

Presence and Sources of Momentum and Contrarian Profits: Evidence from the Indian Stock Market

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Abstract

This paper investigates the presence and sources of contrarian and momentum profits on the Indian stock market. Results show that there are contrarian and momentum profits in the short- and medium-term investment horizons, respectively. Further investigation reveals that investors can only earn short-term contrarian profits by investing in small and medium size (and low- and medium-trade volume) firms. In contrast, large firms (and high-volume of trade firms) appear to be correctly priced, leaving no opportunity for contrarian profits. As far as the sources of contrarian profits are concerned, firm-specific component is the major source of such profits. The role of firm-specific component as the source of contrarian profits for large size and high trade volume firms is very small and this phenomenon explains why large firms do not contribute to contrarian profits. Firm-specific component plays the major role in contrarian profits for small and medium size and low and medium trade volume firms. However, the good news for the Indian stock market is that the contribution of firm-specific component as a source of contrarian profits has decreased dramatically since 1999.

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1. Introduction

Early studies have supported the notion of the random walk hypothesis in stock returns, which implies that stock returns are unpredictable. Research in finance in the 1980s, including French (1980); Keim (1983); DeBondt and Thaler (1985, 1987); and Lo and MacKinlay (1988), indicates that historical stock prices do not follow random walk, implying predictability of stock returns to some extent. Thus, investors may earn abnormal returns from the market by adopting appropriate investment strategies.

Extant literature has shown the existence of various forms of return regularities (or patterns) in the developed as well as emerging markets. Among these, the two most notable regularities — contrarian and momentum profits — are of major concern for both practitioners and academicians. Contrarian profits arise when the previous period's best (worst) performing stocks systematically become worst (best) performing stocks in the next period. Momentum profits arise when the previous period's best-performing stocks systematically continue to do well in the next period.

DeBondt and Thaler (1985, 1987) are the first to provide evidence of contrarian profits on the U.S. market in the long-run investment horizon. Thus, investors may benefit from buying past losers and selling past winners. Jegadeesh (1990), Lehman (1990), and Chopra *et al.* (1992) also provide evidence in favor of short- and long-term contrarian profits. Jegadeesh and Titman (1993, 2001) are the first to show the existence of momentum opportunity in the U.S. market in the medium-term investment horizon. More recently, other research findings also support the presence of momentum profits in the U.S. market. In general, contrarian and momentum profits are attributed to overreaction and underreaction of investors to market information, respectively.

Behavioral explanations for stock market over- and under-reaction are nicely presented by Daniel, Hirshleifer, and Subrahmanyam (hereafter DHS, 1998) and Hong and Stein (hereafter HS, 1999). DHS assume that investors have their own information and value their stock selection skills very highly. This overconfidence leads these investors to overreact to new information, driving the price from the true value. In the long run, the market realizes the overvalued stocks and makes necessary corrections. This phenomenon causes momentum profits initially and contrarian profits in longer investment horizons. HS believe there are two types of investors: (1) investors who are well-informed about the market and (2) technical analysts who use past information to make investment strategies. Informed investors first react to new information. Then the prices set by this group, coupled with the subsequent reaction of technical analysts to new information, causes stock prices to move further in the same direction. Thus, if there is any good news about a firm, the stock price will go up in two phases, resulting in underreaction to information initially and momentum profits at the end.

Predictable behavior is not good for any stock market because possibly only a handful of big institutional investors will exploit the resultant profit opportunities, leaving a significant dent in the wealth and confidence of small investors. It is generally believed that small investors constitute a large portion of the market participants in an emerging market. Therefore, in order to ensure proper functioning of the channel between the surplus and deficit units in the economy, small investors' interests must be protected. The regulatory bodies must benefit from this research because it informs them what rules to make and where to incorporate surveillance in order to protect the small investors and less-informed foreign investors.

Most of the previous papers attempt to detect the presence of momentum and contrarian profits in developed markets. Recently, many papers have also investigated the sources of contrarian and momentum returns. However, research in this context has mainly focused on developed markets. Academicians have conducted serious research on emerging capital markets since the early 1990s, mainly because emerging markets historically have low correlation with developed markets, creating opportunities for global portfolio managers to capture more diversification benefits.¹ Previous literature on the Indian stock market focuses primarily on efficiency issues, stock-price predictability, return volatility, and integration with other markets—possibly because the behavioral explanation for stock market movements is a relatively recent idea.

The Bombay (Mumbai) Stock Exchange (BSE) and National Stock Exchange (NSE) account for most of the trading volume in the Indian stock market. The BSE, established in 1875, is the oldest stock exchange in Asia. It has a rich heritage and is the largest stock exchange in South Asia. It is the 10th largest stock exchange in the world and had a market capitalization of US\$1.79 trillion² as of December 31, 2007. Considering the size and prospect of the market, it is no surprise that international portfolio investors are interested in investing in an emerging market such as India.

In this paper, we consider both contrarian and momentum strategies in an integrated framework for the Indian stock market. The paper follows the methodology of Lo and MacKinlay (1990) to form portfolios with a weighted relative strength scheme (WRSS). Then we use the procedure followed by Jegadeesh and Titman (1995) to decompose the contrarian/momentum profits into three elements: compensation for cross-sectional risk, lead-lag effect in time series with respect to the

¹ Portfolio diversification benefits can be achieved through the construction of portfolio of assets so that the portfolio is further mean-variance efficient.

² This information is collected from the official BSE website, www.bse-india.com.

common factor, and time pattern of stock returns. This paper focuses on the presence of contrarian or momentum profits, their sources, and robustness of results with regard to various risk factors and changes in the behavior of the sources of such profits over time since 1991.

The results of this paper show that (i) there are contrarian profits in the short run, (ii) contrarian profits turn into momentum profits when portfolios are held for medium horizons of six to 12 months, (iii) mainly the small and medium-size firms and low- and medium-volume trade firms exhibit contrarian phenomena, (iv) firm-specific sources are the main component of contrarian profits, and finally (v) large (high-trade volume) firms are more correctly priced (the component of firm-specific sources of these firms is very small compared to that of small and medium-size firms and those with low and medium trade volume).

The rest of the paper is structured as follows. We provide a brief survey of the relevant literature in section 2. Section 3 discusses data and methodology used in the study. Section 4 analyzes the results. Section 5 concludes the paper.

2. Literature Review: Momentum and Contrarian Profits and Sources

DeBondt and Thaler (1985) are the first to report that past winners (losers) ultimately become losers (winners) in the three- to five-year investment horizon. Many subsequent research papers, including DeBondt and Thaler (1987) and Jones (1993), find similar results. Jegadeesh (1990), Lehman (1990), and Chopra *et al.* (1992) show that contrarian profits exist even in such short-run horizons as weekly returns. Jegadeesh and Titman (1995) argue that contrarian profits occur due to overreaction to firm-specific information. Boudoukh *et al.* (1994) and Conrad *et al.* (1997) show that market microstructure is the reason behind the observed contrarian returns.

Wongchoti and Pyun (2005) show that there are long-term contrarian profits even after risk is adjusted for.

Jegadeesh and Titman (1993) first present the evidence of momentum profits in the U.S. market for the intermediate horizon of three to 12 months. They attempt to find the reasons for momentum profits by introducing several risk factors in the model. Still, momentum profits continue to exist in the market. Conrad and Kaul (1998) argue that momentum profits occur due to cross-sectional differences in risk, i.e., expected returns. Moskowitz and Grinblatt (1999) suggest that momentum in industry risk factors explains observed momentum profits. Lee and Swaminathan (2000) show that momentum profits are more prevalent in high-turnover stock returns. Hong *et al.* (2000) find that small firms with low analyst attention have more momentum phenomena. Griffin *et al.* (2003) suggest that macroeconomic risk factors cannot explain momentum profit. They show that momentum profits are large and exist in both good and bad states and that profits tend to reverse over an investment horizon of one to five years. More recently, Chui *et al.* (2005) suggest that momentum is related to individualism and cultural or psychological explanations. Cooper *et al.* (2004) find that for U.S. stocks momentum profits occur only in the “up” market. This finding supports Daniel *et al.* (1998), who suggest that investors attribute investing success to their skills, causing overconfidence and further pushing up stock prices. In a recent paper, Huang (2006) formulates trading strategies considering 17 developed market indices and shows that momentum profits exist only in the up market. However, results are somewhat sensitive to the definition of market states. Safieddine and Sonti (2007) show that firms in the highest industry growth category exhibit more momentum profits than firms in the lowest industry growth category.

Many recent papers concentrate on emerging markets and investigate the sources of momentum and contrarian profits. Rouwenhorst (1999) considers emerging markets to test momentum and contrarian phenomena. He finds momentum in emerging market returns and concludes that “factors are fundamentally related to the way by which investors set prices in financial markets around the world.” Naranjo and Porter (2007) investigate the issue extensively, using almost 16,000 stocks from 22 developed and 18 emerging markets over the period 1990-2004, and report the presence of momentum profits for both markets and opportunity for diversification benefits when emerging markets are included in international momentum investment strategy. McInish *et al.* (2008) show that short-run trading strategies based on past return are not profitable in the Pacific Basin markets (except Japan and Hong Kong, where contrarian profits have been found).

Kang *et al.* (2002) find short-term contrarian and medium-term momentum profits for the Chinese stock market. They also report that negative serial correlation contributes to momentum profit. Hameed and Ting (2000) examine the effect of trading volume on contrarian profits and find that contrarian profits are higher from actively traded firms than from thinly traded firms. Galariotis (2004) uses the methodology of Jegadeesh and Titman (1995) to find the sources of contrarian profits on the Athens stock exchange. Findings show that short-term contrarian profits are present in the stock returns and firm-specific component contributes to overreaction in stock returns. Similarly, Ding *et al.* (2008) show that high-volume firms are more likely to experience price reversals than low-volume ones in the Asia-Pacific markets. However, Ding *et al.* (2009) suggest that the lack of momentum in an Asian emerging market such as Taiwan is due more to state dependence than to cultural differences between Asian and developed markets.

3. Data and Methodology

3.1. Data

Monthly stock price index, volume, and number of shares outstanding data on Indian stocks are collected from Thomson Datastream. Since the interest in emerging markets is a relatively recent phenomenon, early data contain some missing values for returns, trade volume, and number of shares outstanding. This requires us to drop many firms from the initial dataset. We consider only the firms that have been relatively regularly traded and have survived for the whole study period. After screening the data, we have the final dataset of 254 firms to use for the study. Thus, it is understandable that the results could contain some survivorship bias. The study covers the stock market for the period January 1991 through December 2006. Returns are calculated as the log difference of stock price indices times 100.

3.2. Methodology

3.2.1. Construction of Portfolios

We use the weighted relative strength scheme (WRSS) of Lo and MacKinlay (1990) to construct portfolios. The formation and holding periods are of 1-, 2-, 3-, 6-, 9-, and 12- month duration. Thus there are 36 trading strategies. Under this portfolio formation strategy the stocks with positive (negative) return (i.e., higher return than the market or average return) over the formation period are bought (sold). The positive (negative) return stocks with respect to the market return are considered to be the winners (losers). The stocks that have higher positive (negative) return in the formation period have larger positive (negative) weights in the portfolios. Thus the weight of an individual stock depends on the magnitude of its performance in the formation period. During each study period, each stock is assigned the weight of

$$w_{i,t} = \frac{1}{N} (r_{i,t-1} - \bar{r}_{t-1}), \quad (1)$$

where $r_{i,t-1}$ is the return of stock i at time $t-1$, N is the number of stocks at period $t-1$, and \bar{r}_{t-1} is the market return at time $t-1$. Thus the total weight of the portfolio becomes zero if individual stock weights are added. The momentum or contrarian profit, π_t , is given by

$$\pi_t = \frac{1}{N} \sum_{i=1}^N r_{i,t} (r_{i,t-1} - \bar{r}_{t-1}). \quad (2)$$

I create the portfolios considering the performance of the past 1, 2, 3, 6, 9, or 12 months. This is called the formation or ranking period. The performance of the portfolio is evaluated during the next 1, 2, 3, 6, 9, or 12 months. This duration is called the evaluation or holding period. Thus there are 36 trading strategies that involve short to medium-run trading horizons. After the portfolio is made, the cumulative return in the holding period is calculated. The respective momentum/contrarian profit in the observation period $k = 1, 2, 3, 6, 9,$ and 12 months is given by

$$\pi_{j,t}(k) = \sum_{i=1}^{N_j} w_{i,t} r_{i,t+k}, \quad (3)$$

where $J = L$ (loser portfolio), W (winner portfolio), C (contrarian portfolio), $w_{i,t}$ is the weight of respective stocks in the portfolio, and N_j is the number of stocks in the

portfolio during the ranking (formation) period. $r_{i,t+k}$ is the average return of firm i for period k . The weight of individual stocks does not change during the holding (observation) period.

This study also investigates the robustness of results with respect to size and trade volume of firms. We construct the size portfolios based on the average market capitalization of firms during the sample period. The highest market value firms are large. Likewise, the lowest market value firms are small. Firms in the middle in terms of market capitalization are medium. In the same manner, we construct trade-volume portfolios based on the average volume of trade. Trade volume portfolios are categorized as high, medium, and low. The numbers of large, medium, and small firms are 85, 85, and 84, respectively. The numbers of high, medium, and low trade volume firms are 85, 85, and 84, respectively. Finally, WRSS portfolios are formulated and the decomposition method described below is applied to every category of firms.

3.2.2. *Decomposition of Contrarian/Momentum Profits*

The decomposition of momentum and contrarian profits given by Jegadeesh and Titman (1995) is

$$\pi^m = \sigma_\mu^2 + \delta\sigma_f^2 + \Omega \quad (4a)$$

$$\pi^c = -\sigma_\mu^2 - \delta\sigma_f^2 - \Omega, \quad (4b)$$

where π^m and π^c are momentum and contrarian profit, respectively, and σ_f^2 is the variance of the factor (market portfolio return).

Momentum profits can be decomposed into different components, that give a better idea about how investors may exploit this information to formulate trading strategy. Jegadeesh and Titman (1995) develop the following framework to find the sources of momentum and contrarian profits.³

They estimate

$$r_{i,t} = \mu + b_{0,i}f_t + b_{1,i}f_{t-k} + \varepsilon_{i,t} \quad (5)$$

where $r_{i,t}$ is the return of individual stock i at time t ; f_t is the market return (equally weighted) at time t , which happens to be the common factor for all the stocks; f_{t-k} is the market return (equally weighted) during $t-k$ period; k is the observation period; and $b_{0,i}$ and $b_{1,i}$ are the estimated parameters. As shown in Jegadeesh and Titman (1995), from this factor model we can calculate the following components of contrarian/momentum returns:

(i) Cross-sectional risk component:

$$\sigma_{\mu}^2 = \frac{1}{N} \sum_{i=1}^N (\mu_i - \bar{\mu})^2, \quad (6)$$

(ii) Lead-lag effect component:

$$\delta = \frac{1}{N} \sum_{i=1}^N (b_{0,i} - \bar{b}_0)(b_{1,i} - \bar{b}_1), \quad (7)$$

³ Recently McInish *et al.* (2008) use similar methodology to find sources of momentum and contrarian profits in the Asian markets.

(iii) Time-series pattern component:

$$\Omega = \frac{1}{N} \sum_{i=1}^N Cov(\varepsilon_{i,t}, \varepsilon_{i,t-1}), \quad (8)$$

where μ_i is the intercept of the regression for an individual stock; $b_{0,i}$ and \bar{b}_0 are the regression coefficient and mean (cross-sectional) regression coefficients, respectively; $b_{1,i}$ and \bar{b}_1 are the second regression coefficient and mean (cross-sectional) of that, respectively; $\varepsilon_{i,t}$ is the error-term of the regression equation.

After using equations (6), (7), and (8), we use equation (4a) and (4b) to decompose the expected contrarian/momentum profits into three components: the first term is the cross-sectional variance of expected returns, the second term is contrarian or momentum profits attributable to time difference in reacting to a common factor, and the last term is the stock price adjustment to idiosyncratic information.

Since the study also investigates the robustness of results with respect to size and volume of trade, we also sort portfolios based on these factors and then apply the same decomposition framework. Since data are monthly, the sources correspond to only monthly contrarian or momentum returns and not to longer investment horizon returns.

4. Analysis of Results

Table 1 presents the returns of winner, loser, and relative strength (WRSS) portfolios of different ranking and holding periods. The table gives 36 mean returns for the whole period for each winner, loser, and WRSS portfolio. Mean return of WRSS

portfolio is strongly negatively significant for 1x1 (ranking period x holding period), 1x2, 1x3, and 1x6 strategies and becomes insignificant at higher holding periods. When the holding period is 9 and 12 months, there are no significant contrarian profits. One interesting result in this table is that for all the ranking periods the initial WRSS (or total portfolio) return is always negative, whereas as the holding period increases the contrarian profits tend to become significantly positive. This is probably an indication that investors are uncertain about the stock performance initially, resulting in current-period over-pricing and next-period correction. However, in the relatively longer horizons of 9 and 12 months, investors are less uncertain about the stocks. It is also possible that since holding period returns are cumulative, there should be a tendency for ups and downs to cancel out each other, resulting in smaller returns. We also observe significantly positive momentum returns when both ranking and holding periods are of relatively longer horizons of three to 12 months.

Please insert table 1 here

Table 2 gives the returns of relative-strength portfolios when stocks are sorted and portfolios are constructed based on the market value of individual stocks. I take the average of year-end market capitalization data for the whole study period to select the firms in terms of size. Thus, status of size for individual stocks is fixed for the whole study period. Since the objective of the study is to focus on short-term trading strategies, I consider strategies of only a one- to three-month investment horizon. Therefore, there are nine short-term trading strategies. Panel A of Table 2 suggests that there is no contrarian or momentum profit for large firms on the Indian stock market. This finding is consistent across all short-term investment strategies.

Please insert table 2 here

This result supports the theory, since stock analysts usually follow large stocks more closely and give frequent recommendations on these firms. The foreign investors, who are major players in the Indian stock market, are mostly interested in large firms and reluctant to invest in small firms, mainly because of easy availability of more reliable information on large firms. Moreover, large firms are believed to follow the rules and regulations more thoroughly and transparently, and their corporate practices are such that they can signal that they are different from others in the market. For the same reason, it is believed that there is more opportunity for price manipulation on the small firms in an emerging stock market such as India.

Panel B of Table 2 gives the results of momentum and contrarian profits for medium-size firms. All the medium-size firms have significant contrarian profits. For all the investment horizons, the contrarian profits are huge. Investors just need to buy the loser stock and sell the winner stock and hold the portfolio for one, two, or three months, depending on their investment horizon preferences, to earn abnormal returns. Panel C shows the opportunity for abnormal returns when only small stocks are chosen in portfolios. Results exhibit highly significant contrarian profits for all the short-term investment horizons. Almost all the portfolios — WRSS, winner, and loser — earn negative returns. It seems that when all portfolios earn negative returns there is no need to distinguish between winner and loser portfolios, and a very raw strategy (regardless of the type) can earn abnormal returns. However, the construction of a WRSS portfolio gives the opportunity to reduce risk by assigning weights appropriately to create a zero-investment portfolio. Results in panels B and C of Table 2 also indicate the inefficiency of the market with respect to medium-size and small firms. For achieving a well-functioning market overall, these pricing anomalies must

be eradicated. The Securities Exchange Board of India (SEBI) must ensure proper and timely surveillance and financial reporting practices.

Table 3 presents the mean return of the portfolios when firms are sorted and portfolios formulated based on the volume of trade of individual firms. We take the average of year-end volume-of-trade data for the whole study period to select firms in terms of trade volume. Thus, the volume-of-trade status of firms is fixed for the whole study period. Results are close to those found previously, when firms were sorted based on market value. The firms with high volume of trade do not show any opportunity for abnormal returns. Probably high-volume firms are mostly big firms, and higher level of trading offers better opportunity for faster adjustment of prices to new information, which ultimately drives out the possibility of abnormal returns. As with medium-size and small firms, medium- and low-volume firms also exhibit significant contrarian profits.

<p style="text-align: center;">Please insert table 3 here</p>

It is noticeable that at every short-term investment horizon the WRSS portfolio return is highly significant. Therefore, an investor needs only to sell the previous period's winner and buy the previous period's loser. Nonsynchronous trading may be one of the reasons for such contrarian profits. Since the data are monthly, there should be less nonsynchronous trading. However, some nonsynchronous trading may still exist. Nonsynchronous trading, which is quite typical of any emerging market, keeps stock prices from reflecting new information on a timely basis and gives well-informed traders the opportunity to manipulate the situation so it eventually translates into some sort of observable return regularity. Particularly, SEBI should be vigilant when trading of these stocks resumes after certain periodic gaps. This kind of

monitoring should bolster the confidence of less-informed small and foreign investors.

Please insert table 4 here

Table 4 exhibits the sources of momentum/contrarian portfolio returns. Panel A shows the sources of contrarian profits when firms are sorted based on market value and volume of trade. For market-value sorted portfolios, the cross-sectional risk component plays almost the same role for large-, medium-, and small-size firms. The lead-lag effect—the second component of contrarian or momentum profits—does not have much impact on WRSS portfolios. However, the effects of the lead-lag relationship on small firms are much larger than on large- and medium-size firms. This result implies that small firms follow large firms and not the other way around. The last component, firm-specific error terms, plays the largest role in contrarian profits. The sign of this effect is negative for all three types of firms, which explains why the portfolio return is negative and contrarian profits occur eventually. This effect is relatively small for large firms but large for medium- and small-size firms. This finding also confirms the absence of contrarian returns for large firms exhibited in Table 2.

Results do not change that much when firms are categorized by volume of trade. Once again, low-traded firms exhibit higher average covariance of error terms than the other two volume-based firms do. The difference of cross-sectional risk between high- and low-volume firms is more noticeable than that between large- and small-size firms. Probably high-volume firms are even more informationally efficient than large firms. This may indicate that information efficiency is more of a volume- than size-related issue in the Indian stock market. It is plausible since high-volume firms

are probably large as well. Cross-sectional risk indicates expected return for the stock concerned. That is, firms with higher (lower) cross-sectional risk should expect higher (lower) returns. Since high-volume firms are less risky due to frequent adjustment of information into stock prices and there is a high degree of correlation between trade volume and size, expected return for high-volume firms is less than that for the low-volume firms. Panel B shows the sources of contrarian profits for the whole period and two sub-periods, 1991-2001 and 2002-2006. For the whole study period and sample of firms, the lead-lag effect is very small. the cross-sectional component has some effect on contrarian profits, but the firm-specific component is the most important. When the total period is divided into two sub-periods, there is a noticeable change in the contribution of error terms (time-series pattern or firm-specific component) to contrarian profits. The contribution of the time pattern component is -7.92 during the period 2002-2006 compared to -18.50 during the period 1991-2001, suggesting the market has matured and firm-specific mispricing has declined over time.

Since it has been found that the effect of the time-series pattern has declined in the past few years of the study, I divide the total period further into eight two-year sub-periods to investigate how the contribution of components changes over time. When the sample period is short, there is a tendency to have larger estimated coefficients, resulting in larger values of components as against the case when the whole sample period is considered. Thus, results reported in Table 5 may not be directly comparable with results in the other tables. However, the results can be validly used for comparison across various two-year sub-periods. Panel A of Table 5 presents the sources of contrarian profits for each of the two-year sub-periods. The cross-sectional component is high during the period 1991-1992, declines during the

period 1997-2002, and then rises again after 2003. Since the Indian stock market was on the bullish trend beginning in 2003 and the cross-sectional component corresponds to the average return of stocks, the value of this component is logically higher in the later period. This happens due to the higher spread of returns between large and small stocks. For example, the bullish period is also accompanied by a higher influx of foreign investors who are mostly interested in large caps, causing an increase in cross-sectional return deviation. Also evident from the table is that the lead-lag effect in the later period is slightly lower than in the initial period. Thus, the quality of response to a common factor does not change noticeably throughout the period. It may indicate higher market efficiency in terms of the lead-lag effect or simply higher segmentation (low correlation) of firms in the market. Overall, it is good to see that the effect of the time-series pattern has dramatically declined despite a few spikes over the period. This scenario implies better reflection of information in the stock prices and consequently less observed autocovariance among error terms. Thus, we may conclude that the market's stock-pricing mechanism has markedly improved.

<p style="text-align: center;">Please insert table 5 here</p>

Panel B of Table 5 reports the estimated time-series pattern for each period when the estimated coefficients for the whole sample period are used. This gives a better comparison across various periods. In this case, the lead-lag and cross-sectional components are not reported since estimated coefficients from the factor model do not change and thus have no impact on those two effects. However, the time-series pattern is sensitive to stock prices at every period, resulting in month-to-month changes. Results show that throughout the sample period the firm-specific factor is a major cause for contrarian profits. Nonetheless, the good news for the Indian market

is the fact that this effect has been gradually disappearing in the last few years of the sample period.

5. Conclusion

This paper studies the presence and sources of contrarian and momentum profits on the Indian stock market for the period January 1991 through December 2006. The methodology used in this paper is the weighted relative strength scheme (WRSS) of Lo and MacKinlay (1990) and the procedure used by Jegadeesh and Titman (1995) to find the components of contrarian or momentum profits.

Results show that there are short-term contrarian profits, which suggests that investors in the Indian stock market tend to correct price departures due to initial overreaction at frequent intervals. This is not surprising since the market is believed to be dominated by less-informed individual investors. In the relatively longer investment horizons of six and 12 months, WRSS portfolios produce momentum profits. Further classification of stocks based on market value and volume of trade reveals that larger-size and high-volume stocks are correctly priced whereas medium- and small-size and medium- and low-volume stocks are not correctly priced, resulting in overall contrarian profits for the market. Decomposition of contrarian and momentum profits suggests that the firm-specific component does not contribute that much to any abnormal returns for large firms. However, the firm-specific component explains a large portion of contrarian returns for medium- and small-size and medium- and low-volume firms. The good news is the finding that the impact of the firm-specific component has been decreasing since the year 1999.

In a nutshell, small- and medium-size firms in the Indian stock market contribute very much to contrarian returns, indicating mispricing of these firms and

overall market inefficiency. Regulatory bodies like SEBI and policymakers should work to implement or modify regulations to help small- and medium-size firms perform better so that information is better reflected in their stock prices. Policymakers and regulators may adopt policies such as imposition of stringent accounting rules, more frequent and transparent disclosure of accounts, persuasion of or incentives to local and foreign institutional investors to invest in small- and medium-size firms to improve overall market efficiency.

References

- Boudoukh, J., Richardson, M. P. and Whitelaw, R. F. (1994) A tale of three schools: Insights of autocorrelations of short-horizon stock returns, *Review of Financial Studies*, **7**, 539-573.
- Chopra, N., Lakonishok, J. and Ritter, J. (1992) Measuring abnormal performance: Do stocks overreact? *Journal of Financial Economics*, **31**, 235-268.
- Chui, A. C. W., Titman, S. and Wei, K. C. J. (2005) Individualism and momentum around the world, *Working Paper*, University of Texas at Austin.
- Conrad, J. and Kaul, G. (1998) An anatomy of trading strategies, *Review of Financial Studies*, **11**, 489-519.
- Conrad, J., Gultekin, M. and Kaul, G. (1997) Profitability of short-term contrarian strategies: Implications for market efficiency, *Journal of Business and Economic Statistics* **15**, 386–397.
- Cooper, M., Gutierrez, R. and Hameed, A. (2004) Market states and momentum, *Journal of Finance*, **59**, 1345-1365.
- Daniel, K., Hirshleifer, D. and Subrahmanyam, A. (1998) Investor psychology and security market under- and over-reactions, *Journal of Finance*, **58**, 2515-2547.

- DeBondt, W. and Thaler, R. (1985) Does the stock market overreact? *Journal of Finance*, **40**, 793-805.
- DeBondt, W. and Thaler, R. (1987) Further evidence on investor overreaction and stock market seasonality, *Journal of Finance*, **42**, 557-581.
- Ding, D. K., McInish, T. H. and Wongchoti, U. (2008) Behavioral explanations of trading volume and short-horizon price patterns: An investigation of seven Asia-Pacific markets, *Pacific-Basin Finance Journal*, **16**, 183-203.
- Ding, D., Huang, Z. and Liao, B. (2009) Why there is no momentum in the Taiwan stock market, *Journal of Economics and Business*, **61**, 140-152.
- French, K. (1980) Stock returns and the weekend effect, *Journal of Financial Economics*, **8**, 55-69.
- Galariotis, E. C. (2004) Sources of contrarian profits and return predictability in emerging markets, *Applied Financial Economics*, **14**, 1027-1034.
- Griffin, J. M., Ji, X. and Martin, S. (2003) Momentum investing and business cycle risk: Evidence from pole to pole, *Journal of Finance*, **58**, 2515-2547.
- Hameed, A. and Ting, S. (2000) Trading volume and short-horizon contrarian profits: Evidence from Malaysian stock market, *Pacific-Basin Finance Journal*, **8**, 67-84.

- Hong, H. and Stein, J. (1999) A unified theory of underreaction, momentum trading, and overreaction in asset markets, *Journal of Finance*, **54**, 2143-2184.
- Hong, H., Lim, T. and Stein, J. (2000) Bad news travels slowly: Size, analyst coverage, and the profitability of momentum strategies, *Journal of Finance*, **55**, 265-295.
- Huang, D. (2006) Market states and international momentum strategies, *Quarterly Review of Economics and Finance*, **46**, 437-446.
- Jegadeesh, N. (1990) Evidence of predictable behavior of security returns, *Journal of Finance*, **45**, 881-898.
- Jegadeesh, N. and Titman, S. (1993) Returns to buying winners and selling losers: Implications for stock market efficiency, *Journal of Finance*, **48**, 65-91.
- Jegadeesh, N. and Titman, S. (1995) Overreaction, delayed reaction, and contrarian profits, *Review of Financial Studies*, **8**, 973-993.
- Jegadeesh, N. and Titman, S. (2001) Profitability of momentum strategies: An evaluation of alternative explanations, *Journal of Finance*, **56**, 699 – 720.
- Jones, S. L. (1993) Another look at time-varying risk and return in a long-horizon contrarian strategy, *Journal of Financial Economics*, **33**, 119-144.

- Kang, J., Liu, M. and Ni, S. X. (2002) Contrarian and momentum strategies in the China stock market: 1993-2000, *Pacific-Basin Finance Journal*, **10**, 243-265.
- Keim, D. (1983) Size-related anomalies and stock return seasonality: Further empirical evidence, *Journal of Financial Economics*, **12**, 13-32.
- Lee, C. M. C. and Swaminathan, B. (2000) Price momentum and trading volume, *Journal of Finance*, **55**, 2017-2069.
- Lehmann, B. (1990) Fads, martingales, and market efficiency, *Quarterly Journal of Economics*, **105**, 1-28.
- Lo, A., and MacKinlay, C. (1988) Stock market prices do not follow random walks: Evidence from a simple specification test, *Review of Financial Studies*, **1**, 41-66.
- Lo, A. and MacKinlay, C. (1990) When are contrarian profits due to stock market overreaction? *Review of Financial Studies*, **3**, 175-205.
- McInish, T. H., Ding, D. K., Pyun, C. S. and Wongchoti, U. (2008) Short-horizon contrarian and momentum strategies in Asian markets: An integrated analysis, *International Review of Financial Analysis*, **17**, 312-329.

- Moskowitz, T. J. and Grinblatt, M. (1999) Do industries explain momentum? *Journal of Finance*, **54**, 1249-1290.
- Naranjo, A. and Porter, B. (2007) Including emerging markets in international momentum investment strategies, *Emerging Markets Review*, **8**, 147-166.
- Rouwenhorst, K. G. (1998) International momentum strategies, *Journal of Finance*, **53**, 267-284.
- Rouwenhorst, K. G. (1999) Local return factors and turnover in emerging stock markets, *Journal of Finance*, **54**, 1439-1464.
- Safieddine, A. and Sonti, R. (2007) Momentum and industry growth, *Review of Financial Economics*, **16**, 203-215.
- Wongchoti, U. and Pyun, C. S. (2005) Risk-adjusted long-term contrarian profits: Evidence from non S&P500 high volume stocks, *Financial Review*, **40**, 335-359.

Table 1. WRSS Portfolio Returns for All Trading Strategies

Ranking Period	Holding Period	1		2		3		6		9		12	
	Portfolio	Mean Ret.	<i>t</i> -stat.	Mean Ret.	<i>t</i> -stat.	Mean Ret.	<i>t</i> -stat.	Mean Ret.	<i>t</i> -stat.	Mean Ret.	<i>t</i> -stat.	Mean Ret.	<i>t</i> -stat.
1	WRSS	-17.74	-6.69*	-19.85	-5.32*	-18.54	-4.33*	-12.31	-2.35*	-9.23	-1.54	-3.80	-0.59
	Winner	-3.90	-0.81	-0.01	0.00	6.65	0.76	25.07	2.15*	39.07	2.63*	56.86	3.27*
	Loser	-13.83	-3.36*	-25.18	-3.28*	-19.84	-3.29*	-37.38	-3.27*	-48.30	-3.42*	-60.67	-3.64*
2	WRSS	-9.87	-5.28*	-10.29	-3.93*	-10.10	-3.49*	-3.67	-1.06	0.13	0.03	6.29	1.36
	Winner	-0.39	-0.12	3.61	0.74	7.76	1.34	21.61	2.70*	32.24	3.21*	46.43	3.92*
	Loser	-9.48	-3.39*	-13.90	-3.23*	-17.86	-3.35*	-25.28	-3.21*	-32.12	-3.31*	-40.14	3.51*
3	WRSS	-6.20	-4.04*	-6.76	-3.20*	-5.86	-2.43*	0.10	0.03	4.22	1.18	10.01	2.50*
	Winner	1.02	0.39	4.04	1.05	7.91	1.69	18.25	2.82*	28.20	3.46*	39.27	4.11*
	Loser	-7.22	-3.06*	-10.80	-3.05*	-13.77	-3.08*	-18.15	-2.86*	-23.98	-3.02*	-29.26	-3.20*
6	WRSS	-2.06	-2.06*	-1.32	-0.95	-0.12	-0.07	4.75	2.25*	10.14	3.85*	10.96	3.56*
	Winner	1.54	0.89	3.82	1.46	6.30	1.94	14.34	3.18*	10.67	5.27*	28.37	4.18*
	Loser	-3.60	-2.13*	-5.14	-2.06*	-6.42	-2.07*	-9.59	-2.18*	-0.52	-0.31	-17.41	-2.68*
9	WRSS	-1.09	-1.36	-0.06	-0.05	1.34	0.95	6.64	3.57*	8.83	3.83*	9.74	3.81*
	Winner	1.57	1.11	3.83	1.80	6.32	2.42*	13.41	3.71*	18.83	4.10*	23.69	4.24*
	Loser	-2.66	-1.92	-3.89	-1.86	-4.98	-1.91	-6.77	-1.86	-9.99	-2.15*	-13.96	-2.59*
12	WRSS	-0.28	-0.41	1.17	1.16	2.65	2.13*	5.70	3.46*	0.83	3.90*	4.93	2.76*
	Winner	1.73	1.43	3.03	1.81	5.85	2.62*	10.85	3.43*	1.76	3.86*	14.04	3.34*
	Loser	-2.01	-1.60	-1.86	-1.10	-3.20	-1.40	-5.15	-1.61	-0.93	-2.04*	-9.11	-2.21*

Asterisks indicate significance at the 5% level. Winner, Loser, and WRSS (Winner+Loser) portfolios are constructed using equation (3). Formation and holding periods are 1, 2, 3, 6, 9, or 12 months. Thus, there are 36 trading strategies. Formation period returns are the cumulative returns for the respective period (number of months). Holding-period returns are calculated based on the weight derived from the formation period and cumulative return for the respective holding period where weights of the firms do not change. Winner and Loser portfolio returns are calculated when assigned weights are positive and negative, respectively. Weights of the stocks in the portfolio and corresponding portfolio returns change every month after the initial period when weights are assigned.

Table 2. Market Value–Sorted WRSS Portfolio Returns for Short-Term Strategies

Ranking Period	Holding Period 1		2		3		
	Portfolio	Mean Ret.	<i>t</i> -stat.	Mean Ret.	<i>t</i> -stat.	Mean Ret.	<i>t</i> -stat.
<i>Panel A: Portfolio of large firms</i>							
1	WRSS	-2.61	-1.09	-2.55	-0.79	0.43	0.11
	Winner	6.62	1.65	12.50	2.23*	19.69	2.91*
	Loser	-9.23	-2.59*	-15.05	-2.88*	-19.26	-2.93*
2	WRSS	-2.26	-0.59	0.63	0.13	3.94	0.72
	Winner	9.61	1.64	19.37	2.36*	15.29	2.81*
	Loser	-11.87	-2.37*	-18.74	-2.46*	-11.36	-2.11*
3	WRSS	0.45	0.09	3.85	0.61	10.26	1.44
	Winner	12.79	1.81	25.13	2.56*	40.61	3.46*
	Loser	-12.35	-1.97*	-21.28	-2.23*	-30.35	-2.52*
<i>Panel B: Portfolio of medium firms</i>							
1	WRSS	-17.01	-6.02*	-19.75	-5.16*	-15.84	-3.71*
	Winner	-5.55	-1.17	-2.10	-0.29	4.49	0.51
	Loser	-11.45	-2.84*	-17.65	-2.98*	-20.33	-2.74*
2	WRSS	-19.74	-5.38*	-18.65	-3.52*	-17.47	-2.85*
	Winner	-3.12	-0.48	4.09	0.42	10.37	0.87
	Loser	-16.62	-3.03*	-22.73	-2.74*	-27.83	-2.70*
3	WRSS	-15.84	-3.48*	-17.26	-2.64*	-15.16	-2.03*
	Winner	0.35	0.05	7.36	0.63	16.80	1.17
	Loser	-16.20	-2.39*	-24.62	-2.39*	-31.97	-2.41*
<i>Panel C: Portfolio of small firms</i>							
1	WRSS	-34.96	-7.87*	-38.91	-6.58*	-40.61	-6.16*
	Winner	-13.82	-2.16*	-12.08	-1.32	-6.39	-0.57
	Loser	-21.14	-3.82*	-26.83	-3.42*	-34.22	-3.55*
2	WRSS	-39.33	-6.77*	-45.34	-5.56*	-48.03	-5.20*
	Winner	-10.64	-1.29	-4.64	-0.38	-5.06	-0.58
	Loser	-28.69	-3.97*	-40.69	-3.75*	-42.97	-5.62*
3	WRSS	-41.27	-5.88*	-48.34	-4.96*	-49.18	-4.23*
	Winner	-5.55	-0.56	0.67	0.05	9.87	0.56
	Loser	-35.71	-3.91*	-49.01	-3.74*	-59.05	-3.68*

Asterisks indicate significance at the 5% level. Winner, Loser, and WRSS (Winner+Loser) are constructed using equation (3). First the firms are categorized as large, medium, or small based on the average market capitalization for the sample period. Size status is fixed for the whole period. Similarly, firms are also categorized as high, medium, or low volume (of trade). Formation and holding period are 1, 2, and 3 months. Thus, there are 9 trading strategies. Formation-period returns are the cumulative returns for the respective period (number of months). Holding-period returns are calculated based on the weight derived from the formation period and cumulative return for the respective holding period where weights of the firms do not change. Winner and Loser portfolio returns are calculated when assigned weights are positive and negative, respectively.

Table 3. Volume of Trade–Sorted WRSS Portfolio Returns for Short-Term Strategies

Ranking Period	Portfolio	Holding Period					
		1		2		3	
		Mean Ret.	<i>t-stat.</i>	Mean Ret.	<i>t-stat.</i>	Mean Ret.	<i>t-stat.</i>
<i>Panel A: Portfolio of high volume-sorted firms</i>							
1	WRSS	-4.07	-1.38	-4.62	-1.23	-3.79	-0.80
	Winner	4.07	0.85	8.94	1.35	3.22	0.93
	Loser	-8.14	-1.99*	-13.55	-2.29*	-7.01	-2.08*
2	WRSS	-4.45	-1.05	-4.30	-0.74	-4.32	-0.64
	Winner	6.74	1.00	15.05	1.59	23.50	2.13*
	Loser	-11.19	-1.99*	-19.36	-2.21*	-27.82	-2.52*
3	WRSS	-3.77	-0.69	3.85	0.61	10.26	1.44
	Winner	9.92	1.24	25.13	2.56*	40.61	3.46*
	Loser	-13.69	-1.89	-21.28	-2.23*	-30.35	-2.52*
<i>Panel B: Portfolio of medium volume-sorted firms</i>							
1	WRSS	-22.13	-6.28*	-24.10	-5.25*	-21.39	-4.37*
	Winner	-5.14	-1.06	0.48	0.06	-0.84	-0.23
	Loser	-16.99	-3.65*	-24.58	-3.69*	-20.55	-5.67*
2	WRSS	-24.01	-5.04*	-23.14	-3.72*	-22.79	-3.32*
	Winner	-1.91	-0.28	9.16	0.87	17.57	1.36
	Loser	-22.10	-3.54*	-32.30	-3.46*	-40.36	-3.55*
3	WRSS	-21.31	-3.78*	-22.46	-2.95*	-22.75	-2.66*
	Winner	4.61	0.56	15.02	1.20	25.14	1.60
	Loser	-25.92	-3.29*	-37.47	-3.31*	-47.89	-3.40*
<i>Panel C: Portfolio of low volume-sorted firms</i>							
1	WRSS	-28.02	-8.12*	-32.61	-6.24*	-32.84	-5.67*
	Winner	-11.54	-2.15*	-11.07	-1.38	-5.99	-0.64
	Loser	-16.47	-3.78*	-21.54	-3.39*	-26.84	-3.33*
2	WRSS	-32.54	-6.95*	-37.43	-5.47*	-36.92	-4.57*
	Winner	-8.89	-1.27	-5.19	-0.50	-6.09	-0.84
	Loser	-23.65	-4.08*	-32.24	-3.67*	-30.83	-4.62*
3	WRSS	-33.10	-5.73*	-4.64	14.99*	-32.05	-3.22*
	Winner	-7.11	-0.84	-0.08	9.79*	10.16	0.68
	Loser	-25.99	-3.59*	-3.35	7.02*	-42.21	-3.13*

Asterisks indicate significance at the 5% level. Winner, Loser, and WRSS (Winner+Loser) are constructed using equation (3). First the firms are categorized as large, medium, or small based on the average market capitalization for the sample period. Size status is fixed for the whole period. Similarly, firms are also categorized as high, medium, or low volume (of trade). Formation and holding period are 1, 2, and 3 months. Thus, there are 9 trading strategies. Formation-period returns are the cumulative returns for the respective period (number of months). Holding-period returns are calculated based on the weight derived from the formation period and cumulative return for the respective holding period where weights of the firms do not change. Winner and Loser portfolio returns are calculated when assigned weights are positive and negative, respectively.

Table 4. Sources of Momentum/Contrarian Portfolio Profits

<i>Panel A. Sources of return when firms are sorted based on MV and Volume</i>						
Components of profit	Market value–sorted portfolios			Volume of trade–sorted portfolios		
	Large	Medium	Small	High	Medium	Low
Cross-sectional risk	1.0071	1.1178	1.1552	0.8007	0.8993	1.2000
Lead-lag effect	-0.0003	-0.0014	-0.2114	-0.0012	-0.0057	-0.0144
Time-series pattern	-3.8433	-21.3732	-27.8633	-3.3030	-17.1967	-35.2709

<i>Panel B: Sources of return for total and two sub-periods</i>			
	1991-06	1991-01	2002-06
Cross-sectional risk	1.1518	1.5433	8.6909
Lead-lag effect	-0.0044	-0.0134	0.0025
Time-series pattern	-18.6794	-18.4969	-7.9238

This table exhibits the sources of momentum/contrarian profits. The expected profits are decomposed using the one-factor (contemporaneous and lagged market return) model shown in equation (5). To estimate the parameters I use equally weighted market return as the proxy for the common factor for the return of individual stocks. The momentum/contrarian profit components, cross-sectional risk, lead-lag effect, and time-series pattern correspond to equations (6), (7), and (8), respectively. Since these numbers are estimated based on monthly returns, results can be treated only as related to monthly contrarian or momentum characteristics. Thus, the components are not valid for investment horizons of more than one month.

Table 5. Sources of 2-Year Momentum/Contrarian Portfolio Profits

Components of profit	1991-92	1993-94	1995-96	1997-98	1999-00	2001-02	2003-04	2005-06
<i>Panel A: Estimated factor coefficients are based on respective 2-year period regression</i>								
Cross-sectional risk	11.7606	6.9484	12.8951	9.5032	6.6281	6.5569	11.9243	12.7157
Lead-lag effect	-0.0439	-0.0628	0.0629	-0.0202	-0.0373	0.0186	-0.0123	0.0377
Time-series pattern	-32.8101	-23.9467	-17.4374	-31.9206	-38.9811	-25.1367	-15.8253	-13.8357
<i>Panel B: Estimated factor coefficients are based on full period regression</i>								
Time-series pattern	-29.4162	-24.2546	-22.6251	-34.2424	-39.5332	-31.5243	-17.1981	-11.2360

This table exhibits the sources of momentum and contrarian profits when the total period is divided into eight 2-year sub-periods to investigate how the role of components changes over time. The expected profits are decomposed using the one factor (contemporaneous and lagged market return) model shown in equation (5). To estimate the parameters I use equally weighted market return as the proxy for the common factor for the return of individual stocks. The momentum/contrarian profit components, cross-sectional risk, lead-lag effect, and time-series pattern correspond to equations (6), (7), and (8), respectively. Since these numbers are estimated based on monthly returns, results can be treated only as related to monthly contrarian or momentum characteristics. Thus, the components are not valid for investment horizons of more than one month.