Profitability of Momentum and Contrarian Strategies Based on Trading Volume in Tehran Stock Exchange: A Comparison of Emerging Market

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ABSTRACT: In this study, the profitability of contrarian and momentum strategies were traded in mid- term based on trading volume. The stocks were categorized into three parts (high, middle and low) at the outset. Then, the relationship between excess return with three components such as cross-sectional risk, lead-lag effect and time-series pattern were examined based on Jegadeesh and Titman approach. The sample including 108 listed companies of Tehran Stock Exchange that were traded over 2005-2010. The data was collected annually, monthly and daily using Tadbir Pardaz and Rahavard Nouvin softwares. The hypotheses were tested using mean comparisons test, ANOVA and Ordinary Least Squares.
The results show that by increasing trading volume, the momentum or contrarian return will be increased. There would be a possibility of explaining instances of no significant momentum or contrarian return with cross-sectional risk and lead-lag effect in medium trading volume. Moreover, the momentum return can be described with independent variables on middle and high trading volume.

Keywords: *Behavioral finance, Momentum and contrarian strategies, Cross-sectional risk, Lead-lag effect, Time-series pattern*

INTRODUCTION

There is considerable evidence indicating that both contrarian and momentum investment strategies produce excess returns. The work of DeBondt and Thaler (1985, 1987), Chopra et al. (1992), Richards (1997), and others find that a contrarian strategy of sorting (portfolios of) firms by previous returns and holding those with the worst prior performance and shorting those with the best prior performance generates positive excess returns. On the contrary, the work of Jegadeesh and Titman (1993), Chan et al. (1996, 2000), Rouwenhorst (1998), Grundy and Martin (2001), Jegadeesh and Titman (2001), Lewellen (2002), Patro and Wu (2004) and others show that a momentum strategy of sorting (portfolios of) firms by previous returns and holding those with the best prior performance and shorting those with the worst prior performance generates positive excess returns. There is no direct contradiction in the profitability of both

contrarian and momentum investment strategies since contrarian strategies work for a sorting period ranging from 3 to 5 years prior and a similar 3 to 5 years holding period, while momentum strategies typically work for a sorting period ranging from 1 month (or more commonly 3 months) to 12 months and a similar 1 (or 3) to 12 months holding period. The results correlate well with the findings of mean reversion at horizons of around 3 to 5 years and the findings of return continuation for horizons up to 12 months. Furthermore the overreaction hypothesis of DeBondt and Thaler (1985,1987), as formalized by DeLong et al. (1990), and the behavioral theories of Daniel et al. (1998), Barberis et al. (1998), and Hong and Stein (1999) imply the observed pattern of momentum /continuation at short horizons and mean reversion at long horizons.

The apparent overreaction may also be generated in an efficient market when unanticipated persistent

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changes in risk or risk premia occur: For instance, when a persistent increase in systematic risk comes about, returns are initially low as prices adjust but subsequently are higher as expected returns have increased due to the increased reward for risk; similarly, if previous return realizations correlate with future risk sensitivities, as suggested by Berk et al. (1999), a price pattern resembling overreaction may result.

Chan et al. (1996), state prominently: " Spelling out the links between momentum strategies and contrarian strategies remains an important area of research". Subsequent research by Lee and Swaminathan (2000), and Jegadeesh and Titman (2001) exploring these links confirms an earlier finding of Jegadeesh and Titman (1993) (hereafter JT) that particular momentum sorted portfolios experience eventual partial mean reversion. This finding is important since it suggests that momentum and mean reversion, which may be the case with different groups of assets in principle, occur in the same group of assets. This reversal pattern, however, needs further support due to following reasons (Jegadeesh and Titman, 2001):

✓ It is established for U.S. data only.
✓ It is weak in the 1982–1998 periods.
✓ It may not hold for large firms after risk correction.
✓ It appears to be insignificant for prior losers.

The purpose of this paper is to explore the implications of an investment strategy that considers momentum and mean reversion jointly. While it is essential to consider momentum and mean reversion effects jointly, traditional non-parametric approaches make a combination strategy inconvenient. In the present study Fama and French (1988) decomposition into permanent and transitory components was used; the study was done based on the parametric approach already employed by Jegadeesh (1990), Pesaran and Timmermann (1995, 2000), as well as Balvers et al. (2000). The study decomposition assumes that all country specific price components are impermanent. To motivate this assumption, one need to consider the context of a Lucas (1978) production-based asset pricing model that relates asset returns to production growth; while transitory differences in productivity imply transitory differences in stock price index levels.

The transitory nature of shocks in relative production levels is supported by the growth literature (Baumol, 1986; Dowrick and Nguyen, 1989; Barro and Sala-I Martin, 1995), which finds that "convergence" in per capita GDP occurs between developed countries, suggesting that any relative productivity shocks, and thus relative stock price index levels are not stable. The excess return remains similarly high after correction for basic factors such as global beta risk, the Fama – French factors and exchange rate risk factors, and survives adjustment for trading costs. The results sustain the view that full mean reversion occurs in all cases where momentum drives prices away from original levels.

Moreover , a number studies on the momentum strategy impact on stocks return in Tehran Stock Exchange have confirmed the existence of excess return of momentum strategy, but the excess return could not be explained by the models yet. Therefore, the present paper tries to investigate the relationship between excess return with three components including cross-sectional risk, lead-lag effect and time-series pattern based on Jegadeesh and Titman approach.

The remainder of this paper is organized as follows: related literature is presented in the next section. Sources of momentum and contrarian profits, lead-lag effects and momentum profits are presented in third and fourth sections respectively. Data and Methodology are reviewed in section five. The findings of capital market of Iran and other emerging markets comparison are discussed in section six. The results and discussion are described in section seven and finally the conclusion is given in section eight.

Literature Review

The literature on stock market anomalies in the form of "contrarian" and "momentum" portfolios is largely attributable to the seminal work of DeBondt and Thaler (1985). They show that during the period from the 1920s through to the 1980s, abnormal profits are obtained in the U. S. stock markets from the portfolio strategy that buys (short sells) stocks that had been extreme bottom (top) performers during a period of three immediate preceding years. Many researchers such as DeBondt and Thaler (1987), Jones (1993), and others attribute such long-horizon contrarian profits to the 'price reversal' induced by market overreaction. Jegadeesh (1990), Lehmann (1990), Chopra et al. (1992), subsequently showed that such contrarian profits exist in both short - (weekly) and long - horizon (3 to 5 years). Wongchoti and Pyun (2005) provide evidence that risk-adjusted long-horizon contrarian profits still

exist in non S & P 500 stocks with high trading volume. As for the intermediate horizon (3 to 12 months), Jegadeesh and Titman (1993, 2001) show that the momentum strategy of buying winners and selling losers yields abnormal returns, which cannot be explained by the conventional risk-return framework. In their view, under reaction to good or bad news is primarily attributable to the "price momentum". Several researchers turn to international markets for "out of sample" tests for momentum strategies. Rouwenhorst (1998) finds significant price momentum for an intermediate time horizon for stocks in twelve European countries during the period between 1980 and 1995. Rouwenhorst (1999) also discovers significant price momentum based on a six-month performance of the stocks in 17 of the 20 emerging markets worldwide studied for the period spanning from the 1980s to the 1990s. However, studying six Pacific Basin markets during the period between 1981 and 1994, Hameed and Yuanto (2002) do not find "momentum profits" within three to eight month observation periods. On the other hand, Chui, Titman, and Wei (2003) examine a longer study period (1975 to 2000) and report significant momentum profits for seven out of the eight Pacific Basin countries. In particular, they find significant momentum profits in stocks of small-capitalization, low book-to-market ratio, and high turnover companies. Similarly, Kang, Liu, and Ni (2002) find the intermediate horizon price momentum in the Chinese market between 1993 and 2000. It is interesting to note that Fung, Leung, and Patterson (1999) study the profitability of trading rule based on one-day price performance in six Pacific Basin markets during the period between1980 and 1993. In general, they find that daily winners (losers) exhibit price momentum (reversal)during the ensuing one to five trading days, and that daily trading volume add useful information in predicting subsequent changes in stock prices. However, the momentum profits they found disappeared when transaction costs were taken into account.

The profitability of contrarian strategy is generally attributed to the so called "price reversal" or "market overreaction." In addition to the studies mentioned at the beginning of this section, Baytas and Cakici (1999) also find significant contrarian profits in all G7 country markets they studied between 1982 and 1991. Similarly, Kang et al. (2002) and Gaunt (2000) found significant short-horizon price reversals in the Chinese and Australian markets, respectively. However, both studies note that such price patterns may not be exploitable since "losers" in their studies largely represent small and probably, illiquid stocks. Bowman and Iverson (1998) also document the weekly price reversals in New Zealand during the period between 1967 and 1986 where contrarian profits are strong in relation to risk, size, and bid–ask bounce effects. Empirical studies done on other individual markets such as the UK, Greece, Germany, and others are also provided by several researchers (Brouwer, Van Der Put and Veld, 1997; Schiereck, De Bondt and Weber, 1999; Weimin and Strong, 1999; Chan and Hameed, 2000; Gregory, Harris and Michou, 2001; Dissanaike, 2002; Scott, Stumpp and Xu, 2003).

As for studies relating to contrarian/momentum profits in Asian markets which have incorporated trading activity of stocks as an information variable, Bremer and Hiraki (1999) test the relation between lagged trading volume and the weekly contrarian profits in the Japanese capital market. Fung et al. (1999) use trading volume of the lagged trading day, while Hameed and Yuanto (2002) and Chui et al. (2003), use trading volume during the six-month formation period. Hameed and Ting (2000) examine the relationship between short-horizon (weekly) return predictability and the level of trading activity (trading volume) in the Malaysian stock market and find contrarian profits on actively traded stocks to be significantly higher than low trading activity stocks. It should be noted that "winner" stocks and "loser" stocks are not analyzed separately in these studies. Another key variable that often documented in the analysis of contrarian strategy is the investors' asymmetric reactions to good news as opposed to bad news. For instance, Nam, Pyun and Kim (2003) show that it takes longer for positive returns and shorter for negative returns to reverse in the nine Pacific Basin markets. Yeh and Lee (2000) document asymmetric impact of good news and bad news on future volatility in Taiwan and Hong Kong. McQueen, Pinegar and Thorley (1996) report delayed reaction to good news especially among small stocks. Lee and Swaminathan (2000) developed a "momentum life cycle model" where stocks go through a cycle of investor favoritism where they experience high volume and a large number of analysts following the stocks and contrarian. To sum up, winners and losers do not necessarily call forth the same investor responses, nor do they share similar patterns in price changes.

Fadaie nejad and Sadeghi (2006) examined the usefulness of contrarian and momentum strategies in Tehran Stock Exchange. They concluded that each of these two strategies is useful in a period of time. Excess return can be obtained in short horizon (monthly) and longer horizon using momentum and contrarian strategies. Ghalibaf et al. (2010), investigated the profit momentum strategy in Tehran Stock Exchange. The result showed that Price and profit momentum strategies have positive return and existing stock in winner portfolio tends to have growth stock. Azimi (2004) tested the hypothesis of whether it is possible to obtain the abnormal return using momentum strategy in Tehran Stock Exchange or not. He investigated fifty superior companies in Tehran Stock Exchange and finally concluded that Tehran Stock Exchange like many capital markets follow momentum strategy. The literature is summarized in table I.

Table I: Summary of the literature

Result	Countries	Authors (Years)
Abnormal profits are obtained in the U. S. stock markets from the portfolio strategy	U.S.A	DeBondt and Thaler (1985).
Long-horizon contrarian profits to the 'price reversal' induced by market overreaction.	U.S.A	DeBondt and Thaler (1987), Jones (1993)
Contrarian profits exist in both short - (weekly) and long –horizon (3 to 5 years)	U.S.A	Jegadeesh (1990),Lehmann (1990), Chopra et al. (1992)
Risk-adjusted long-horizon contrarian profits still exist in non S & P 500 stocks with high trading volume	U.S.A	Wongchoti and Pyun (2005)
The momentum strategy of buying winners and selling losers yields abnormal returns	U.S.A	Jegadeesh and Titman (1993, 2001)
Significant price momentum for an intermediate time horizon for stocks	Twelve European countries	Rouwenhorst (1998)
Significant price momentum based on a six-month performance of the stocks	Seventeen emerging markets	Rouwenhorst (1999)
No momentum profits" within three to eight month observation periods	six Pacific Basin Countries	Hameed and Yuanto (2002)
Significant momentum profits	seven Pacific Basin countries	Chui, Titman, and Wei (2003)
Intermediate horizon price momentum in the Chinese market between 1993 and 2000	China	Kang, Liu, and Ni (2002)
Daily winners (losers) exhibit price momentum (reversal)during the ensuing one to five trading days. The momentum profits were disappeared when transaction costs were taken into account.	six Pacific Basin Countries	Fung, Leung, and Patterson (1999)
Significant contrarian profits	G7 countries	Baytas and Cakici (1999)
Significant short-horizon price reversals	China	Kang et al. (2002)
Significant short-horizon price reversals	Australia	Gaunt (2000)
Contrarian profits are strong in relation to risk, size, and bid–ask bounce effects	New Zealand	Bowman and Iverson (1998)
There is a relationship between lagged trading volume and the weekly contrarian profits	Japan	Bremer and Hiraki(1999)
Contrarian profits on actively traded stocks to be significantly higher than low trading activity stocks.	Malaysia	Hameed and Ting (2000)
Takes longer for positive returns and shorter for negative returns	nine Pacific Basin Countries	Nam, Pyun, and Kim (2003)
Contrarian & Momentum Strategy are useful. Excess return can be obtained in short (monthly) and longer horizon using momentum and contrarian strategies.	Iran	Fadaie Nejad & Sadeghi(2006)
Price and profit momentum strategies have positive return and existing stock in winner portfolio tends to have growth stock.	Iran	Ghalibaf et al.(2010)
Can be obtained using momentum strategy	Iran	Mahmoud Azimi(2004)

Sources of Momentum and Contrarian Profits

A natural interpretation of momentum profits is that stocks under react to information. For example, if a firm releases good news and stock prices only react partially to the good news, then buying the stocks after the initial release of the news will generate profits. However, this is not the only source of momentum profits. Momentum strategies can also be profitable if past winners happen to be riskier than past losers. Also, if the premium for bearing certain types of risk varies across time in a serially correlated fashion, momentum strategies will be profitable. To formalize these ideas, consider the following single factor model:

$$r_{it} = \mu_i + b_i f_t + e_i \qquad (1)$$

$$E(f_t) = 0$$

$$E(e_{it}) = 0$$

$$Cov(e_{it}, f_t) = 0 \forall i$$

$$Cov(e_{it}, e_{it-1}) = 0 \forall i \neq j$$

Where μ_i is the unconditional expected return on security i, r_{it} is the return on security i, f_t, is the unconditional unexpected return on a factor-mimicking portfolio, e_{it} is the firm specific component of return at time t, and b_i is the factor sensitivity of security i. The superior performance of the momentum strategies implies that stocks that generate higher than average returns in one period also generate higher than average returns in the period that follows. In other words, these results imply that:

$$E[(r_{it} - \bar{r}]_t | r_{it} - 1 - \bar{r}_{t-1} > 0) > 0$$

And

$$E[(r_{it} - \bar{r}]_t | r_{it} - 1 - \bar{r}_{t-1} < 0) < 0$$

Where, the bar in above variable denotes its cross-sectional average
Therefore,

$$E[(r_{it} - \bar{r}]_t | r_{it} - 1 - \bar{r}_{t-1} > 0) > 0 \qquad 2)$$

The above cross-sectional covariance turns out to equal the expected profits to a trading strategy, considered in Lehmann (1990) and Lo and MacKinlay (1990) considered weights stocks by the difference between their past returns and the past returns of the equally weighted index. This weighted relative strength strategy (WRSS) is closely related to the Jegadeesh and Titman strategy and it has a correlation of .95 with the returns on P10-P1. While the equally weighted decile portfolios are used in most empirical tests, the closely related WRSS provides a tractable framework for analytically examining the sources of momentum profits and evaluating the relative importance of each of these sources.

Given the one-factor model defined in (1), the WRSS profits given in Equation (2) can be decomposed into the following three terms:

$$(3)$$

$$E\{(r_{it} - \bar{r}_t)(r_{it-1} - \bar{r}_{t-1})\} = \sigma_\mu^2 + \sigma_b^2 Cov(f_t, f_{t-1}) + Cov_i(e_{it}, e_{it-1})$$

Where σ_μ^2 and σ_b^2 are the cross-sectional variances of expected returns and factor sensitivities respectively. This decomposition suggests three potential sources of momentum profits. The first term in this expression is the cross-sectional dispersion in expected returns. Since realized returns contain a component related to expected returns, securities that experience relatively high returns in one period can be expected to have higher than average returns in the following period. The second term is related to the potential to time the factor. If factor portfolio returns are positively serially correlated, large factor recognitions in one period will be followed by higher than average factor recognitions in the next period. The last term in equation (3) is the average serial covariance of the idiosyncratic components of security returns. To assess whether the existence of momentum profits imply market inefficiency, it is important to identify the sources of the profits. If the profits are due to either the first or the second term in Equation (3), they may be attributed to compensation for bearing systematic risk and need not be an indication of market inefficiency. However, if the superior performance of the relative strength strategies is due to the third term, then the results would suggest market inefficiency.

JT examine whether the serial covariance of factor returns, the second term in the decomposition given by Equation (3), can explain momentum profits. Under

model (1), the serial covariance of an equally weighted portfolio of a large number of stocks is:

$$COV(\bar{r}_t, \bar{r}_{t-1}) = \bar{b}_i^2 COV(f_t, f_{t-1}) \qquad (4)$$

If the serial covariance of factor related returns were to contribute to momentum profits, then the factor realizations should be positively serially correlated (see Equation (3)). Although the main factor is unobservable, Equation (4) indicates that the serial covariance of the equally weighted market index will have the same sign as that of the common factor. JT found that the serial covariance of 6-month returns of the equally weighted index is negative (-0.0028). Since the momentum strategy can only benefit from positive serial covariance in factor returns, the finding here indicates that the negative factor return serial covariance does not contribute to momentum profits.

Lead-lag Effects and Momentum Profits

Momentum profits can also potentially arise if stock prices react to common factors with some delay. If stock prices react with a delay to common information, investors will be able to predict future price changes based on current factor realizations and devise profitable trading strategies. In some situations such delayed reactions will result in profitable contrarian strategies. The contribution of the serial covariance of e_{it} to the serial covariance of the equally weighted index becomes arbitrarily small as the number of stocks in the index becomes arbitrarily large situations, it will result in profitable momentum strategies. To see this, consider the following return generating process:

$$r_{it} = \mu_i + \beta_{0i} f_t + \beta_{1i} f_{t-1} + e_{it} \qquad (5)$$

Where, β_{0i} and β_{1i} are sensitivities to the contemporaneous and lagged factor realizations >0 implies that stock i partly reacts to the factor with a lag, and <0 implies that the stock overreacts to contemporaneous factor realizations and this overreaction gets corrected in the subsequent period. This type of delayed reaction model has been used to realize stock return dynamics by Lo and MacKinlay (1990), JT, Jegadeesh and Titman (1995) and Brennan, Jegadeesh and Swaminathan (1993). This model obtains the empirical finding that stock returns are sensitive to lagged market returns (see Jegadeesh and Titman (1995)).

The WRSS profits under this model are given by:

$$E\{(r_{it} - r_t)(r_{it-1} - \bar{r}_{t-1})\} = \sigma_\mu^2 + d\sigma_f^2 \qquad (6)$$

where,

$$d = \frac{1}{N} \sum_{i=1}^{N} (\beta_{0i} - \bar{\beta}_0)(\beta_{1i} - \bar{\beta}_1) \qquad (7)$$

$\bar{\beta}_0$ and $\bar{\beta}_1$ are the cross-sectional averages of β_{0i} and β_{1i}, respectively. Equation (6) indicates that the delayed reaction will generate positive momentum profits when $\delta > 0$. δ is greater than zero if firms with large contemporaneous betas also tend to show large lagged betas. Here, the contemporaneous betas are less dispersed than the sum of contemporaneous and lagged betas. When > 0, then stock prices tend to be changed at the same time. In other words, if the market moves up, high beta stocks will increase more than low beta stocks, but not by as much as they should. Hence, the higher beta stocks will also react with a delay. It is possible that delayed reactions of this nature may be due to the tendency of investors to buy and sell stocks in baskets rather than individually. With such delayed reactions, a momentum strategy will buy high beta stocks following a market increase, and will profit from the delayed response in the following period. When lead-lag effects are generated in this way, large factor realizations will be followed by large delayed reactions, and hence the profit in any period will depend on the magnitude of factor realizations in the previous period. Formally, consider the expected WRSS profits conditional on the past factor portfolio return:

$$E\{(r_{it} - \bar{r}_t)(r_{it-1} - \bar{r}_{t-1})|f_{t-1}\} = \sigma_\mu^2 + d f_{t-1}^2 \quad (8)$$

Equation (8) implies that if the lead-lag effect contributes to momentum profits then the magnitude of the profits should be positively related to the squared factor portfolio return in the previous period. To investigate the importance of this source JT estimate the following regression using the value-weighted index as a proxy for the factor portfolio:

$$r_{pt,6} = a_i + \theta_p r_{mt,-6}^2 + u_{it}$$

Where $r_{pt,6}$ denotes the WRSS profits and $r_{mt,-6}^2$ is the demeaned return on the value-weighted index in the months $t - 6$ through $t - 1$. The

estimation of θ_p and the corresponding autocorrelation-consistent *t*-statistic are –1.77 and 3.56, respectively over 1965 - 1989. The negative coefficients indicate that any market wide lead-lag effect does not add to the momentum profits.

RESEARCH METHOD

This study covers the stock markets in Tehran Stock Exchange (TSE) from 2004 to 2010. All data, including daily and monthly returns on individual stocks and each country's market, number of shares traded and number of shares outstanding is obtained by applying Tadbir Pardaz and Rahavard Nouvin Softwares. In this research data contains of all listed companies in Tehran stock exchange with the following conditions:

1) Companies that have been listed in Tehran stock exchange before 2005.
2) Companies that their symbols have not stop transaction more than 5 months.
3) The number of total period transactional days should not be less than 500 days for each company.

The number of membership possessing condition in our community arrived to 147 companies regarding the limitations. The Sample size of 108 companies is determined by Cucran formula. The portfolio formation procedure used is the momentum version of Lo and Mackinlay's (1990) weighted relative strength scheme (WRSS). Specifically, we take a long/short position in positive/negative excess return stocks (based on their three- month ranking period), with a higher weight assigned to more extreme performers. These portfolios are observed after a three- month period. Also, we decompose profits into three components, cross-sectional risk, lead–lag effect, and price pattern, following the Jegadeesh and Titman (1995) approach.

Trading Activity

To evaluate whether momentum and contrarian profits differ among stocks of varying trading activity levels in Tehran Stock Exchange, stocks are classified by trading volumes based on the turnover ratio (numbers of shares traded divided by number of shares outstanding). For each year under study, stocks are classified into the top (high), middle (medium), and bottom (low) thirds based on the daily average turnover ratio during 2005. We note that our volume classification is different from Conrad, Hameed, and Niden (1994) who classify stocks into high and low volume groups based on whether the trading volume

in the formation period is higher or lower than its historical average. Our classification is different from trading volume classification of Lee and Swaminathan (2000). We argue that this trading volume measure is more appropriate in distinguishing trading activity levels. For example, a stock classified as high (low) volume using the Conrad et al. (1994), methodology could represent a thinly (heavily) traded stocks in a particular week.

Portfolio Formation and Trading Strategy

As mentioned before the momentum version of WRSS as proposed by Lo and MacKinlay (1990) is used for the formation of momentum portfolios. WRSS represents the investment strategy of buying stocks in proportion to their returns over the ranking period. Using this method, the investor takes a long position in positive-return stocks, with higher weight on top performers. At the same time, the investor takes a short position in negative-return stocks, with higher weight on bottom performers. The winner stocks during period *t* are the stocks that outperform the market $(R_{i,t} - R_m > 0)$, where $R_{i,t}$ is the return of stock *i* during formation period *t* and R_m is the return of the market during the same period) and the loser stocks are the stocks that under-perform the market. During each study period *t*, each stock is assigned a weight of:

$$W_{i,t} = \frac{1}{N}\left(r_{i,t-1} - \bar{r}_{t-1}\right) \qquad (9)$$

Where $r_{i,t-1}$ is the return of stock *i* during the ranking period, $\bar{r}_{t-1}$ is the market return at time *t-1*, and *N* is the number of stock in the sample. The profit, denoted as π_t, is

$$\pi_t = \frac{1}{N}\sum_{i=1}^{N} w_{it}\left(r_{it}\right) \qquad (10)$$

If $\left(r_{i,t-1} - \bar{r}_{t-1}\right) > o$, the stock is classified as a winner, otherwise it is considered a loser. A momentum strategy involves taking a long position for winners and a short position for losers. A positive return on a long position and a negative return on a short position both produce a profit. Hence, a positive value for Equation (10) indicates momentum profit. On the other hand, a contrarian portfolio has a short position for winners and a long position for losers. A negative value of Equation (10) reflects a profit.

Decomposition of Contrarian/Momentum Profits

Conrad and Kaul (1993), among others, show that momentum profits reflect cross-sectional risk caused by the momentum portfolio formation procedure. Lo and Mackinlay (1990) also attribute contrarian profits to lead–lag effects, rather than the time pattern displayed by extreme performers. As a result, it is essential to decompose momentum profits into different components and check for the portion of such profits exploitable by the investment strategy. Under the WRSS portfolio scheme, the decomposition of momentum or contrarian profits can be represented as follows:

$$(R^m) = \sigma_\mu^2 + \delta\sigma_f^2 + \Omega \tag{11}$$

Where the superscript m stands for momentum, σ_μ^2, describes the part of momentum profit that compensates for cross-sectional risk among stocks, $\delta\sigma_f^2$, explains the lead–lag effect as analyzed by Lo and MacKinlay (1990), and Ω is the correlation or time pattern of stocks that show market inefficiency exploitable by trading strategies such as momentum or contrarian strategies. Each component can be calculated as follows:

Cross-sectional risk:

$$\sigma_\mu^2 = \frac{1}{n}\sum_{i=1}^{N}(\mu_i - \bar{\mu})^2 \tag{12}$$

Lead-lag effect:

$$\delta = \frac{1}{N}\sum_{i=1}^{N}(b_{0.i} - \bar{b}_0)(b_{1,i} - \bar{b}_1) \tag{13}$$

Time-series pattern:

$$\Omega = \frac{1}{N}\sum_{i=1}^{N}COV(\varepsilon_{i,t}, \varepsilon_{i,t-1}) \tag{14}$$

where μ_i is the regression intercept of stock I; $\bar{\mu}$ is the mean of regression intercept of all stocks in the sample; $b_{0.i}$ is the regression coefficient b_0 of stock I; $\bar{b}_0$ is the mean of regression coefficient b_0 of all stocks in the sample; $b_{1,i}$ is the regression coefficient b_1 of stock I; $\bar{b}_1$ is the mean of regression coefficient of all stocks in the sample.

In this study the above methodology were applied to study the difference in the decomposition of momentum /contrarian profits among stocks of varying trading volume levels.

Trading Volume Variable

In this research momentum Return is studied based on trading volume. In order to eliminate the company size, the turnover ratio variable is used; namely, share traded is divided by company share outstanding. Regarding the above criteria, there will be 3 group of trading volume (figure 1).
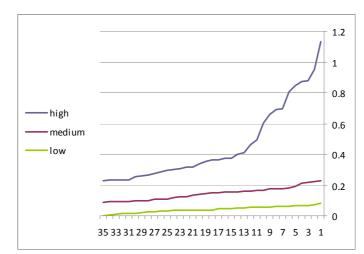

Figure 1: Comparison of turnover rate in 3 groups trading volume

Turnover Ratio and Momentum Return

In order to prove positive correlation in securities return we make the select or observation period (j=3) months and the testing period (k=3) months. This was our logic that if the momentum returns still exists therefore the shares that had good performance at past they will continue to their good performance at next month, but if they had shown the bad performance at past months, they will have performance at next too.

Finally the momentum portfolio formation strategy will bring non zero return. In order to test it, the mean of cumulative abnormal return means for winner and loser portfolios were calculated and compared to ensure the normal data before testing the purposed theory.

Therefore; the kolmogorov-Smirnov test was applied to test for a normal distribution. With respect to the significant level is more than 5% level, the kolmogorov-

Smirnov test accept the normality hypothesis for the case of normal data. The result is shown in table 1.

In order to confirm the momentum return that exists in 3 groups of trading volume, means comparison test was applied (see table 2).

According to table 2, there is a significant momentum return exists in average and high trading volume, but there isn't a significant momentum or contrarian return exists in low trading volume. ANOVA test is used for trading volume effect survey on momentum return (see table3).

Regarding significant level is .001 in tables (3) which is less than .005, therefore the zero hypothesis is rejected. It means that equality of momentum return mean reject at 3 volume groups. But Tukey test is used for realizing significant difference between couple means result of relevant test is shown in following table (table 4).

Table 1: Kolmogorov-Smirnov test for normal survey

Low volume	Average volume	High volume	Trading volume
-0.0246	0.0393	0.0719	Mean
0.474	1.024	0.942	Kolmogorov-smironov statistic
0.978	0.245	0.337	Significant level

Table 2: Mean comparisons test for survey momentum returns

Result	Upper	Lower	Mean Difference	Sig. (2-tailed)	d.f	T	Trading volume
reject (0)	0.1163	0.0276	0.07192	0.002	66	3.238	High
Reject (0)	0.0708	0.0077	0.03925	0.015	66	2.486	Medium
Accept (0)	0.0042	-0.534	-0.2460	0.093	66	-1.707	Low

Table 3: Analyze variance (ANOVA) for mean comparisons of trading volume

Sig	F	Mean Square	d.f	Sum of squares
0.001	7.607	0.161	200	0.323

Table 4: Tukey test result

Group 1		Group 2	
	-0.0246		Low volume
0.0393			Average volume
0.0719			High volume
0.398	1000		Sig

Formation of this groups that means of average and high volume groups have different due to momentum return .Therefore, there is a significant difference between means of momentum return trading volume groups by 95 percent confidence (figure 2).

In order to determine the relationship between momentum return and cross - sectional risk variables Lead-lag effect and time series pattern is used from Ordinary Least Squares (OLS). The result of relevant tests at high and average trading volume is summarized in following tables (table 5 and 6).

Capital Market of Iran and Other Emerging Markets Comparison

As Tehran Stock Exchange is categorized as emerging market, it is necessary to investigate its position among other emerging markets. To do so, in this section, Tehran Stock Exchange is compared to other similar markets. Chen (2007) studied the applications of momentum and contrarian strategies in Taiwan Stock Exchange during 2001-2005. He found a momentum strategy in Taiwan Stock Exchange and showed that trading volume is useful in prediction of
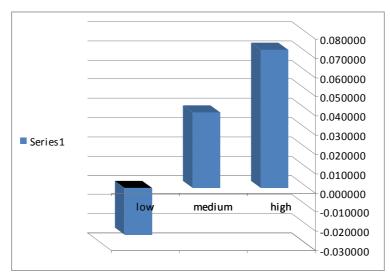

Figure 2: Comparison acceleration return in trading volume 3 groups

Table 5: Relation between high trading volume with independent variables

variable	Coefficient	t-statistic	Prob.
Cross-sectional risk	35.3974	1.9933	0.05
Lead- lag effect	-0.0004	-1.4646	0.14
Time-series pattern	4.0832	1.4099	0.16

Table 6: Relation between average trading volume with independent variables

variable	coefficient	t-statistic	Prob.
Cross-sectional risk	1758.344	2.5476	0.01
Lead- lag effect	0.0533	2.5891	0.01
Time-series pattern	1149.365	1.8913	0.0634

portfolios return. Chui and Wei found a significant momentum profit for 7 Pacific Ocean countries during 1975-2000 and showed that companies with lower levels of capital, lower B/M ratio and higher trading volume have significant momentum profit.

Hamed and Ting (2000) studied the relationship between the capability of weekly returns and trading volume prediction in Malaysia stock exchange and found that contrarian profit of stocks with high trading volume is significantly higher than stocks with low trading volume. Shah Saeed Hassan Chudhuri and Franklin E.Michaelo confirmed the momentum and contrarian strategies in India stock market during 1999-2006. They showed significant momentum and contrarian strategies in this market in the short and long run. Further research revealed that investors who invest in small firms (firms with low and middle levels of trading volumes) just achieved short-term contrarian profit. In contrast, large firms (with high levels of trading volumes) don't have contrarian investing opportunity. Special information, as a source of contrarian profit, has little effect in large companies. Overall, good news is a source of contrarian profit in India stock market since 1999. In conclusion, small and medium size firms have more contrarian profit and that is due to wrong pricing and overall market inefficiency.

Dwi Astuti Putranto (2009) investigated the relationship between the size effect and momentum versus contrarian strategies in Indonesia Stock Market for the period 1991-2008. They also studied the effect of trading volume in momentum and contrarian strategies. The results showed that value and small stocks outperform glamour and big stocks in Indonesian stock market. In other words, in short - term, winners outperform losers due to investors' overestimation towards winners that belong to high lagged volume group. Overreaction of investors to losers is higher than their overreaction towards winners in mid-term.

To sum up, findings of Pacific Ocean countries are consistent with those found in the stock market of Iran. In contrast, these results are not consistent with the results of Taiwan, Malaysia, Indonesia and India. For Taiwanese stocks, the time-series patterns are consistent with our previous findings. Time-series patterns (Ω) yield momentum profits in high and medium volume stocks and contrarian profits in low volume stock. A portion of momentum profits found in high and medium volume stocks represents cross-sectional risk, which is higher in the medium volume stocks. The lead–lag effect, on the other hand, reduces momentum profits in high and medium volume stocks. Low volume stocks display positive numbers for δ, which is unusual for the lead–lag effect. In Korea, the time-series pattern (Ω) yields price momentum and are higher in high volume stocks than in low volume stocks. Cross-sectional risk also explains a portion of momentum profits and is found to be highest in low volume stocks. In Hong Kong, momentum profits reported in the previous section may mostly represent the country's unusual lead–lag effect. The time-series pattern (Ω) itself seems to represent price reversals instead of price momentum. Such price reversals are stronger for thickly traded stock. Cross-sectional risk also explains a portion of momentum profits found and is highest in medium volume stocks. Malaysia's contrarian returns partly reflect time-series patterns (Ω). Consistent with Hameed and Ting's (2000) finding, such time-series patterns are stronger for higher volume stocks. Lead–lag effects still play an important role in explaining contrarian returns. The lead–lag effect is highest for low volume stocks. Cross-sectional risks reduce contrarian profits, especially in the medium volume stock. As for Thailand, the momentum profits found for high volume stocks mostly represent the unusual lead–lag effect, just as we had found for Hong Kong and China. Another part of momentum profits can be explained by cross-sectional risks. For medium volume stocks, momentum profits only compensate for cross-sectional risks while lead–lag effects and time series patterns yield price reversals. Similar to high volume stocks, momentum profits in low volume stocks represent the unusual lead–lag structure and cross sectional risks. In general, the time-series patterns (Ω) in Thailand actually reflect price reversals, which are higher in inactively traded stocks. In Singapore, the time-series pattern (Ω) displays price reversals, which is higher in the high volume stock. The conventional lead–lag effect also indicates price reversals across all trading volume groups. This effect is stronger for the lower volume stocks sectional risk contributes to momentum profits, which is highest in the medium volume stock.

RESULTS AND DISSCUSSION

We implement the methodology that decomposes momentum/contrarian (positive/negative) returns into the cross-sectional risk σ_μ^2, lead–lag effect (δ), and

time- series pattern (Ω) on stock with different levels of trading activities. The first term (σ_μ^2) represents the cross-sectional variance of expected returns. This component is always positive and increases (decreases) momentum (contrarian) profits. The second component, the conventional Lo and MacKinlay (1990) lead–lag effect, posits that δ is negative and contributes to contrarian profits. The last term, time-series pattern (Ω), is negative (positive) if price of stock in the market overreact (under react) to firm specific news and corrections (momentum) occur during the observation period.

We expected that shares because of cumulative abnormal return during past 3 months will continue its performance in future months if there is a price momentum. While those have a bad performance in past months will have a bad performance in future as well. Finally momentum portfolio formation strategy (we will buy shares that their end functions had done and we will sell shares that their end functions had not done well) will bring non zero return for us. If this non-zero return is positive, it will be considered as momentum return. Otherwise significant negative return is considered as contrarian return if we have calculated ACARS for loser and winner portfolios and compared them. If the momentum portfolio mean is positive, that means the buying winner share and selling loser share can make abnormal return. On the contrary, the momentum portfolio means are negative. It means that buying loser share and selling winner share can make abnormal return.

CONCLUSION

In this research contrarian and momentum return were surveyed in three trading volume groups. In two average and high trading volume, there is enough evidence for rejecting null hypothesis. By observing to the distance of low and high borders that both are positive, we conclude that excess return of momentum strategy is significantly positive. The positivity of momentum portfolio abnormal return shows that in both volumes, winner shares will remain winner and on the contrary, loser shares will remain loser in future. Although the momentum portfolio return in low trading volume is negative, but since it is statistically insignificant, the contrarian return cannot be confirmed. Consequently the low trading volume is omitted in remained calculation. Therefore the momentum strategy of average and high trading volume

is profitable in a three month period in Tehran Stock Exchange. Also, there is a significant relationship between trading volume and momentum return using ANOVA. It means that increase in trading volume, the momentum strategy will be profitable. It is shown by Tukey test that momentum return of low trading volume is significantly lower than momentum return of average and high volume. There is a significant positive relationship between the excess return of using momentum strategy and cross- sectional risk of momentum return at high trading volume.

At average trading volume there is a significant positive relationship between the excess return of using momentum strategy and cross- sectional risk of momentum return too. At high trading volume there is not significant relation between the excess return of using momentum strategy and lead-lag effect. The obtained results from momentum return and sectional risk in Iran Stock Exchange is consistent with Korea, Hong Kong, Malaysia, Taiwan and Thailand. In other words, in Iran and other emerging markets, there is a direct relationship between sectional risk and momentum return. The results from momentum return and lead-lag effect in Iran is consistent with Taiwan stock exchange results, but Iran stock exchange momentum return and time-series pattern results are not consistent with any of the markets. Thus, in contrast to other emerging markets, momentum return in Tehran Stock Exchange is not derived from inefficiency of the market. In general, it can be concluded that part of contrarian and momentum profits survive the decomposition of profits and reflect the time-series patterns of stock returns.

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