners' Portfolio ($ACAR_{W,t}$), Losers' Portfolio ($ACAR_{L,t}$), and the Zero-Investment/Arbitrage Portfolio ($ACAR_{CE,t}$) along with their Corresponding *t*- Statistics for the Month 1 to 36 of the Test Period

Month	$ACAR_{W,t}$	$ACAR_{L,t}$	T_t	$T_{t\,Win}$	$T_{t\,Los}$	$ACAR_{CE,t}$	T_{CEt}
1	0.01	0.06	0.72	0.21	1.43	0.05	1.48
2	0.05	0.14	0.86	0.49	2.86**	0.09	1.27
3	0.06	0.20	1.07	0.55	2.44*	0.13	1.95
4	0.07	0.21	1.19	0.63	2.84**	0.14	2.15**
5	0.11	0.27	1.42	1.19	3.32**	0.16	1.73
6	0.15	0.27	1.18	1.61	4.07**	0.12	1.86
7	0.17	0.29	1.03	1.93	3.66**	0.11	1.19
8	0.23	0.33	0.98	2.15*	6.57**	0.10	1.29
9	0.28	0.36	0.61	2.23*	5.12**	0.08	0.79
10	0.27	0.33	0.43	1.97*	6.23**	0.06	0.56
11	0.26	0.31	0.40	1.73	9.04**	0.06	0.46
12	0.24	0.30	0.35	1.32	7.05**	0.06	0.39

Table 3: (Cont'd)

Month	$ACAR_{W,t}$	$ACAR_{L,t}$	T_t	$T_{t\,Win}$	$T_{t\,Los}$	$ACAR_{CE,t}$	T_{CEt}
13	0.29	0.39	0.53	1.41	5.48**	0.10	0.67
14	0.33	0.47	0.81	1.85	6.79**	0.14	1.12
15	0.32	0.50	0.85	1.61	4.41**	0.18	1.29
16	0.33	0.54	0.93	1.50	4.80**	0.21	1.39
17	0.35	0.57	0.99	1.63	5.14**	0.22	1.59
18	0.35	0.56	0.99	1.59	5.66**	0.22	1.38
19	0.35	0.56	1.10	1.78	6.28**	0.22	1.61
20	0.40	0.63	1.38	2.44*	8.66**	0.23	2.16**
21	0.43	0.65	1.37	2.72**	7.99**	0.22	2.69**
22	0.41	0.65	1.52	2.64**	7.81**	0.24	2.82**
23	0.38	0.67	1.70	2.34*	8.38**	0.28	2.74**
24	0.38	0.65	1.75	2.35*	9.15**	0.28	2.52*
25	0.45	0.76	1.84	2.69**	12.01**	0.30	2.56*
26	0.49	0.83	2.06*	2.96**	10.02**	0.35	2.67**
27	0.46	0.86	2.36*	2.91**	8.62**	0.40	2.80**
28	0.44	0.87	2.25*	2.54*	8.11**	0.42	2.99**
29	0.47	0.90	2.26*	2.56*	8.28**	0.44	3.56**
30	0.46	0.92	2.42*	2.53*	9.20**	0.46	3.67**
31	0.45	0.92	2.60**	2.59**	9.95**	0.47	3.54**
32	0.51	0.95	2.40*	3.03**	8.32**	0.44	3.41**
33	0.54	0.97	2.18*	3.06**	7.75**	0.43	3.28**
34	0.53	0.97	2.30*	3.09**	8.25**	0.44	3.12**
35	0.52	0.97	2.39*	2.91**	8.95**	0.45	3.14**
36	0.50	0.97	2.38*	2.76**	8.72**	0.47	3.04**

Notes: * Statistically significant at 5% level of significance
** Statistically significant at 1% level of significance

T_t in Table 5 represents the *t* statistics of the zero-investment portfolio, corresponding to the equation no. (8):

$$t_t = \frac{ACAR_{L,t} - ACAR_{W,t}}{\sqrt{2s_t^2 / N}}$$

T_{tWin} and T_{tLos} in Table 5 represent the *t* statistics of the winners' and the losers' portfolios respectively, corresponding to the equation no. (7):

$$t_t = \frac{AR_{P,t}}{s_t / \sqrt{N}} \qquad p = L, W$$

T_{CEt} in Table 5 represent the *t* statistics of the zero-investment portfolio, corresponding to the equation no. (10):

$$t_{CEt} = \frac{ACAR_{CEt}}{s_{CEt} / \sqrt{N}}$$

The period analysed is from March 1996 to March 2007. Losers' and winners' portfolios are formed with fifty stocks each experiencing extreme market returns in either direction during the 36-month formation period. The monthly return on the Nifty index for the same period has been used as a proxy of the market portfolio. The monthly equivalent of the annual interest rates on 91-day Treasury bills has been used as a proxy of the risk-free rate of return.

the formation period, which is indicative of a strong overreaction of Indian investors to bad news.

On the other hand, the winners' portfolios have not performed as predicted by the overreaction hypothesis. ACARs of the winners' portfolios, which should turn into negative if the return reversal phenomenon as implied by the overreaction hypothesis is to exist, continued to remain positive for all the months after portfolio formation. Although a decline can be observed (in Table 1) in their positive cumulative returns from 251 per cent during the formation period to 50.50 per cent (t-statistic = 2.76) by the end of the test period, the extent of such a decline is not large enough so as to account for a statistically significant overreaction of the investors to good news.[4] This implies that no significant return reversal has been found for the winners' portfolios, thus indicating that Indian investors do not overreact to good news.

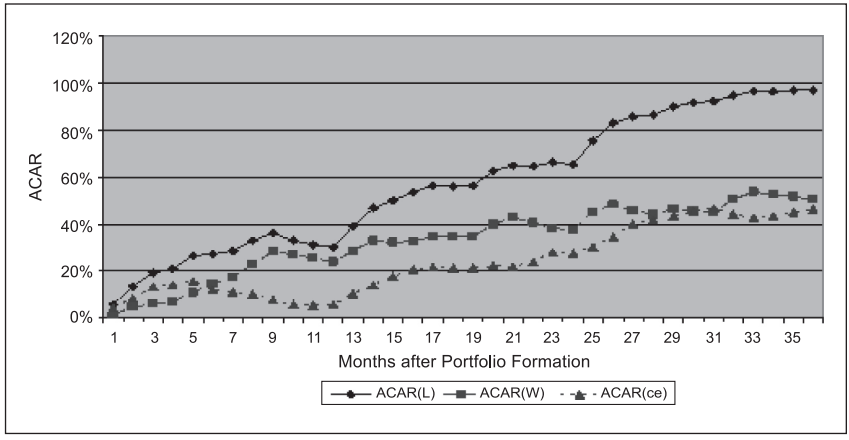
These findings are indicative of an unbalanced behaviour of Indian investors and the presence of an asymmetric overreaction effect in the Indian stock market; investors have been found to exhibit strong overreaction to bad news but do not overreact to good news. The winners' portfolios continue to provide significantly positive cumulative returns during the test period but such returns are much lesser than the excess returns provided by them in the formation period as well as it is much lesser than the significant cumulative excess returns generated by the losers' portfolios in the test period, thus resulting into significantly positive cumulative excess returns to zero-investment portfolio.

It can be observed from Figure 1 that ACAR of both winners' *[ACAR (W)]* and losers' *[ACAR (L)]* portfolios is positive and rising during the test period, but the cumulative returns of the losers' portfolios are increasing at a very fast pace such that the difference between the losers' ACAR and the winners' ACAR is consistently increasing as we progress through the 36-month test period. Losers are consistently outperforming the winners during each month of the test period, leading to the significant profitability of contrarian investment strategy *[ACAR (ce)]*.

These findings can be attributed to the pessimistic nature of Indian investors who do not overreact to good news, but display a significant overreaction to the bad news, such that past winners continue to be winners, providing statistically significant positive excess returns and the past losers experience a significant return reversal, thus turning into winners during

[4] It shows that when good news comes into market, investors positively react to it by taking stock prices up but their positive reaction marginally falls short of the reaction warranted by the impact of that good news such that stock prices continue to move upward, though very slightly, providing positive returns in the long term.

Figure 1: ACARs of the Losers', Winners' and the Contrarian/Zero-Investment Portfolios of 50 Stocks Each During the 6 Three-Year Test Periods from 1 April 1996 to 31 March 2007



the test period providing statistically significant positive excess returns, even higher than the positive returns to the winners' portfolios. Thus, it can be contended that the significantly positive excess returns to contrarian strategy in the Indian stock market are primarily driven by the large positive returns to the losers' portfolios during the test period.

3.3 Risk-Adjusted Excess Returns and the Overreaction Effect

The results in the previous Section revealed that the overreaction effect has its presence in the Indian stock market when the market-adjusted excess returns are considered. However, there is a possibility that the effect might disappear once the risk-adjusted excess returns to the portfolios are taken. According to the leverage option effect, changes in the total value of a company have a greater effect on the market value of its equity than on the market value of its debt, so that a decrease in the total value of a firm causes an increase in its financial leverage ratio and consequently, in its risk (except when the firm takes steps to keep its financial leverage ratio constant). Incidentally, the risk of loser (winner) stocks, which experienced a decrease (increase) in their market values during the formation period, increases (decreases) between the formation period and the test period and thus the increased (decreased) returns to the losers' (winners') portfolios during the test period is the compensation for their increased (decreased) market risk and not due to investors' overreaction. In Table 1 also, we observed that

there is a decline in the risk level of the winners' portfolios from formation period to test period in all the six periods. The risk of the losers' portfolios has significantly increased in three test periods (Portfolios 1, 3 and 5) while it has marginally declined in the remaining three periods (Portfolios 2, 5 and 6). Interestingly, losers which were less risky than winners during all the six formation periods turned more risky than their corresponding winners during five out of six test periods. This in turn necessitates the need to test the possibility that increased returns to losers and decreased returns to winners are due to the changed risk of the two portfolios and not due to the investor overreaction. For this, we used the method proposed by Chan (1988) and the results of such an application appear in Table 4.

As expected, the winner stocks have significantly positive cumulative returns and the loser stocks have significantly negative cumulative returns during the formation period. Incidentally, zero-investment portfolio has significant negative returns during this period. The test period results seem to be in conformity with those obtained in the previous section using market-adjusted excess returns. The losers' portfolios have earned significantly positive risk-adjusted abnormal returns ($\alpha_{L,T}$) for all except the first test period. The aggregated result of all the test periods combined also shows highly significant positive risk-adjusted abnormal returns for the losers' portfolios (U statistic = 5.66), thus lending a strong support to the presence of a strong investor overreaction to bad news.

On the other hand, the winners' portfolios are experiencing positive but insignificant risk-adjusted abnormal returns ($\alpha_{W,T}$) in all the six test periods. They are earning significantly positive risk-adjusted abnormal returns on an aggregative basis (U statistic = 2.76). However, on comparing the coefficients of their risk-adjusted abnormal return for the test periods ($\alpha_{W,T}$) with the corresponding formation periods ($\alpha_{W,F}$), it is found that it has decreased in all the six test periods. This also indicates that the winners' returns do decline from the formation period to the test period; however, such a decline is not sufficient enough so as to relate it to any significant overreaction to good news, a finding similar to the one obtained through the previous method.

Mixed results are obtained for the test period performance of contrarian strategy; zero-investment portfolios have generated insignificantly positive risk-adjusted abnormal returns ($\alpha_{CE,T}$) in all the six test periods; however, the aggregative effect of all test periods combined resulted into a significantly positive risk-adjusted abnormal returns (U statistic = 1.97). Going by the global practice of considering the aggregate results into account, it can be interpreted that in the Indian stock market, one can earn significantly positive risk-adjusted abnormal returns by following a

Table 4: Risk-Adjusted Monthly Abnormal Returns (α) and the Systematic Risk (β) of the Losers, Winners and Zero-Investment Portfolios in Each of the Formation (F) and Test (T) Periods

Portfolio	Losers					Winners					Contrarian / Zero-investment				
	$\alpha_{L,F}$	$\alpha_{L,T}$	$\beta_{L,F}$	$\beta_{L,D}$	Adj. R^2	$\alpha_{W,F}$	$\alpha_{W,T}$	$\beta_{W,F}$	$\beta_{W,D}$	Adj. R^2	$\alpha_{CE,F}$	$\alpha_{CE,T}$	$\beta_{CE,F}$	$\beta_{CE,D}$	Adj. R^2
1	-0.04	0.02	0.8	0.42	0.54	0.06	0.01	1.01	0.37	0.50	-0.1	0.01	-0.21	0.05	
(Apr' 96-	(-3.22)**	(1.90)	(4.81)**	(1.76)		(3.78)**	(0.63)	(4.71)**	(1.21)		(-6.25)**	(0.84)	(-0.97)	(0.15)	0.34
Mar' 02)	[0.00]	[0.06]	[0.00]	[0.08]		[0.00]	[0.53]	[0.00]	[0.23]		[0.00]	[0.40]	[0.34]	[0.88]	
2	-0.03	0.03	0.72	0.26	0.45	0.09	0.01	1.18	0.43	0.54	-0.12	0.02	-0.46	-0.17	
(Apr' 97-	(-2.77)**	(2.19)*	(4.98)**	(1.16)		(5.00)**	(0.26)	(4.87)**	(1.16)		(-6.53)**	(1.04)	(-1.85)	(-0.46)	0.42
Mar' 03)	[0.00]	[0.03]	[0.00]	[0.25]		[0.00]	[0.80]	[0.00]	[0.25]		[0.00]	[0.30]	[0.07]	[0.65]	
3	-0.03	0.03	0.76	0.34	0.52	0.08	0.02	1.66	-0.33	0.57	-0.11	0.02	-0.9	0.67	
(Apr' 98-	(-2.33)*	(2.72)**	(4.95)**	(1.44)		(4.43)**	(0.96)	(7.30)**	(-0.96)		(-6.14)**	(0.91)	(-4.04)**	(1.98)*	0.41
Mar' 04)	[0.02]	[0.01]	[0.00]	[0.15]		[0.00]	[0.34]	[0.00]	[0.34]		[0.00]	[0.37]	[0.00]	[0.05]	
4	-0.03	0.03	0.81	0.33	0.56	0.06	0.02	1.66	-0.67	0.73	-0.08	0.01	-0.86	1	
(Apr' 99-	(-2.22)*	(2.75)**	(5.02)**	(1.43)		(5.25)**	(2.00)*	(10.95)**	(-3.06)**		(-7.95)**	(0.95)	(-5.90)**	(4.78)**	0.56
Mar' 05)	[0.03]	[0.01]	[0.00]	[0.16]		[0.00]	[0.05]	[0.00]	[0.00]		[0.00]	[0.35]	[0.00]	[0.00]	
5	-0.02	0.03	1.53	-0.63	0.65	0.06	0.03	1.18	-0.21	0.59	-0.08	0.01	0.35	-0.42	
(Apr' 00-	(-1.48)	(2.51)*	(8.43)**	(-2.52)*		(4.74)**	(2.02)*	(6.39)**	(-0.83)		(-7.22)**	(0.51)	(2.18)*	(-1.92)	0.47
Mar' 06)	[0.14]	[0.01]	[0.00]	[0.01]		[0.00]	[0.05]	[0.00]	[0.41]		[0.00]	[0.61]	[0.03]	[0.06]	
6	-0.02	0.02	1.11	-0.26	0.60	0.07	0.01	1.3	-0.37	0.60	-0.08	0.01	-0.19	0.11	
(Apr' 01-	(-1.64)	(2.00)*	(7.92)**	(-1.29)		(5.05)**	(1.00)	(6.84)**	(-1.36)		(-8.63)**	(0.65)	(-1.38)	(0.56)	0.52
Mar' 07)	[0.10]	[0.05]	[0.00]	[0.20]		[0.00]	[0.32]	[0.00]	[0.18]		[0.00]	[0.51]	[0.17]	[0.58]	
U Statistic	-5.5**	5.66**	14.53**	0.79		11.36**	2.76**	16.53**	-1.54		-17.19**	1.97*	-4.81**	2.05*	

Notes: * statistically significant at 5% level of significance
** statistically significant at 1% level of significance

Period analysed: March 1996 to March 2007. Losers' and winners' portfolios are formed with fifty stocks each, experiencing extreme market returns in either direction during the 36-month formation period. Monthly return on the Nifty index for the same period has been used as a proxy of the market portfolio. Monthly equivalent of the annual interest rates on 91-day Treasury bills has been used as a proxy of the risk-free rate of return. *t-statistics* are shown in brackets ( ) and *p-values* in square brackets [ ]. Figures in the last row represent the aggregated U statistic.

$$R_{p,t} - R_{f,t} = \alpha_{p,F}(1-D_t) + \alpha_{p,T}D_t + \beta_{p,F}(R_{m,t} - R_{f,t}) - \beta_{p,D}(R_{m,t} - R_{f,t})D_t + \varepsilon_{p,t}$$

$$R_{L,t} - R_{W,t} = \alpha_{CE,F}(1-D_t) + \alpha_{CE,T}D_t + \beta_{CE,F}(R_{m,t} - R_{f,t}) - \beta_{CE,D}(R_{m,t} - R_{f,t})D_t + \varepsilon_{CE,t}$$

$$t = -36, -35, \ldots, 0, \ldots, 35, 36; \; p = L, W$$

contrarian investment strategy,[5] consequently supporting the validity of the overreaction hypothesis in the Indian stock market also.

Regarding the possible leverage option effect, the evolution observed in the systematic risk when it changes from the formation period to the test period (as measured by $\beta_{p,D}$) does not seem to favour it. Systematic risk of the losers' portfolios has insignificantly increased from the formation period to the test period (U statistic = 0.79) which is insufficient to account for a large increase in their returns during the test period.

The systematic risk of the winners' portfolios has declined from the formation period to the test period but again such a decline is very marginal and insignificant (U statistic = -1.54). Furthermore, though the systematic risk of the zero-investment portfolios has increased significantly from the formation period to the test period (U statistic = 2.05), the increase is insufficient to explain the risk-adjusted abnormal return on the zero-investment portfolios, since $\alpha_{CE,T}$ is significantly positive at 5 per cent level of significance.

Thus, it seems that the change of direction observed in the returns of the losers' portfolios, the zero-investment portfolios, and insignificantly for the winners' portfolios cannot be attributed to a possible leverage option effect in the context of the Indian stock market.

3.4 Asset Pricing Framework and the Overreaction Effect

In this Section, we test if the overreaction effect serves as a proxy for an omitted risk factor in the asset pricing models, instead of an exploitable anomaly. For this purpose, we incorporate another risk factor, the Loser Minus Winner (LMW) factor, corresponding to the contrarian risk premium, in a standard CAPM equation which will capture the effect of returns from the contrarian strategy in explaining the overall returns from a particular stock or a portfolio and run regression equation 15 in every formation-test period for each of the six winners' and the six losers' portfolios. Table 5 provides the summary of the test results so obtained.

The results are indicative of a significant role of overreaction effect in explaining the cross-section variations in the returns of the common stock's portfolios. The Coefficient of LMW factor (γ_p) has been found to be

[5] Although the contrarian investment strategy has been found to be generating significantly positive risk-adjusted abnormal returns, the magnitude of returns is relatively small ranging from 1 per cent to 2 per cent before considering transaction costs. Our study did not consider the impact of incorporating transaction costs on the significance and magnitude of the contrarian returns and thus poses a research problem for the empiricists who may attempt to address the question of profitability of contrarian trading rule after considering transaction costs.

statistically significant in all the six formation-test periods for the winners' portfolios (γ_W) and in five out of the six formation-test periods for the losers' portfolios (γ_L). Also, on comparing the newly obtained α values (appearing in Table 5) measuring the risk-adjusted abnormal returns, with the ones formerly obtained (appearing in Table 4) which is exclusive of LMW factor, it is observed that it has turned insignificant in four out of the six formation-test periods for both losers' and winners' portfolios. Adjusted R^2 has also improved over its previous values (appearing in Table 4) with the inclusion

Table 5: Risk-Adjusted Monthly Abnormal Returns (α), Market-Risk Premium (β) and the Contrarian Risk Premium (γ) of the *Losers' and the Winners' Portfolios* in Each of the *Formation-Test* Periods

Portfolio	Losers				Winners			
	α_L	β_L	γ_L	Adj. R^2	α_W	β_W	γ_W	Adj. R^2
1	0.01	1.07	0.37	0.59	0.01	1.07	-0.63	0.72
(Apr' 96-	(0.87)	(9.50)**	(4.89)**		(0.87)	(9.50)**	(-8.25)**	
Mar' 02)	[0.38]	[0.00]	[0.00]		[0.38]	[0.00]	[0.00]	
2	0.01	0.93	0.24	0.49	0.01	0.93	-0.76	0.84
(Apr' 97-	(0.93)	(8.32)**	(4.19)**		(0.93)	(8.30)**	(-13.1)**	
Mar' 03)	[0.36]	[0.00]	[0.00]		[0.36]	[0.00]	[0.00]	
3	0.02	1.11	0.30	0.56	0.02	1.11	-0.7	0.8
(Apr' 98-	(1.91)	(9.44)**	(4.46)**		(1.91)	(9.44)**	(-10.27)**	
Mar' 04)	[0.06]	[0.00]	[0.00]		[0.06]	[0.00]	[0.00]	
4	0.02	1.17	0.54	0.67	0.02	1.17	-0.46	0.74
(Apr' 99-	(2.92)**	(11.52)**	(6.58)**		(2.92)**	(11.52)**	(-5.61)**	
Mar' 05)	[0.00]	[0.00]	[0.00]		[0.00]	[0.00]	[0.00]	
5	0.02	1.14	0.54	0.70	0.02	1.14	-0.46	0.58
(Apr' 00-	(2.40)*	(9.97)**	(5.05)**		(2.40)*	(9.97)**	(-4.29)**	
Mar' 06)	[0.02]	[0.00]	[0.00]		[0.02]	[0.00]	[0.00]	
6	0.01	1.01	0.18	0.57	0.01	1.01	-0.82	0.72
(Apr' 01-	(0.98)	(9.86)**	(1.81)		(0.98)	(9.86)**	(-8.47)**	
Mar' 07)	[0.33]	[0.00]	[0.07]		[0.33]	[0.00]	[0.00]	

Notes: *Statistically significant at 5% level of significance
**Statistically significant at 1% level of significance

The period analysed is from March 1996 to March 2007. The losers' and winners' portfolios are formed with fifty stocks each experiencing extreme market returns in either direction during the 36-month formation period. The monthly return on the Nifty index for the same period has been used as a proxy of the market portfolio. The monthly equivalent of the annual interest rates on 91-day Treasury bills has been used as a proxy of the risk-free rate of return. The T statistics are shown in parenthesis ( ) and the *p*-values in square brackets [ ]. The Figures in the last row represent the aggregated U statistic.

$$R_{p,t} - R_{f,t} = \alpha_p + \beta_p (R_{m,t} - R_{f,t}) + \gamma_p (L_{p,t} - W_{p,t}) + \varepsilon_{p,t}$$

t = -36, -35,…, 0,…, 35, 36; p = L,W

of LMW factor. All these findings raise doubts on the appropriateness of single factor market model in explaining the cross-section variations in stock returns, consequently suggesting that the overreaction effect serves as a proxy for an omitted risk factor that is explaining a significant variation in common stock returns which are not captured by a single factor market model.

Alternatively, if we assume single factor CAPM to be the correct model for measuring the expected return on an asset, overreaction effect can be apprehended as a stock market anomaly present in the Indian stock market which can be profitably exploited. However, the negative values of γ_p for the winners' portfolios in every formation-test period suggest that the holding of the winners' portfolios and not following the contrarian strategy of buying past losers by selling the winners short results in reduced returns, thus indicating the presence of an overreaction effect as an exploitable anomaly in the Indian stock market.

4. Summary and Conclusion

Overreaction effect suggests that stock markets are subject to the waves of optimism and pessimism and hence, contrarian investment strategy generates abnormal returns.

This paper examined whether overreaction effect exists in the Indian stock market. We have employed the methodology proposed by De Bondt and Thaler (1985) and Chan (1988) and used both market-adjusted and risk-adjusted returns for the testing purposes. On the whole, the results seem to be in line with the findings obtained for the developed stock markets of the world. Our findings reveal a presence of statistically significant but asymmetric overreaction effect in the Indian stock market; the losers' returns have been observed to revert their direction from extremely negative to extremely positive path during the test period; however, such a reversal is not evident in the direction of the winners' returns. A decline has been observed in the winners' returns from the formation period to the test period, however, such a decline has not been found to be strong enough so as to convert them into losers during the test period. Such behaviour of Indian investors has been attributed to their pessimistic nature whereby they tend to overreact strongly to bad news but do not exhibit overreaction to good news. Contrarian investment strategy has been found to be economically feasible, generating abnormally positive returns on market-adjusted as well as risk-adjusted basis (contrary to the findings of Sehgal and Balakrishnan (2002) who reported moderately positive returns to the investors following

the contrarian investment strategy in the Indian stock market). These returns are largely attributable to the extremely positive returns to the loser stocks during the test period.

The findings of our study encompass strong implications for investment analysts, mutual fund managers as well as small investors who are continuously engaged in designing a trading strategy that can outperform the market. For instance, investment analysts and the retail investors can track the return performance of stocks during the last two to three years and invest in the stocks with most negative past returns so as to earn above normal returns in the long run, without being involved in the intricacies of fundamental and technical analysis for investment management.

Also, the economic feasibility of contrarian investment strategy casts serious objections against the informational efficiency of the Indian stock market. Evidence indicating the presence of significant overreaction effect in the Indian stock market and the availability of risk-adjusted excess returns to the contrarian investment strategy implies a weak form inefficiency of the Indian stock market where superior returns can be earned by making use of information on the past prices of securities.

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