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Asymmetric reaction in the Taiwan stock market: Overreaction to bad news and underreaction to good news[1]

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Abstract

This paper examines the behavior of the Taiwan stock market after a large price change during a single trading day and finds that the Taiwan stock market appears to underreact to good news and overreact to bad news. Though the January and February effects, and the difference in risk can partially explain the profits of losers and winners, the over- or underreaction effects cannot be completely subsumed under them. Market's underreaction to good news tends to better characterize the return continuation and market's overreaction to bad news is a proper explanation for the reversal pattern, a result consistent with the uncertain information hypothesis proposed by Brown, Harlow, and Tinic (1988).

Key Words: overreaction, underreaction, size effect, January effect, and February effect

I. Introduction

In recent years, a large volume of empirical evidence has been presented showing that security returns are predictable based on public available information. In terms of predictability, short-term underreaction and long-term overreaction are

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seen as anomalies. The underreaction evidence indicates that news is incorporated slowly into prices, which tends to show positive serial correlation over 1-12 months (Jegadeesh and Titman, 1993; Rouwenhorst, 1998). Overreaction indicates that asset prices overreact to information released over longer intervals of perhaps 3-5 years, which suggests that past winners (losers) tend to be future losers (winners) (see DeBondt and Thaler, 1985, 1987; Chopra, Lakonishok, and Ritter, 1992; Fama and French, 1996, 1998; Ball, Kothari, and Shanken, 1995; Poterba and Summers, 1988; Richards, 1997; Kim, Nelson, and Startz, 1988).

Based on individual stocks on the Taiwan stock market, much literature has also presented evidence of long-term (3-5 years) overreaction (e.g., Lin, 1992; Chin, 1996; Hsu, 1997; Cheng, 1998; Chen, 2001; Chen, 2001) and short-term (1-12 months) momentum (e.g., Hsieh, 1991; Liu, Liu, Hsieh, 1993; Chen, 1999; Cheng, 2000; Liu, 2002; Huang, 2001; Chen, 2001).

Except for short-term underreaction and long-term overreaction, several studies have examined the short-term price movements based on a very short (i.e., daily, weekly, or, at most, monthly) period. For example, Brown and Harlow (1988) detected large price reversal for losers, but winners did not show any decline after the first month. Based on weekly data, Howe (1986) found strong support for the overreaction hypothesis for both winners and losers over the subsequent ten weeks. With daily data, Bremer and Sweeney's (1991) findings indicate that losers earn a return of 3.95 percent over the first five days after the event. In contrast, winners show virtually no excess returns in the period immediately following the event. In addition, Lehmann (1990) provides some evidence of nonzero return autocorrelations over a very short period of time, such as a day.

All previous research typically studied the issue of stock market overreaction from the viewpoint of investigating different firms' performance for a given interval. As a result, these studies are subject to and focus on cross-sectional differences, such as the bid-ask spread[2] (e.g., Kaul and Nimalendran, 1990), firm size (e.g., Zarowin, 1990), January effect (e.g., Fant and Peterson, 1995; Zarowin, 1990), and other firm-specific factors that may explain the overreaction.[3]

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[2] The long-term performance measures calculated by cumulative single-period returns over long periods are upwardly biased because of bid-ask spreads and the bias per period is approximately $s_i^2/4$, where s_i is dollar bid-ask spread (Blume and Stambaugh, 1983; Conrad and Kaul, 1993).

[3] For example, Fama and French (1996) documented that their three-factor model can explain the overreaction evidence, but not the continuation of short-term returns

To avoid the confounding effects resulting from the cross-sectional differences in individual stocks, this paper used portfolios to investigate the overreaction of markets rather than that of individual stocks.[4] Since the study focused on portfolios to avoid the potential bias due to firm size and the bid-ask spread, the finding of over- or underreaction in portfolios suggests that this stock market is inefficient independent of cross-sectional differences in individual stocks. To obtain this objective, the best and worst performing days in the portfolio's history were used to form the winner and loser portfolios. Then, the performance on the subsequent days relative to the initial returns was computed to identify any over- or underreactions in the portfolio.[5] Furthermore, Moskowitz and Grinblatt (1999) suggested that past industry portfolios with better performance continue to outperform past portfolios with worse performance.[6] Therefore, despite tests with individual stocks and market index, this study also explored the profitability of industry-based strategies.

This study focused on returns in a short window of time (a few days) around an event. One advantage of this approach is that because daily-expected returns are close to zero, the model for expected returns does not have a big effect on inferences about abnormal returns. Conversely, long-term return anomalies are sensitive to the model and statistical approach (see Fama, 1998). The other advantage of focusing on the short-term (i.e. daily) behavior of portfolio return is that mean reversion in stock market is primarily a long-term phenomenon, and the findings of long-term over- or underreaction is often subject to the criticism that stock prices move toward their fundamental values in the long run. The focus on daily returns does help to avoid mean reversion in the stock market, and any findings of short-term over- or underreactions in the stock markets provide more robust evidence of the over- or underreaction hypothesis.

(underreaction). Along the same lines, Atkins and Dyl (1990) found that stock market overreaction may disappear after controlling for cross-sectional differences.

[4] Schnusenberg and Madura (2001) argue that though investors normally focus on buying and selling individual stocks on stock fundamentals (e.g., earnings and dividend), broad market movements may have an effect on their decisions even in the absence of significant changes in the underlying stock fundamentals.

[5] Price limit regulation was imposed on the Taiwan stock markets ever since it was established. Kodres (1988) points out that the positive serial correlation for price changes in currency futures seems to be induced by price limits. Avoiding the positive serial correlation of price changes on the individual stocks induced by price limits is the other reason that the stock indexes were employed in this study.

[6] Moskowitz and Grinblatt (1999) report significant momentum profits when industries are sorted based on their past six-month returns and positions are held for six months.

Individual firms were first used in the testing showing that past winners continue to outperform past losers, a result consistent with Chen (1999), Chen (2001), Cheng (2000), Hsieh (1991), Hunag (2001), Jegadeesh and Titman (1993), and Liu (2002). Since Moskowitz and Grinblatt (1999) present a similar pattern in industry portfolios, the test was done again based on eight different industries, including the cement, food, plastics, textile, electrical, paper, construction, and finance industries. Overall, it was found that the Taiwan stock market appears to underreact to good news and overreact to bad news. The underreaction of winners and overreaction of losers in the TSEC indexes seem to support the uncertain information hypothesis. In addition, stocks in all industries tend to under-react to good news. For industries, such as the plastics, electrical, and finance industries, stocks have a tendency to overreact to bad news.

Lewellen (2002) extended the results of industry momentum to size and B/M portfolios and found that momentum in size and B/M portfolios are as strong as in individual stocks. Therefore, apart from tests with individual stocks, market index, and industry indexes, this study also explored the profitability of size, price, and B/M portfolios because there is much evidence that they capture risk factors in returns (Fama and French, 1993, 1996). It was found that the smaller-size effect and the higher-B/M value effect also had some explanatory power for underreaction phenomena of winners, whereas lower-price effect shows no explanatory power. The magnitude of price reversal was more significant in the medium portfolios, regardless of size, price, and B/M value. Furthermore, the difference in risk and the seasonality phenomena (January effect and February effect) can partially explain the under- and overreaction.[7] The more prolonged accumulation of abnormal returns supports underreaction to good news as an explanation for the abnormal returns in the winners. The evidence of price reversal for the losers implies that market overreacts to bad news.

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[7] Some domestic research documented that the size factor is one important resource for the profits from momentum strategy (e.g., Hsu, 1993; Tu, 1998; Cheng, 2000; Chen, 2001; Huang, 2001). But, Hsieh (1994), Chou (1996), Chen (2001), and Liu (2002) argue that size effect has little explanatory power on the returns from momentum strategy. Some papers, such as Chen (2001), Cheng (2000), Huang (2001), and Liu (2002), also provide evidence of the book-to-market value effect. Whereas, Tu (1998) documented that there is no book-to-market value effect in the Taiwan stock market. Besides, the industry factor also plays an important role (Yu, 1999; Chen, 2001). Moreover, Tu (1998) found that risk difference can partially explain the Taiwan stock returns, but Liu (2002) has a completely different view about this. Overall, there is no agreement about which firm characteristics can explain the risk premiums.

The remainder of the paper proceeds as follows. Section 2 provides competing explanations for overreaction and underreaction. Section 3 describes the data and methodology. Section 4 states the testable hypothesis and presents the empirical results. The last section briefly concludes the paper.

II. Explanations for overreaction and underreaction

Explanations for long-term reversals

DeBondt and Thaler (1985) were the first to find evidence of return reversals over long intervals. In particular, stocks that experience poor performance over the previous three to five years (losers) tend to substantially outperform prior-period winners during the subsequent three to five years. They thought the reason for the long-term return reversals was that investors overreact to past performance and that performance tends to mean-revert.

Some studies, however, have argued that long-term price reversals can be explained by systematic risk. For example, Chan (1988) and Ball and Kothari (1989) argue that these reversals are due primarily to systematic changes in expected returns. However, Brown, Harlow, and Tinic (1988) demonstrated that portfolio returns by buying past losers and selling past winners persist after controlling for size but disappear once systematic risk is considered. In addition, since returns to the losers primarily occur in January, it is argued that the DeBondt and Thaler (1985) results can be attributed to overreaction (see Fama and French, 1988; Zarowin, 1990). Another reason that has been proposed by Fama and French (1988) and Zarowin (1990) for why losers outperform winners, relates to the size effect. They argue that losers tend to be smaller-sized firms, and the losing firm effect can be subsumed under the size effect.

Explanations for short-term reversals

Based on a short (i.e., daily, weekly, or, at most, monthly) formation period, several papers provide evidence of short-term reversals (e.g., Howe, 1986; Brown and Harlow, 1988; Jegadeesh, 1990; Lehmann, 1990; and Bremer and Sweeney, 1991). In particular, Howe (1986), using weekly returns, strongly supports the overreaction hypothesis for both winners and losers. Brown and Harlow (1988)

found large price reversals for losers. Winners, on the contrary, show no decline after the first month. Bremer and Sweeney's (1991) findings indicate that losers earn returns of 3.95 percent over the five days after a one-day price change of 10 percent or greater, but winners show no excess returns over the subsequent few days.

However, Atkins and Dyle (1990), Jegadeesh and Titman (1995), Cox and Peterson (1994), and Ball, Kothari, and Shanken (1995) suggest that the bid-ask spread can explain short-term price reversals.[8] In addition, Conrad and Kaul (1993) and Ball, Kothari, and Shanken (1995) noted that many prior losers have low prices and large percentage bid-ask spreads. That is, most short-term overreaction

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[8] Let P_{it}^{o} be the observed/transaction price of security *i* at time *t*. This price will reflect the "true" price, P_{it}, adjusted for the bid-ask spread; that is,

$$P_{it}^{o} = P_{it} + \frac{s_i}{2} Q_{it} \qquad \text{(a)}$$

and

$$P_{it} = P_{it-1} + U_{it}, \qquad \text{(b)}$$

where Q_{it} = the unobservable indicator for the bid-ask classification of P_{it}^{o}; Q_{it} = +1 if transaction at time *t* is at the ask, and Q_{it} = -1 if it is at the bid; U_{it} innovation is the "true" price due to the arrival of information between periods *t*-1 and *t*; and s_i is dollar bid-ask spread quoted by the market maker. Given the model for security prices in (a) and (b), the change in observed/transaction prices of security *i*, ΔP_{it}^{o}, can be written as the "true" price change plus a measurement error

$$\Delta P_{it}^{o} = \Delta P_{it} + \varepsilon_{it}, \qquad \text{(c)}$$

where $\varepsilon_{it} = s_i / 2[Q_{it} - Q_{it-1}]$

From (c) it can be readily seen that, even if true price changes (and therefore true returns) are serially uncorrelated, observed returns will exhibit negative autocorrelation. Under the assumption that bid-ask errors in prices are independent and identically distributed over time and that the ex-ante probabilities of buys and sells are equal for all trades, the autocovariance generated by the bid-ask effect is given by

$$\operatorname{cov}(\Delta P_{it}^{o}, \Delta P_{it-j}^{o}) = \operatorname{cov}(\varepsilon_{ut}, \varepsilon_{it-j})$$

$$= \begin{Bmatrix} -\frac{s_i^2}{4} if\ j = 1 \\ 0\ if\ j > 1 \end{Bmatrix} \qquad \text{(d)}$$

Hence, even if there is no market overreaction, the price reversals might simply be induced by the bid-ask spread in (d); that is, $s_i^2 / 4$ (Atkins and Dyl, 1990).

findings can be attributed to a combination of bid-ask spreads and price effect, rather than prior returns.[9]

Explanations for short-term price continuation

Hong, Lim, and Stein (2000) documented that short-term price continuation is a consequence of the gradual diffusion of private information. If short-term price continuation does come from gradual information flow, stocks with slower information diffusion should exhibit more pronounced underreaction in the short term. This seems plausible since information about small firms diffuses more slowly. The reason is that if investors face fixed costs of information acquisition and choose to put more effort into learning about the stocks in which they can take large positions, then size can be a useful measure of the rate of information diffusion. Hong, Lim, and Stein's (2000) evidence is consistent with the gradual-information-flow hypothesis documented by Hong and Stein (1999).

Possible explanations based on Investor Psychology

As documented by Jegadeesh and Titman (2001), it is very difficult to explain the observed momentum profits with a risk-based model. Therefore, in recent years, a couple of studies have turned to behavior models to explain these phenomena. Most of the models assume that the momentum profits are a result of the serial correlation of individual stock returns. Nevertheless, they differ about whether the serial correlation is caused by underreaction or delayed overreaction. If the serial correlation is caused by underreaction, then there are long-lasting positive abnormal returns during the testing period. However, if the abnormal returns are caused by delayed overreaction, the abnormal momentum returns in the testing period will be followed by negative returns since the delayed overreaction must subsequently be reversed.

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[9] Whereas Loughran and Ritter (1995) question Conrad and Kaul (1993) and Ball, Kothari, and Shanken's (1995) explanations and argue that price not only proxies for percentage bid-ask spreads, but also proxies for prior returns. Furthermore, many low priced stocks are subsequently delisted due to distress, price may be also a better risk proxy.

Barberis, Shleifer, and Vishny (1998) were the first to offer an explanation for momentum profits based on the conservatism bias. The conservatism bias suggests that investors tend to underreact to new information when they update their priors. Then prices will slowly adjust to information. This gives rise to momentum profits. In addition, Barberis, Shleifer, and Vishny (1998) argue that representative heuristics may lead investors to mistakenly conclude that firms with consistent earnings growth will continue to experience similar growth in the future. Thus, though the conservatism bias leads to underreaction, the conservatism bias in conjunction with representative heuristics can lead to overshooting their fundamental value. Eventually, stock with past high returns will accompany negative returns in the long run.

Daniel, Hirshleifer, and Subrahmanyam (1998) explained the short-term momentum and long-term overreaction by developing a theory based on investor overconfidence and on changes in confidence resulting from biased self-attribution of investment outcomes. According to the biased self-attribution theory, the confidence of the investor grows when information is in agreement with his information, but disconfirming information causes his confidence to fall only modestly, if at all. Thus, if an individual is overconfident in his ability, new public signals are usually viewed as confirming the validity of his private signal. This suggests that public information can trigger further overreaction to a preceding private signal (Investors overreact to private information release and underreact to public information release.). Thus, such continuing overreaction causes momentum in security prices, but this momentum is eventually reversed as further public information gradually draws the price back toward fundamental values. As a result, there is a short-term momentum and long-term overreaction.

Hong and Stein (1999) do not discuss momentum or overreaction based on any behavioral biases of investors. They consider two groups of investors who trade based on different sets of information (momentum traders and news watchers). They argue that momentum and overreaction arises from the interaction of momentum traders and news watchers. Momentum traders make partial use of the information contained in recent price trends and ignore fundamental news. News watchers rationally use fundamental news but ignore prices. They assume that private information diffuses gradually across news watchers, this leads to underreaction and results in momentum profits. Because the momentum traders can adjust according to past prices, their attempts to profit from the underreaction

caused by news watchers tend to push prices above their fundamental values. When prices eventually revert to their fundamentals, return reverses itself. This leads to short-term momentum and an eventual overreaction to any news.

III. Data and Methodology

3.1 Data

The Taiwan Security Exchange (TSEC) stock indexes and eight industry indexes (cement, food, plastics, textile, electrical, paper, construction, and finance) were used to test the index over- or underreaction hypothesis. Daily data from January 1981 to December 2001 were studied, a total of 6080 observations for each index.[10] These data are taken from the Taiwan Economic Journal.

Summarized statistics for these nine Taiwan stock market indexes are shown in Table 1. It is clear that during the past 21 years, the average daily return of the TSEC index was 0.05434% with a standard deviation 0.01737%. Over the sample period, the electrical industry stocks had the highest daily mean return (0.07037%), while the construction industry index showed the lowest daily average return (0.02495%). The financial industry index had the highest volatility, while the cement industry index had the lowest volatility. Comparing the industry portfolios to the market portfolio, five industries (cement, food, textile, paper, and construction) were dominated by the market portfolio in terms of average returns and standard deviations. That is, given a choice between investing in one of these industries and the market portfolio, a market portfolio was perceived to be a better investment for a risk-averse investor because it delivers a lower standard deviation and a higher average return. Furthermore, the stocks in the electrical industry had the highest average ratio of trading value and turnover ratio, and the stocks in the cement industry had the lowest trading ratio and turnover ratio.

[10] Returns for the finance industry begin in 1987.

3.2 Methodology

To test whether the Taiwan Security Exchange (TSEC) market exhibited short-term over- or underreactions, the following methodology was employed. First, to model an over- or underreaction appropriately, market index performances were measured relative to the mean return over the sixty days preceding day *t* to obtain the initial reactions and to track the subsequent performance (see Ajayi and Mehdian, 1994). The mean-adjusted model used in the context of stock market overreaction by Ajayi and Mehdian (1994) was employed here to estimate the expected returns (a proxy for benchmark) of a market portfolio.[11] The abnormal initial return for market index on day *t* for the mean-adjusted model is then given by[12]

$$AR_{mt} = R_{mt} - E(R_{mt}) = R_{mt} - \overline{R_m}, \qquad (1)$$

where R_{mt} is the observed market index return on day *t*; the same as Schnusenberg and Madura (2001), $\overline{R_m}$ is the mean return for market index over the sixty days preceding day *t*. Then, the daily returns in the top 10th percentile are assigned to the "winner" class, and those in the bottom 10th percentile are assigned to the "loser" class. After the initial abnormal returns were obtained and the winner and loser classes were formed, the subsequent returns associated with the winners and losers were calculated.[13] To obtain the abnormal subsequent returns on the day

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[11] The abnormal returns for market portfolio can not be calculated using market-adjusted model and market model, because in these two models, the market return itself is used to compute the expected returns. Therefore, the mean-adjusted return model is used to determine the abnormal returns for market portfolio.

[12] Brown and Warner (1980) show that the mean-adjusted model is roughly as powerful as the conventional market model in detecting abnormal price movements associated with events that are not clustered in calendar time. Masulis (1980) further notes that this method may be better than the market model for daily returns, since the explanatory power of the market model is less significant for daily data than for monthly data.

[13] When two best or worst price changes occurred during 60 days, the second one was not deleted. But, to avoid potential bias due to overlapping extreme value during 60 days, the abnormal subsequent returns following the first winners (losers) were calculated only to the day before the second best or worst price change. The remaining days were regarded as missing values and the portfolio weights were readjusted appropriately. For

following an initial reaction, the same method for calculating the abnormal initial returns was used.[14] If the abnormal subsequent returns to winners increase (decrease) following the initial reaction, the index underreacts (overreacts), and vice versa.

For each stock and industry index, all daily abnormal returns were computed using the market model as follows:

$$AR_{it} = R_{it} - (\hat{\alpha}_i + \hat{\beta}_{1i} R_{mt} + \hat{\beta}_{2i} SMB_t + \hat{\beta}_{3i} HML_t) \quad , (2)$$

where R_{it} is the excess return for stock i or industry i on day t, R_{mt} is the market return in excess of risk-free rate over day t, SMB_t is the excess return on portfolios of small minus large firms in day t, HML_t is the return on portfolios of high minus low book-to-market stocks in day t. $\hat{\alpha}_i$, $\hat{\beta}_{1i}$, $\hat{\beta}_{2i}$, and $\hat{\beta}_{3i}$ are computed using the returns over the sixty days preceding day t. Once the initial returns are obtained, winners and losers are formed following the method used previously. To avoid the bias in cumulative abnormal returns (CAR) due to cumulating the buy-and-hold abnormal return (BHAR) is used. The T-period buy-and hold abnormal return for index i is $\left[\prod_{t=1}^{T}(1+AR_{it})\right]-1$. Furthermore, since there is evidence of heteroskesdasticity for stock returns, the t-statistics are corrected using White-heteroskesdasticity method.[15]

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example, if the winners include n top returns, then the portfolio weights on and after the second best or worst returns will be $1/n-1$ rather than $1/n$.

[14] For example, on the first day following an initial reaction (t+1), $\overline{R_m}$ is the mean return for market index during t-59 and t. On the second day following an initial reaction (t+2), $\overline{R_m}$ is the mean return for market index during t-58 and t+1, and so on.

[15] Beginning with the works of Mandelbrot (1963a, 1963b, 1967), much evidence indicates that the volatility of stock returns will change over time (heteroskesdasticity). This issue was subsequently also mentioned by the following authors: Akgiray (1989), Ballie and DeGennaro (1990), Barber and Lyon (1997), Black (1976), Bodurtha and Mark (1991), Bollerslev (1986; 1987), Boness, Chen, and Jatusipitak (1974), Choi and Wohar (1992), Engle (1982), Fama (1965), Hagerman (1978), Harvey (1989), Harvey and Zhou (1993), Lamoureux and Lastrapes (1990), Lawrence, Simon, and To (1994), Lee, Jiang, and Indro (2002), Joseph (2003), Kim and Kon (1994), Nelson (1991), Pagan and Schwert (1990), Schwert and Segiun (1990), Stenius (1991). The domestic literature about heteroskesdasticity includes Lin, Liu, and Wu (1997, 1999, 2000), Lin and Yeh (1999).

IV. Testable hypothesis and empirical results

This study focused on testing the over- or underreaction hypothesis using individual stocks, the market indexes, and the industry indexes in the Taiwan stock market. In addition to testing the short-term over- or underreaction based on daily data, several related hypotheses were tested in the study. In the following, each hypothesis is briefly described and then the empirical results are presented.

The overreaction hypothesis

The overreaction hypothesis documents that stock market investors overreact to new information and that there is a subsequent reversal (Kahneman and Tversky, 1973). Several previous studies provide strong support for the overreaction hypothesis for individual stocks in the short run (Howe, 1986; Brown and Harlow, 1988; Ferri and Chung-ki, 1996; and Liang and Mullineaux, 1994). In the context of the Taiwan stock indexes, the overreaction hypothesis states that indexes with a large decline (increase) exhibit a subsequent increase (decline) on the following day.

The initial movements and subsequent reactions for the *individual stocks* are displayed in Panel A of Table 2. It was found that, for individual stocks, the returns to the winners on the first day following the formation of the portfolio were 0.606% (t=11.622). This suggests that the short-term (one-day) price continuation for the winners was substantial and statistically significant in the Taiwan stock market.

The “long-term” price continuation for the winners was also substantial. The average subsequent return of winners was consistently positive and significant for the first twenty days following the formation of the portfolio. In particular, the average return of the winner increased as the holding period following the initial return was extended, suggesting continual growth in the average returns of these winners. The average return of the winners reached 6.245% (t = 7.214) within 60 days. These results provide strong momentum evidence in the winner categories.

The pattern for the losers was completely different from the winners. In particular, although there was significant price continuation on the first 10 days following the initial reaction, no significant evidence of long-term momentum was found in the loser categories. On the contrary, when the holding periods were extended to 30 days, the evidence of price reversals for the losers was statistically significant. For example, the loser yielded a 30-day return of 1.506% (t = 2.387). These price-reversal results offer strong evidence that stock prices overreact to bad news. Overall, the evidence of price continuation for the winners and price reversals for the losers confirms the findings by Brown and Harlow (1988).

Furthermore, from Panel B of Table 2, the initial mean-adjusted return to the TSEC index winners was 3.226%. By contrast, the initial mean-adjusted return to the TSEC losers was -3.294%. The returns on the day following the initial reaction provide some evidence of stock market “short-term” underreaction following the drastic change of the TSEC index. For example, an average increase in the TSEC index of 3.226% was followed by an increase of 0.446% (t = 4.621) on the following trading day; an average decrease in the TSEC index of -3.294% was followed by an increase of -0.331% (t = -3.142) on the following trading day.

The “long-term” underreaction for the TSEC index winners was also pronounced. The average abnormal subsequent return of the TSEC winners was consistently positive and significant for the first 20 days following the initial return. In particular, the average abnormal return of the TSEC winners increased as the test period was extended, suggesting continual growth in the average buy-and-hold abnormal subsequent return of these winners. The average buy-and-hold abnormal subsequent return of the TSEC winners reached 1.953% (t = 3.550) within 20 days (not including the initial abnormal return of 3.462%). Note that there were no significant price reversals even after 60 days following the initial return. These results provide strong evidence of underreaction of the TSEC index winner categories, and the high returns represent the market's gradual correction of underreaction to good news.

The pattern for the losers of the TSEC indexes is somewhat different. In particular, the negative and statistically significant abnormal return continued on the subsequent day indicating the short-term underreaction of the TSEC index losers. However, as the subsequent period was extended to the 60th day, the evidence of overreaction for the losers is statistically significant. For example, the

initial reaction of -3.294% in the TSEC index yielded a sixty-day buy-and-hold abnormal subsequent return of 2.088% (t = 2.401). These results offer strong evidence of “long-term” overreaction of the index's loser categories.

The results of the test for the over- or underreaction of the industry index are shown in Panel C to Panel J of Table 2. It was found that, regardless of industry, the returns on the first few of days following the initial reaction was significantly positive for the winners, but significantly negative for the losers. This suggests that the short-term underreaction is pronounced and statistically significant in the Taiwan stock market. Furthermore, there is “long-term” underreaction for winners in all industries. For industries, such as plastics, electrical, and finance, “long-term” overreaction was found in the loser category, and there was no evidence of “long-term” overreaction for losers in other industries.[16] Overall, stocks in all industries tend to underreact to good news, but whether overreaction to bad news depends on the industry.[17]

Except for the difference effects across industries, there are also the buy-and-hold abnormal subsequent returns for winners and losers *within* the same industry. That is, both industry and security-specific components help to explain returns, a result consistent with Moskowitz and Grinblatt (1999) and Grundy and Martin (2001). Momentum occurring within an industry is reasonable because it takes time for news to disseminate among firms in an industry. Industry leaders might be the first to receive a piece of information, but this information may slowly diffuse to other firms within the industry. This could induce the kind of lead-lag effects among industry leaders and other firms within the industry, and this may generate momentum.

Moreover, momentum/overreaction profits vary with industry. The difference level in industry momentum/overreaction may come from the difference in industry characteristics. First, construction and finance industries have quite similar characteristics. Both of them are sensitive to the interest rate. Most of their

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[16] Above result is similar to the findings of Weng (1993), which examined eight industry indices and found that abnormal returns will differ with industry. Among these eight industries, abnormal returns existed especially in the electrical and finance industries.

[17] To test if the performance is sensitive to different risk-adjusted returns, the results were computed with two different risk-adjusted models. The first one is based on the research of Sheu, Wu, and Ku (1998). Risk-adjusted returns were calculated with three factors such as market risk, volume, and sales to price ratio. The second one adjusts risk using the market mode. It was found that the results are robust to the risk-adjusted returns.

operating performance depends on each other. The construction industries financed their operating from the finance industry and interest revenue from mortgage loans; the latter being the main profit resource for the finance industry. Among those industries, the paper industry had the smallest market value (see Table 1). Therefore stock prices in this industry could be expected to be more readily affected by speculating trading and investors' sentiment. Therefore, stocks tend overreact to both bad and good news. Besides, the cement industry had the lowest turnover ratio. Since trading delivers information, low turnover ratio means that private information diffuses gradually and information is asymmetric. Because fundamental valuation of securities (forecasting long-term cash flows) requires judgment about open-ended issues, and feedback is noisy and deferred, overconfidence will occur in stocks with greater information asymmetry.[18] Therefore, the cement industry with the lowest turnover ratio will under-react in the short run and overreact in the long run regardless of winners or losers.

The uncertain information hypothesis

As an explanation for stock price reactions to large price change events, Brown, Harlow, and Tinic (1988) propose the uncertain information hypothesis. They argue that investors tend to overreact to bad news but underreact (or at least not overreact) to good news. The uncertain information hypothesis implies that losers are followed by a significant reversal and winners are not followed by a subsequent reversal.

The underreaction for winners and overreaction for losers based on individual stocks and market index in the TSEC market seem to support the uncertain information hypothesis. In addition, evidence of the uncertain information hypothesis is also found in the plastics, electrical, and finance industries. As for the other five industries (cement, food, textile, paper, and construction), the significant price continuation amongst the winners and insignificant price reversal amongst the losers do not strongly support the uncertain information hypothesis.

[18] Daniel, Hirshleifer, and Subrahmanyam (1998) argue that investors' overconfidence will cause short-term underreaction and long-term overreaction.

The size effect hypothesis

Studies by Brown, Harlow, Tinic (1988), and others hypothesize that the overreaction anomaly is at least partly a small firm effect. Firm size may proxy for the amount of information available to market participants. Consequently, if winner and loser reversals are more pronounced for smaller firms, it may be argued that the overreaction hypothesis holds primarily for firms that are not widely followed and for which little information is available. Conversely, if significant reversals are observed even after controlling for firm size, one can conclude that the overreaction hypothesis holds equally well for widely followed and less widely followed firms.

To examine if the size is because of overreaction returns, five size-sorted portfolios were formed according to their market capitalization in the previous year.[19] The previous procedure for testing market overreaction was done again on these portfolios. If the losers in the small-sized portfolio would have more significant price reversal than the losers in the large-sized portfolio, the size effect documented by Chan (1988) and Ball, Kothari, and Shanken (1995) can partially explain the overreaction effect.

The results in Table 3 indicate that the losers in all portfolios exhibited pronounced price reversal in the long run. Likewise, the winner portfolios exhibited underreaction behavior, regardless of the size. In comparison, the losers in the medium-sized portfolio rather than in the small-sized portfolio exhibited more significant price reversal. In contrast, the price continuation was more pronounced for winners in the small-sized portfolio. These results suggest that the overreaction effect is a much more powerful source of abnormal returns than the smaller-size effect for the losers. This is consistent with the findings of Chopra, Lakonishok, and Ritter (1992). Hong, Lim, and Stein (2000) documented that information about small firms diffuses more slowly, and stocks with slower information diffusion should exhibit more pronounced underreaction. The more pronounced price continuation for winners in the small-sized portfolio is consistent with the gradual-information-flow hypothesis proposed by Hong and Stein (1999). In addition, the underreaction effect seems partially to be the smaller-size effect

[19] To test for size, price, and book-to-market value hypothesis, five portfolios are formed but only three groups (high, low, and medium) are reported.

documented by Ball, Kothari, and Shanken (1995).

The price effect hypothesis

Conrad and Kaul (1993) and Ball, Kothari, and Shanken (1995) argued that prices can proxy for percentage bid-ask spreads, and losers are generally with lower prices and larger percentage bid-ask spreads. That is, the overreaction phenomenon can be attributed to price effect, rather than prior returns. Consequently, if winner and loser reversals are more pronounced for lower-priced firms, it may be argued that the overreaction hypothesis holds primarily for price effect.

To see if overreaction is another manifestation of the price effect (Losers have lower prices compared with winners), five portfolios were formed based on prices and were then used to examine the price effect. The results are shown in Table 4. The price effect implies that the contrarian profits come from low-priced stocks. However, the results in Table 4 show that the winners underreacted to information releases, regardless of price, and the losers in all these three portfolios show the evidence of overreaction. More specifically, the magnitude of price reversal was larger for the medium-priced firms, and the high-priced firms exhibited more significant price continuation. Therefore, in the Taiwan stock market, the returns from buying past losers or selling past winners seem not to be from the lower-price effect.

The book-to-market (B/M) value effect hypothesis

To see if the overreaction effect is another manifestation of the B/M value effect, five portfolios were formed based on the ratio of book equity to market value in the previous year. The results for high, medium, and low groups are shown in Table 5. The results in Table 5 show that the winners underreacted to information releases, regardless of B/M ratio. The losers in all these three portfolios also overreacted. In particular, the medium firms had the largest magnitude of price reversal, and the high-B/M value firms had more significant price continuation. Therefore, in the Taiwan stock markets, the returns from buying past losers seem to

be from the medium-B/M value effect, rather than from the high-B/M value effect. In fact, the returns from buying past winners seem to be from the high-B/M value effect.

The risk and seasonality effect hypothesis

Based on the evidence that the price continuations and reversals contain a strong January and risk component (e.g., Zarowin, 1990; Ball, Kothari, and Shanken, 1995, Weng, 1993; Chuang, 1999), it was worth considering whether these factors also contribute to price continuations and reversals in the Taiwan stock market. In addition, since the Chinese new year often occurs in February, the February component is included in the regression (Tong, 1992; Weng, 1993; Chuang, 1999; Lin, 2000; Hsieh, 2000).

To examine if overreaction in the Taiwan stock market can be subsumed under the January effect, the February effect, or the difference in risk, the following cross-sectional regression model was used:

$$BHAR_{iT} = b_0 + b_1 RISK_{iT} + b_2 JAN_{iT} + b_3 FEB_{iT} + \varepsilon_{iT} \qquad (3)$$

Where $BHAR_{iT}$ is the buy-and-hold abnormal returns for index *i* on date *T (T=60)*. *RISK* is the risk of loser *i* or winner *i* at day *T* measured in terms of the standard deviations of their index return. *JAN (FEB)* is dummy variable equal to unity if the subsequent reaction on day *t* occurred in January (February), and zero otherwise. Following Ajayi and Mehadian (1994), the standard deviations of market return and industry index return in losers and winners portfolios beginning 30 trading days prior to the over- or underreaction and ending 30 trading days thereafter were computed.

The results in Panel A of Table 6 show that the subsequent performance of the winners and losers in TSEC index can be attributed to the February effect, but not to the January effect. The evidence for the February effect is consistent with Hsieh (2000), Lin (2000), and the evidence against the January effect also confirms Hsu (1993), Chou (1996), Hsieh (1997), and Cheng (1998).[20] On the other hand, risk

[20] Since the value-weighted market index was computed by including all stocks in the markets, there will be a complex effect from all industry indexes. The difference in the

difference can explain the underreaction of the winners and the overreaction of losers in the TSEC market. The estimated intercept coefficients from these regressions (b_0) were intercepted as the risk-adjusted return of the portfolio not associated with exposure to these three factors. The significantly negative coefficients on the intercepts indicate that earlier results could not be completely explained by these three factors.

The estimated loading on the *FEB* factor in each industry reveals that the Chinese Lunar New year exhibits significant explanatory power (The only exception is the winners in the cement category). Additionally, except for losers in the finance industries, the January phenomenon seems to have explanatory power about the overreaction of losers. Likewise, the January phenomenon also can explain the underreaction of winners. Whether the difference in risk is a manifestation of over- or underreaction or not depends essentially on the industry. In particular, risk difference can partially explain the subsequent performance of both the winners and the losers in the cement, textile, electrical, and paper industries. However, the difference in risk has no explanatory power for the subsequent performance of losers in the food and construction industries. Neither can it explain the subsequent performance of winners in the plastics and finance industries.

Overall, the study found that the difference in risk and seasonality phenomena (January effect and February effect) can partially explain the under- and overreaction, and that the under- and overreaction effect cannot be subsumed under the difference in risk and seasonality effect.[21]

Behavioral explanations

As discussed earlier, based on investor psychology, the price continuation may come from investors underreacting to information as well as from investors overreacting to past information with a delay. If the price continuation is caused by underreaction, then there are long-lasting positive abnormal returns following the

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coefficients may also come from the weight of one firm in the value-weighted market index being different from that in its corresponding industry.

[21] One exception is the winners in the food industries, in which the intercept is not significantly different from zero.

formation date. However, if the abnormal returns are caused by delayed overreaction, the price continuation in the post-holding period will be followed by negative returns since the delayed overreaction must be subsequently reversed.

From Table 2, regarding the TSEC index as well as all industries, the average subsequent return of winners is consistently positive and significant even after 15 days following the formation date. In particular, the average return of the winners increased as the test period was extended, suggesting continual growth in the subsequent return of these winners. These results provide strong evidence of underreaction in the winner categories, and the high returns represent the market's gradual correction of underreaction to favorable information.

Moreover, the losers in the market index and three industry portfolios (plastics, electrical, and finance) reveal a dramatic reversal of returns even after 20-60 days following the formation date. With regards to losers in other industries, they also show some evidence of price reversal, though not significantly. This indicates that the Taiwan stock market tends to overreact to bad news. Overall, stocks tend to underreact to good news, but overreact to bad news.

V. Conclusion

This study examined the behavior of the Taiwan stock market after a large change in a single trading day. The study found that the reaction of market participants in the Taiwan stock market to extreme price movements depends essentially/heavily on the direction of the initial change. Specifically, the market reaction to events generated by favorable and unfavorable information is asymmetrical. The prolonged price reversals to negative events are overwhelmingly significant, while the price continuing to rise after positive events, is a result that confirms Brown and Harlow (1988).

This study further analyzed whether the result can be attributed to risk difference, to market seasonally, to price effect, or to the well-known size effect. It was found that the differences in risk and February phenomena have explanatory power on the under- and overreaction. However, though the February effect and the

difference in risk can partially explain both losers' and winners' profits, the over- or underreaction effect cannot be subsumed under the difference in risk and February effect. Apart from this, lower-price effect, smaller-size effect, and higher B/M value effect have no explanatory power on overreaction in the losers. Whereas the smaller-size effect and the higher-B/M value effect have some explanatory power over the underreaction in the winners. The more prolonged accumulation of returns and lack of any observable return reversal support for delayed reaction to good news is an explanation of the abnormal returns among the winners. The evidence of price reversal for the losers implies that the market overreacts to bad news. The finding that investors tend to overreact to bad news but underreact to good news is consistent with the uncertain information hypothesis proposed by Brown, Harlow, and Tinic (1988).

References

Ajayi, R. A. and S. Medhdian, 1994, “Rational Investors Reaction to Uncertainty: Evidence from the World's Major Markets”, **Journal of Business Finance and Accounting** Vol. 21, 533-545.

Akgiray, V., 1989, “Conditional Heteroscedasticity in Time Series of Stock Returns: Evidence and Forecasts”, **Journal of Business** Vol. 62, 55-80.

Atkins, A.B. and E.A. Dyl, 1990, “Price Reversals, Bid-Ask Spreads, and Market Efficiency”, **Journal of Financial and Quantitative Analysis** Vol. 25, 535-47.

Ball, Ray and S. P. Kothari, 1989, “Nonstationary Expected Returns: Implications for Tests of Market Efficiency and Serial Correlation in Returns”, **Journal of Financial Economics** Vol. 25, 51-74.

Ball, R., S. P. Kothari, and Jay Shanken, 1995, “Problems in Measuring Portfolio Performance: An Application to Contrarian Investment Strategies”, **Journal of Financial Economics** Vol. 38, 79-107.

Ballie R. and R. DeGennar, 1990, “Stock Returns and Volatility”, **Journal of Financial and Quantitative Analysis** Vol. 25, 203-214.

Barberis, Nicholas, Andrei Shleifer, and Robert Vishny, 1998, “A Model of Investor Sentiment”, **Journal of Financial Economics** Vol. 49, 307-343.

Barber, B. M. and J. D. Lyon, 1997, “Detecting Long-Run Abnormal Stock Returns: The Empirical Power and Specification of Test Statistics”, **Journal of Financial Economics** Vol. 43, 341-372.

Black, F., 1976, Studies of Stock Market Volatility Changes, **Proceedings of the American Statistical Association Business and Economic Statistics Section**, 177-181.

Blume, Marshall and Robert F. Stambaugh, 1983, “Biases in Compute Returns: An Application to the Size Effect”, **Journal of Financial Economics** Vol. 12, 387-404.

Bodurtha, J.N. and N.C. Mark, 1991, “Testing the CAPM with Time-Varying Risks and Returns”, **Journal of Finance** Vol. 46, 1485-1505.

Bollerslev, T., 1986, "Generalized Autoregressive Conditional Heteroskedasticity", **Journal of Econometrics** Vol. 31, 307-327.

Bollerslev, T., 1987, "A Conditionally Heteroskedastic Time Series Model for Speculative Prices and Rates of Return", **Review of Economics and Statistics** Vol. 69, 542-547.

Boness, A. J., Chen, A., and Jatusipitak, S., 1974, "Investigations of Nonstationarity in Stock Prices", **Journal of Business** Vol. 47, 518-537.

Bremer, M. and R. J. Sweeney, 1991, "The Reversal of Large Stock-Price Decreases", **Journal of Finance** Vol. 46, 747-54.

Brown, K.C. and W.V. Harlow, 1988, "Market Overreaction: Magnitude and Intensity", **Journal of Portfolio Management** Vol. 14, 6-13.

Brown, K.C, W.V. Harlow, and M.S. Tinic, 1988, "Risk Aversion, Uncertain Information, and Market Efficiency", **Journal of Financial Economics** Vol. 22, 355-85.

Brown, Stephen J. and Jerald B. Warner, 1980, "Measuring Security Price Performance", **Journal of Financial Economics** Vol. 8, 205-258.

Chan, K.C., 1988, "On the Contrarian Investment Strategy", **Journal of Business** Vol. 61, 147-163.

Chen, Liang, 2001, **An Investigation of Momentum Strategy in Taiwan Stock Market**, Master Thesis, Dong Hwa University.

Chen, Kuang Hua, 1999, **Further Research the Momentum Life Cycle in Taiwan Stock Market**, Master Thesis, Ming Chuan University.

Chen, Wei-Tung, 2001, **The Empirical Study of the Industries and the Risk Changing in Momentum Strategies**, Master Thesis, Fu Jen Catholic University.

Cheng, Shu Mei, 1998, **Long-Term Market Overreaction: Evidence from the Taiwan Stock Exchange**, Master Thesis, Fu Jen Catholic University.

Cheng, Ya-Ju, 2000, **Momentum Strategy and Stock Characteristics: An Empirical Study on Taiwan Stock Market**, Master Thesis, ChengChi University.

Chen, Yi, 2001, **Momentum Strategy and Contrarian Strategy in Stock Markets of Hong Kuang, Japan, and Taiwan**, Master Thesis, Chung Cheng University.

Chin, Min Chieh, 1996, **The Effect of Size,Book-to-Market Equity, Prior Returns, and Beta on Stock Returns: The Taiwan Case**, Master Thesis, Tamkang University.

Choi, Seungmook and Mark E. Wohar, 1992, "Implied Volatility in Options Markets and Conditional Heteroscedasticity in Stock Markets", **The Financial Review** Vol. 27, 503-531.

Cho, Shin Chun, 1996, **The Practical Study of Stock of Taiwan**, Master Thesis, Chang Gung University.

Chopra, Navin, Josef Lakonishok, and Jay R. Ritter, 1992, "Measuring Abnormal Performance: Do Stocks Overreact?", **Journal of Financial Economics** Vol. 31, 235-268.

Conrad, J. and G. Kaul, 1993, "Long-Term Market Overreaction or Biases in Computed Returns", **Journal of Finance** Vol. 48, 39-63.

Cox, D.R. and D.R. Peterson, 1994, "Stock Returns Following Large One-Day Declines: Evidence on Short-Term Reversals and Longer-Term Performance", **Journal of Finance** Vol. 49, 255-67.

Chuang, John, 1999, **An Investigation of January Effect in Taiwan Stock Market**, Master Thesis, Chung Yuan University.

Daniel, K., D. Hirshleifer, and A. Subrahmanyam, 1998, "Investor Psychology and Security Market Under-and Overreactions", **Journal of Finance** Vol. 53, 1839-85.

DeBondt, Werner F. M., and Richard H. Thaler, 1985, "Does the Stock Market Overreact?", **Journal of Finance** Vol. 40, 793-808.

DeBondt, Werner F. M., and Richard H. Thaler, 1987, "Further Evidence on Investor Overreaction and Stock Market Seasonally", **Journal of Finance** Vol. 42, 557-581.

Engle, R. F., 1982, "Autoregressive Conditional Heteroscedasticity with Estimates of the Variance of United Kingdom Inflation", **Econometrica** Vol. 50, 987-1007.

Fama, E. F., 1965,"The Behavior of Stock Market Prices", **Journal of Business** Vol. 38, 34-105.

Fama, E. F. and K. French, 1988, "Dividend Yields and Expected Stock Returns", **Journal of Financial Economics** Vol. 22, 3-25.

Fama, E. F., 1998, "Market Efficiency, Long-Term Returns, and Behavioral Finance", **Journal of Financial Economics** Vol. 49, 283-306.

Fama, E. F. and K. R. French, 1993, "Common Risk Factors in the Returns on Stocks and Bonds", **Journal of Financial Economic**s Vol. 53, 427-465.

Fama, E. F. and K. R. French, 1996, "Multifactor Explanations of Asset Pricing Anomalies", **Journal of Finance** Vol. 51, 55-84.

Fama, E. F. and K. R. French, 1998, "Value Versus Growth: The International Evidence", **Journal of Finance** Vol. 53, 1975-1999.

Fant, L. F. and D. R. Peterson, 1995, "The Effect of Size, Book-to-Market Equity, Prior Returns, and Beta on Stock Returns: January Versus the Remainder of the Year", **Journal of Financial Research** Vol. 28, 129-142.

Ferri, M. G. and M. Chung-ki, 1996, "Evidence that the Stock Market Overreacts and Adjusts", **Journal of Portfolio Managemen**t Vol. 22, 71-76.

Grundy, B. and J. S. Martin, 2001, "Understanding the Nature of the Risks and the Source of the Rewards to Momentum Investing", **Review of Financial Studies** Vol. 14, 29-78.

Hagerman, R., 1978, "More Evidence on the Distribution of Security Returns", **Journal of Finance** Vol. 33, 1213-1220.

Harvey, C.R., 1989, "Time-Varying Conditional Covariances in Tests of Asset Pricing Models", **Journal of Financial Economics** Vol. 24, 289-317.

Harvey, C.R. and G. Zhou, 1993, "International Asset Pricing with Alternative Distributional Specifications", **Journal of Empirical Finance** Vol. 1, 107-131.

Hong, Harrison, and Jeremy C. Stein, 1999, "A Unified Theory of Underreaction, Momentum Trading and Overreaction in Asset Markets", **Journal of Finance** Vol. 54, 2143-2184.

Hong, Harrison, Terence Lim, and Jeremy C. Stein, 2000, "Bad News Travels Slowly: Size, Analyst Coverage, and the Profitability of Momentum Strategie", **Journal of Finance** Vol. 56, 265-295.

Howe, J. S., 1986, "Evidence on Stock Market Overreaction", **Financial Analysts Journal** Vol. 42, 74-77.

Hsieh, Cheng Neng, 1991, **A Study of Overreaction in Taiwan Stock Market**, Master Thesis, Sun Yat-Sen University.

Hsieh, Chao Hsien, 1994, **An Empirical Study on Relative Strength Strategy**, Master Thesis, National Taiwan University.

Hsieh, Tzung-I, 1997, **Stock Market Seasonality in Taiwan: Empirical Analysis of Conglomerate Factor, Scale Factor and Industry Factor**, Master Thesis, Chung-Kung University.

Hsieh, Wen Sheng, 2000, **The Empirical Study of Chinese Lunar New Year Effect in Taiwan Stock Market: An Application of Factor Model**, Master Thesis, Dong Hwa University.

Hsu, Sheng Chi, 1997, **An Empirical Comparison of Momentum Strategy and Contrarian Strategy in Taiwan stock Market**, Master Thesis, Fu Jen Catholic University.

Hsu, Hong-Pin, 1993, **An Empirical Study of Size Effect and January Effect in Taiwan Stock Market**, Master Thesis, Chung Kung University.

Huang, Wei Hsin, 2001, **The Cross Section of Expected Returns, Firm Attribute Variables and Momentum Effect in Taiwan**, Master Thesis, TungHai University.

Jegadeesh, N., 1990, "Evidence of Predictable Behavior of Security Returns", **Journal of Finance** Vol. 45, 881-898.

Jegadeesh, Narasimhan and Sheridan Titman, 1993, "Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency", **Journal of Finance** Vol. 48, 65-91.

Jegadeesh, Narasimhan and Sheridan Titman, 1995, "Short Horizon Return Reversals and the Bid-Ask Spread", **Journal of Financial Intermediation** Vol. 4, 116-132.

Jegadeesh, Narasimhan and Sheridan Titman, 2001, "Profitability of Momentum Strategies: An Evaluation of Alternative Explanations", **Journal of Finance** Vol. 56, 699-720.

Joseph, N. L., 2003, "Using Monthly Returns to Model Conditional Heteroscedasticity", **Applied Economics** Vol. 35, 791-801.

Kahneman, D. and A. Tversky, 1973, "On the Psychology of Prediction", **Psychological Review** Vol. 80, 237-51.

Kaul, G. and M. Nimalendran, 1990, "Price Reversals: Bid-Ask Errors or Market Overreaction?", **Journal of Financial Economics** Vol. 28, 67-93.

Kim, D. and S. J. Kon, 1994, "Alternative Models for the Cnditional Heteroscedasticity of Stock Returns", **Journal of Business** Vol. 67, 563-598.

Kim, Myung-Jig, Charles R. Nelson, and Richard Startz, 1988, "Mean Reversion in Stock Prices? A Reappraisal of the Empirical Evidence", **Review of Economic Studies** Vol. 58, 551-528.

Kodres, L., 1988, "Tests of Unbiasedness in Foreign Exchange Futures Markets: The Effects of Price Limits", **Review of Futures Market**s Vol. 3, 22-36.

Lawrence K. and L. M. C. Simon, To, 1994, "Some Tests of APT Mispricing Using Mimicking Portfolios", **The Financial Review** Vol. 29, 153-193.

Lamoureux, C. G. and W. D. Lastrapes, 1990, "Heteroskedasticity in Stock Return Data: Volume Versus GARCH Effects", **Journal of Finance** Vol. 45, 221-229.

Lee W. Y., C. X. Jiang, and D. C. Indro, 2002, "Stock Market Volatility, Excess Returns, and the Role of Investor Sentiment", **Journal of Banking and Finance** Vol. 26, 2277-2299.

Lehman, Bruce, 1990, "Fads Martingales, and Market Efficiency", **Quarterly Journal of Economics** Vol. 105, 1-28.

Lewellen, J., 2002, "Momentum and Autocorrelation in Stock Returns", **Review of Financial Studies** Vol. 15, 533-563.

Liang, Y. and D. J. Mullineaux, 1994, "Overreaction and Reverse Anticipation: Two Related Puzzles? " , **Journal of Financial Researc**h Vol. 17, 31-43.

Lin, Chu Hsiung, Wei Chi Liu, and Chin Shan Wu, 1999, "A Study on the Asymmetric GARCH Model", **Journal of Management** Vol. 16, 479-515.

Lin, Chiu Hsiung, Wei Chi Liu, and Chin Shan Wu, 2000, "The Analysis of Stock Return and Volatility in Taiwan OTC Stock Market", **Asia-Pacific Management Review** Vol. 5, 435-449.

Lin, Chiu Hsiung, Wei Chi Liu, and Chin Shan Wu, 1997, "The Relationship between the Expected Return and the Conditional Volatility in Taiwan Stock Market", **Chiao Da Management Review** Vol. 17, 103-124.

Lin, Kuo-Hsuan, 2000, **The Empirical Study of January Effect and Chinese Lunar New Year Effect in Taiwan Stock Market**, Master Thesis, Yunlin University of Science and Technology.

Lin, Ping Hui and Shih Kuo Yeh, 1999, "On the Discontinuous Jump Path and Conditional Heteroskedasticity in Taiwan Stock Prices", **Review of Securities and Futures Markets** Vol. 11, 61-92.

Lin, Zhi-Hon, 1992, **An Empirical Study of Overreaction in Taiwan Stock Market**, Master Thesis, Soochow University.

Liu, Chih Liang, 2002, **A Study on Source of the Rewards to Stock Momentum Investing**, Master Thesis, University of Chung-Hsing.

Liu, Yi-Chen, Wei Chi Liu, and Cheng Neng Hsieh, 1993, **An Empirical Study of Overreaction in Taiwan Stock Market**, Taiwan University Management Review Vol. 4(1), 105-146.

Loughran, T. and J. Ritter, 1995,"The New Issues Puzzle", **Journal of Finance** Vol. 50, 23-51.

Mandelbrot, B., 1963a, "New Method in Statistical Economics", **Journal of Political Economy** Vol. 71, 421-440.

Mandelbrot, B., 1963b, "The Variation of Certain Speculative Prices", **Journal of Business** Vol. 36, 394-419.

Mandelbrot, B., 1967,"The Variation of Some Other Speculative Prices", **Journal of Business** Vol. 40, 393-413.

Masulis, R., 1980, "The Effects of Capital Structure Changes on Security Prices: A Study of Exchange Offers", **Journal of Financial Economics** Vol. 8, 139-177.

Moskowitz, T. and M. Grinblatt, 1999, "Do Industries Explain Momentum", **Journal of Finance** Vol. 54, 1249-1290.

Nelson, D. B., 1991, "Conditional Heteroskedasticity in Asset Returns: A New Approach", **Econometrica** Vol. 59, 347-370.

Pagan, A. R. and G. W. Schwert, 1990, "Alternative Models for Conditional Stock Volatility", **Journal of Econometrics** Vol. 45, 267-290.

Poterba, J.M. and L.H. Summers, 1988, "Mean-Reversion in Stock Prices Evidence and Implications", **Journal of Financial Economics** Vol. 22, 27-59.

Richards, Anthony J., 1997, "Winner-Loser Reversals in National Stock Market Indices: Can They be Explained?", **Journal of Finance** Vol. 52, 2129-2144.

Rouwenhorst, K. G., 1998, "International Momentum Strategies", **Journal of Financ**e 53, 267-284.

Schnusenberg, O. and J. Madura, 2001, "Do U.S. Stock Market Indexes Over- or Underreact?", **Journal of Financial Research** Vol**.** 16, 179-204.

Schwert, G. W. and P. J. Seguin, 1990, "Heteroskedasticity in Stock Returns", **Journal of Finance** Vol. 45, 1129-1155.

Sheu, Her-Jiun, Soushan Wu, and Kuang-Ping Ku, 1998, "The Cross-Sectional Relationships between Stock Returns and Market Beta, Trading Volume, Sales-to-Price in Taiwan", **International Review of Financial Analysis** Vol. 7(1), 1-18.

Stenius, Marianne, 1991, "Volatility and Time-Barying Risk Premiums in the Stock Market", **Applied Economics** Vol. 23, 41-48.

Tong, W. H. S., 1992, "An Analysis of the January Effect of United States, Taiwan and South Korean Stock Returns", **Asia Pacific Journal of Management** Vol. 9, 189-207.

Tu, Hsin-Hwa, 1998, **The Common Factors and Firm Characteristics of Affecting Stock Returns - Fama -French Three Factor Model, Momentum Strategy and Trading Factors**, Master Thesis, Sun Yat-Sen University.

Weng, Hung Lin, 1993, **Empirical Analysis of Anomaly in Taiwan: Stock Market Seasonality**, Master Thesis, Chung Hsing University.

Yu, I-Chi, 1999, **An Empirical Study about the Relationship of Industry and Price Momentum Strategy in Taiwan Stock Market**, Master Thesis, Cheng Chi University.

Zarowin, P., 1990, "Size, Seasonality, and Stock Market Overreaction", **Journal of Financial and Quantitative Analysis** Vol. 25, 113-125.

Table 1: Descriptive Statistics for Taiwan Stock Markets Index and Various Industry Portfolios

This Table presents the summary statistics for Taiwan stock market index and eight industries indexes during 1981 and 2001. Trading ratio means the trading value of one industry over total trading value. Value ratio is the market value of one industry divided by total market value. B/M is the ratio of book value over market vale. All numbers are multiplied by 100.

	Market index	Cement	Food	Plastics	Textile	Electric	Paper	Construction	Finance
Mean	0.05434	0.03479	0.03281	0.05460	0.03879	0.07037	0.03535	0.02495	0.06989
Std.	0.01737	0.01783	0.01801	0.01887	0.01906	0.01982	0.02027	0.01994	0.02264
Trading ratio		2.001	4.688	8.199	13.964	55.101	2.642	5.732	16.773
Value ratio		9.063	3.204	7.587	9.091	41.696	2.565	3.161	29.853
B/M		26.092	54.005	27.102	126.862	33.030	75.232	25.483	63.760
Turnover ratio		115.961	283.993	246.503	283.162	336.683	251.481	296.655	135.011

Table 2: Initial and Subsequent Reactions in the Taiwan Stock Market with Fama and French Three Factor Model

This table reports the initial and subsequent buy-and-hold abnormal returns using eight industry indexes during January 1, 1981 to December 31, 2001. Numbers in parenthesis are t statistics. All return estimates are multiplied by 100.

Initial reaction		1	2	3	4	5	10	15	20	30	40	50	60
Panel A: Individual stocks													
Winners	5.032	0.606	0.876	1.232	1.234	1.467	2.008	2.788	3.030	4.165	4.976	5.567	6.245
		(11.622)*	(11.044)*	(11.076)*	(9.962)*	(9.003)*	(7.096)*	(7.667)*	(7.005)*	(6.798)*	(6.483)*	(6.856)*	(7.214)*
Losers	-5.094	-0.267	-0.304	-0.365	-0.313	-0.276	-0.030	0.215	0.603	1.506	2.358	3.006	3.649
		(-8.073)*	(-5.646)*	(-3.407)*	(-2.504)*	(-1.981)*	(-0.154)	(0.632)	(1.466)	(2.378)*	(3.632)*	(3.964)*	(4.065`)*
Panel B: TSEC index													
Winners	3.226	0.446	0.701	0.980	1.045	1.044	1.228	1.906	1.953	1.309	0.627	-0.061	-0.978
		(4.621)*	(4.906)*	(5.414)*	(4.818)*	(4.296)*	(3.424)*	(4.098)*	(3.550)*	(1.843)	(0.822)	(-0.072)	(-1.140)
Losers	-3.294	-0.331	-0.349	-0.755	-0.775	-0.703	-0.534	-0.755	-0.692	-0.175	0.065	0.876	2.088
		(-3.142)*	(-2.197)*	(-3.697)*	(-3.194)*	(-2.529)*	(-1.357)	(-1.521)	(-1.172)	(-0.250)	(0.083)	(1.018)	(2.401)*

Initial reaction		1	2	3	4	5	10	15	20	30	40	50	60
Panel C: Cement													
Winners	3.387	0.344	0.429	0.604	0.555	0.612	0.742	1.289	1.322	1.193	1.657	1.617	2.051
		(3.357)*	(2.823)*	(3.242)*	(2.422)*	(2.348)*	(2.057)*	(2.826)*	(2.411)*	(1.819)*	(2.303)*	(2.119)*	(2.382)*
Losers	-3.259	-2.290	-0.224	-0.419	-0.480	-0.322	-0.093	0.123	0.362	1.164	0.963	1.227	1.540
		(-2.553)*	(-1.383)	(-2.069)*	(-2.044)*	(-1.213)	(-0.251)	(0.267)	(0.693)	(1.891)	(1.363)	(1.527)	(1.776)
Panel D: Food													
Winners	3.346	0.423	0.601	0.808	0.863	0.906	1.356	1.878	2.151	2.054	2.573	2.995	3.541
		(4.174)*	(3.861)*	(4.276)*	(3.789)*	(3.468)*	(3.586)*	(3.920)*	(3.656)*	(2.807)*	(3.059)*	(3.288)*	(3.459)*
Losers	-3.366	-0.502	-0.564	-0.876	-0.901	-0.816	-1.007	-1.259	-1.244	-0.199	-0.279	0.027	0.488
		(-4.495)*	(-3.374)*	(-4.118)*	(-3.537)*	(-2.799)*	(-2.516)*	(-2.484)*	(-2.144)*	(-0.280)	(-0.360)	(0.030)	(0.485)
Panel E: Plastics													
Winners	3.530	0.315	0.474	0.725	0.780	0.771	1.031	1.658	1.664	1.662	2.100	2.596	2.968
		(3.108)*	(3.173)*	(3.997)*	(3.585)*	(3.123)*	(2.913)*	(2.585)*	(2.984)*	(2.408)*	(2.713)*	(3.161)*	(3.264)*
Losers	-3.449	-0.258	-0.227	-0.671	-0.705	-0.514	-0.492	-0.094	0.195	1.364	1.592	1.714	2.008
		(-2.268)*	(-1.398)*	(-3.250)*	(-2.890)*	(-1.867)	(-1.273)	(-0.188)	(0.347)	(2.118)*	(2.302)*	(2.066)*	(2.173)*
Panel F: Textile													
Winners	3.517	0.327	0.425	0.650	0.769	0.839	1.328	1.963	2.286	2.087	2.684	3.117	3.436
		(3.369)*	(2.986)*	(3.815)*	(3.744)*	(3.584)*	(3.931)*	(4.514)*	(4.267)*	(3.040)*	(3.414)*	(3.710)*	(3.643)*
Losers	-3.533	-0.278	-0.235	-0.579	-0.702	-0.625	-0.698	-0.920	-0.893	-0.188	-0.341	-0.076	0.693
		(-2.504)*	(-1.446)	(-2.802)*	(-2.854)*	(-2.243)*	(-1.843)	(-1.917)	(-1.648)	(-0.289)	(-0.463)	(-0.086)	(0.702)
Panel G: Electric													
Winners	3.686	0.453	0.779	1.071	1.149	1.233	1.423	2.400	2.736	2.952	3.507	4.278	5.204
		(4.479)*	(5.031)*	(5.5871)*	(5.001)*	(4.723)*	(3.817)*	(5.017)*	(4.722)*	(4.044)*	(4.208)*	(4.833)*	(5.262)*
Losers	-3.668	-0.271	-0.204	-0.472	-0.412	-0.277	0.024	0.138	0.447	1.375	1.943	2.653	3.878
		(-2.311)*	(-1.197)	(-2.178)*	(-1.592)	(-0.925)	(0.058)	(0.260)	(0.743)	(1.955)*	(2.478)*	(2.922)*	(3.354)*
Panel H: Paper													
Winners	3.814	0.294	0.439	0.634	0.722	0.706	0.723	1.178	1.041	1.212	1.237	0.639	0.512
		(2.615)*	(2.640)*	(3.096)*	(3.003)*	(3.571)*	(1.918)*	(2.509)*	(1.791)	(1.677)	(1.471)	(0.707)	(0.500)
Losers	-3.709	-0.480	-0.396	-0.670	-0.789	-0.714	-0.757	-1.120	-1.055	-0.494	-0.733	-0.614	0.178
		(-3.943)*	(-2.206)*	(-3.072)*	(-2.974)*	(-2.361)*	(-1.872)	(-2.219)*	(-1.831)	(-0.725)	(-0.951)	(-0.653)	(0.173)
Panel I: Construction													
Winners	3.741	0.531	0.767	1.128	1.254	1.468	1.983	2.955	2.978	3.238	3.402	3.100	2.840
		(4.853)*	(4.680)*	(5.619)*	(5.243)*	(5.373)*	(4.914)*	(5.731)*	(4.731)*	(3.956)*	(3.642)*	(3.057)*	(2.560)*
Losers	-3.633	-0.605	-0.634	-0.899	-0.914	-0.909	-0.932	-1.224	-0.909	-0.281	-0.720	-0.790	-0.422
		(-5.080)*	(-3.551)*	(-3.999)*	(-3.447)*	(-3.051)*	(-2.216)*	(-2.248)*	(-1.440)	(-0.373)	(-0.815)	(-0.752)	(-0.358)
Panel J: Finance													
Winners	4.388	0.623	0.918	1.455	1.776	1.861	2.905	4.210	5.001	5.123	4.648	4.957	3.914
		(4.325)*	(4.100)*	(5.362)*	(5.398)*	(5.011)*	(5.245)*	(5.722)*	(5.725)*	(4.459)*	(3.633)*	(3.545)*	(2.701)*
Losers	-4.043	-0.303	-0.134	-0.365	-0.369	-0.285	0.234	0.066	0.233	0.912	1.844	2.801	4.152
		(-2.026)*	(-0.606)	(-1.358)	(-1.148)	(-0.750)	(0.426)	(0.097)	(0.280)	(0.877)	(1.543)	(2.029)*	(2.797)*

*: Significant at 5% significance level.

Table 3: Initial and Subsequent Reactions in the Size-Sorted Portfolios

This table reports the initial and subsequent buy-and-hold abnormal returns applied to three size portfolios constructed on stocks listed on the Taiwan Security Exchange (TSEC) during January, 1981 to December, 2001. Numbers in parenthesis are t statistics. All return estimates are multiplied by 100.

Initial reaction		1	2	3	4	5	10	15	20	30	40	50	60
Panel A: Small-sized portfolio													
Winners	3.289	0.697	0.995	1.359	1.503	1.614	1.951	2.688	2.823	2.324	2.017	0.652	-0.227
		(6.767)*	(6.167)*	(6.577)*	(5.940)*	(5.586)*	(4.262)*	(4.651)*	(4.094)*	(2.674)*	(2.112)*	(0.668)	(-0.245)
Losers	-3.418	-0.642	-0.745	-1.116	-1.251	-1.217	-1.153	-1.419	-1.062	0.229	1.123	2.605	3.930
		(-5.537)*	(-4.135)*	(-4.768)*	(-4.400)*	(-3.668)*	(-2.557)*	(-2.456)*	(-1.512)	(0.271)	(1.178)	(2.532)*	(3.815)*
Panel B: Medium-sized portfolio													
Winners	3.382	0.478	0.730	1.032	1.163	1.237	1.507	2.098	2.262	1.855	1.793	1.127	0.853
		(4.580)*	(4.564)*	(5.242)*	(4.822)*	(4.474)*	(3.675)*	(4.075)*	(3.720)*	(2.504)*	(2.118)*	(1.280)	(0.981)
Losers	-3.484	-0.585	-0.672	-1.052	-1.204	-1.070	-0.933	-1.077	-0.600	1.042	1.891	3.161	4.596
		(-5.014)*	(-3.638)*	(-4.442)*	(-4.228)*	(-3.248)*	(-2.109)*	(-1.925)	(-0.906)	(1.349)	(2.223)*	(3.329)*	(4.704)*
Panel C: Large-sized portfolio													
Winners	3.288	0.532	0.754	1.023	1.189	1.218	1.326	2.089	2.314	1.677	1.374	1.029	0.634
		(5.126)*	(4.883)*	(5.284)*	(5.070)*	(4.604)*	(3.439)*	(4.221)*	(3.957)*	(2.292)*	(1.641)	(1.182)	(0.723)
Losers	-3.399	-0.468	-0.504	-0.882	-0.948	-0.838	-0.440	-0.587	-0.216	0.671	1.057	1.717	2.980
		(-4.091)*	(-2.898)*	(-3.978)*	(-3.597)*	(-2.762)*	(-1.043)	(-1.102)	(-0.349)	(0.933)	(1.319)	(1.921)	(3.252)*

*: Significant at 5% significance level.

Table 4: Initial and Subsequent Reactions in the Price-Sorted Portfolios

This table reports the initial and subsequent buy-and-hold abnormal returns applied to three price portfolios constructed on stocks listed on the Taiwan Security Exchange (TSEC) during January, 1981 to December, 2001. Numbers in parenthesis are t statistics. All return estimates are multiplied by 100.

Initial reaction		1	2	3	4	5	10	15	20	30	40	50	60
Panel A: Low-priced portfolio													
Winners	3.307	0.572	0.759	1.054	1.160	1.181	1.348	1.843	1.805	1.210	1.187	0.598	-0.156
		(5.765)*	(4.995)*	(5.553)*	(5.031)*	(4.431)*	(3.332)*	(3.584)*	(2.903)*	(1.524)	(1.337)	(0.646)	(-0.171)
Losers	-3.481	-0.558	-0.536	-0.920	-1.089	-1.062	-0.957	-1.343	-1.012	0.384	1.164	1.992	3.429
		(-4.784)*	(-3.003)*	(-4.081)*	(-4.069)*	(-3.408)*	(-2.183)*	(-2.425)*	(-1.548)	(0.490)	(1.357)	(2.087)*	(3.504)*
Panel B: Medium-priced portfolio													
Winners	3.288	0.478	0.657	0.920	0.997	0.997	1.136	1.643	1.563	1.135	1.214	0.844	0.654
		(4.594)*	(4.177)*	(4.691)*	(4.107)*	(3.649)*	(2.857)*	(3.270)*	(2.615)*	(1.544)	(1.470)	(0.993)	(0.780)
Losers	-3.414	-0.447	-0.444	-0.863	-1.021	-0.944	-0.782	-0.893	-0.521	1.033	1.959	3.011	4.120
		(-3.910)*	(-2.557)*	(-3.949)*	(-3.882)*	(-3.088)*	(-1.862)	(-1.694)	(-0.848)	(1.430)	(2.553)*	(3.532)*	(4.675)*
Panel C: High-priced portfolio													
Winners	3.415	0.615	0.888	1.210	1.362	1.410	1.985	2.767	2.978	1.927	1.612	1.481	1.730
		(5.894)*	(5.463)*	(5.934)*	(5.516)*	(5.064)*	(4.861)*	(5.238)*	(4.699)*	(2.416)*	(1.802)	(1.629)	(1.889)
Losers	3.508	-0.511	-0.644	-1.050	-1.211	-1.130	-0.877	-0.982	0.567	0.664	1.706	2.807	3.911
		(-4.328)*	(-3.601)*	(-4.516)*	(-4.262)	(-3.479)*	(-1.978)*	(-1.762)	(-0.847)	(0.848)	(1.962)*	(2.966)*	(1.973)*

*: Significant at 5% significance level.

Table 5: Initial and Subsequent Reactions in the Book-to-Market (B/M) Portfolios

This table reports the initial and subsequent buy-and-hold abnormal returns applied to three B/M portfolios constructed on stocks listed on the Taiwan Security Exchange (TSEC) during January, 1981 to December, 2001. Numbers in parenthesis are t statistics. All return estimates are multiplied by 100.

Initial reaction		1	2	3	4	5	10	15	20	30	40	50	60
Panel A: Low BM portfolio													
Winners	3.322	0.506	0.750	1.025	1.132	1.162	1.221	1.778	1.920	1.378	1.366	1.007	1.035
		(4.890)*	(4.719)*	(5.296)*	(4.754)*	(4.365)*	(3.147)*	(3.630)*	(3.316)*	(1.946)	(1.682)	(1.208)	(1.234)
Losers	-3.416	-0.404	-0.324	-0.682	-0.786	-0.662	-0.613	-0.776	-0.535	0.415	0.938	1.770	3.213
		(-3.475)*	(-1.852)	(-3.117)*	(-3.085)*	(-2.245)*	(-1.504)	(-1.510)	(-0.880)	(0.584)	(1.169)	(2008)*	(3.575)*
Panel B: Medium BM portfolio													
Winners	3.337	0.473	0.757	1.125	1.217	1.163	1.038	1.870	1.822	1.055	1.092	0.863	0.869
		(4.564)*	(4.794)*	(5.757)*	(5.161)*	(4.266)*	(2.585)*	(3.710)*	(3.054)*	(1.480)	(1.363)	(1.055)	(1.058)
Losers	-3.487	-0.550	-0.636	-0.940	-1.055	-0.896	-0.516	-0.679	-0.095	1.419	2.023	3.051	4.311
		(-4.707)*	(-3.548)*	(-4.105)*	(-3.820)*	(-2.848)*	(-1.215)	(-1.274)	(-0.152)	(1.984)*	(2.629)*	(3.635)*	(4.988)*
Panel C: High BM portfolio													
Winners	3.333	0.556	0.788	1.148	1.294	1.379	1.649	2.406	2.436	1.628	1.323	0.824	0.765
		(5.271)*	(4.844)*	(5.651)*	(5.273)*	(4.898)*	(3.871)*	(4.437)*	(3.719)*	(1.980)*	(1.448)	(0.873)	(0.817)
Losers	-3.507	-0.472	-0.543	-0.966	-1.153	-1.121	-1.014	-1.304	-1.139	0.143	1.166	2.206	3.451
		(-4.121)*	(-3.082)*	(-4.260)*	(-4.191)*	(-3.509)*	(-2.256)*	(-2.319)*	(-1.693)	(0.179)	(1.306)	(2.274)*	(3.488)*

*: Significant at 5% significance level.

Table 6: Tests of the January effect, February effect, and Risk Difference

The following cross-sectional regression model is used to examine if overreaction in the Taiwan stock market can be subsumed by January effect, February effect, or the difference in risk.

$$BHAR_{iT} = b_0 + b_1 RISK_{iT} + b_2 JAN_{iT} + b_3 FEB_{iT} + \varepsilon_{iT}$$

Where $BHAR_{iT}$ is the buy-and-hold abnormal returns for index *i* on date *T*. *RISK* is the risk of loser *i* or winner *i* at day T measured in terms of the standard deviations of their index return. *JAN (FEB)* is dummy variable equal to unity if the subsequent reaction on day t occurred in January (February) and zero otherwise. The standard deviations of industry index return and market index return in losers and winners portfolios beginning 30 trading days prior to the over- or underreaction and ending 30 trading days thereafter are computed. Numbers in parenthesis are p-value.

	Intercept	RISK	January	February	AdjR^2
		Panel A: TSEC index			
Winners	-3.0084	1.2308	0.0470	7.1521	0.0146
	(<0.0001)	(<0.0001)	(0.9558)	(<0.0001)	
Losers	-1.4801	0.8306	0.1984	6.4513	0.0133
	(0.0059)	(0.0037)	(0.7745)	(<0.0001)	
		Panel B: Cement			
Winners	3.2157	-0.9427	2.4327	-1.1872	0.0051
	(<0.0001)	(0.0002)	(0.0023)	(0.1897)	
Losers	5.1138	-1.7195	4.1763	4.6226	0.0202
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	
		Panel C: Food			
Winners	-0.2580	-0.4531	9.1305	2.6787	0.0160
	(0.6233)	(0.0844)	(<0.0001)	(0.0094)	
Losers	1.8889	-0.2433	9.0000	7.2670	0.0275
	(0.0001)	(0.3116)	(<0.0001)	(<0.0001)	
		Panel D: Plastics			
Winners	0.8851	-0.3099	8.7449	3.9114	0.0193
	(0.1151)	(0.2456)	(<0.0001)	(<0.0001)	
Losers	2.6968	-0.9461	11.4578	6.8974	0.0451
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	
		Panel E: Textile			
Winners	1.9918	-1.1926	8.5110	3.8572	0.0214
	(0.0012)	(<0.0001)	(<0.0001)	(<0.0001)	
Losers	1.9475	-0.4333	10.7912	6.8246	0.0417
	(0.0003)	(0.1027)	(<0.0001)	(<0.0001)	
		Panel F: Electric			
Winners	2.0482	-0.7745	9.0232	5.1217	0.0228
	(0.0020)	(0.0093)	(<0.0001)	(<0.0001)	
Losers	4.1964	-1.0395	8.3357	2.6893	0.0200
	(<0.0001)	(0.0001)	(<0.0001)	(<0.0001)	
		Panel G: Paper			
Winners	1.4000	-1.1719	13.5230	3.0394	0.0389
	(0.0374)	(<0.0001)	(<0.0001)	(<0.0001)	
Losers	3.2150	-1.5875	12.9653	7.1472	
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	
		Panel H: Construction			
Winners	1.6752	-1.1319	7.4086	-1.6191	0.0127
	(0.0190)	(0.0006)	(<0.0001)	(0.0913)	
Losers	1.5547	0.2342	7.9486	2.5661	0.0141
	(0.0153)	(0.4342)	(<0.0001)	(0.0105)	
		Panel I: Finance			
Winners	2.4908	-0.4200	-2.7497	-5.9486	0.0062
	(0.0010)	(0.2051)	(0.0002)	(<0.0001)	
Losers	6.2420	-0.5397	-0.6272	-4.5330	0.0026
	(<0.0001)	(0.0929)	(0.5014)	(<0.0001)	

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