

Trading volume, Price Momentum, and the 52-week High Price Momentum Strategy in the Saudi Stock Market

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Abstract

This paper investigates the existence of a pure momentum strategy in the Saudi stock market (SSM), the largest market in the Middle East and one of the fastest growing markets in the world. Price momentum profitability in the SSM is very similar in magnitude and significance to those found in developed market. We also find that trading volume affects the profitability of a momentum strategy. Stocks possessing momentum combined with a high volume during the previous 3, 6, 9, and 12 months continue to perform better in the following 3, 6, 9, and 12 months than stocks with a low trading volume.

The 52-week high price momentum strategy for the SSM contradicts the empirical result of George and Hwang (2004) for the US market. We find a reversal in stocks that have reached their 52-week high. George and Hwang argue that when a stock reaches its 52-week high price, investors are reluctant to bid the price higher even if the information warrants it. The information of good news eventually prevails and pushes the stock prices higher. We do not find this for the SSM. One possible explanation of the different result obtained here for the SSM compared to the results for well developed financial markets such as US can be attributed to the diffusion of information and investors overreaction. Stocks might reach their 52-week high price because investors speculation moves the price to their 52-week high; however, when more accurate news reaches the market, the stocks drop below their 52-week high price.

I. Introduction

The objective of this research is to examine different aspects of stocks return behavior in the Saudi stock market (SSM). We test the empirical relationships between trading volume and intermediate-horizon momentum strategies. The history of the SSM dates back to 1954, when the first public company was traded. However, organized trading did not begin until 1985, when the Saudi Arabian Monetary Agency was charged with the day-to-day regulation of the market. Ever since, the market has witnessed significant developments, the last of which were the introduction of the new “Capital Market Law” and the establishment of the Capital Market Authority in 2003.

Over the last 20 years, the SSM has witnessed strong development and growth. It has become the largest market in the region and one of the fastest growing markets in the world. According to the Arab Monetary Fund's annual report, which provides statistics for all 15 Arab stock markets; for the year ending December 2005, the capitalization of the SSM represented 50% of total market capitalization of all these markets. The market value of stocks traded on the SSM represented 76.9% of the total stock value traded in all these markets. The report includes the markets of all Arab countries, namely, the Abu Dhabi Securities Market, the Amman Stock Exchange, the Bahrain Stock Exchange, the Beirut Stock Exchange, the Casablanca Stock Exchange, the Doha Stock Exchange, the Dubai Financial Market, the Egyptian Capital Market, the Kuwait Stock Exchange, the Muscat Securities Market, the Palestine Securities Exchange, the Saudi Stock Market, and the Tunis Stock Exchange. Figure 1.1 shows the relative market capitalization of these markets.

Moreover, the SSM has become one of the leading emerging markets. According to statistics provided by the World Federation of Exchanges (WFE) for December 2005, the SSM ranked 16th in terms of domestic market capitalization (\$650.18 billion), well ahead of the

Bombay Stock Exchange, Taiwan, Shanghai, Singapore, and many other historically world-leading stock exchanges. The market index gained over 40% in 2005, which followed six years of growth at an average annual rate of 38%. Market trading volume has also increased significantly. On average, market volume was worth over \$4 billion a day in 2005 (Saudi Stock Exchange Annual Report 2005). Figures 1.2 and 1.3 show the recent trends in trading volume and market index for the SSM.

Although the SSM is the largest market in the region in terms of capitalization and trading volume, academic research on this market is scarce. This could be due to the lack of readily available data on the SSM. We were able to collect a comprehensive dataset for this market. It is our objective to explore and pave the road for future academic research in the SSM market.

The SSM market exhibits different characteristics than other developed and emerging markets. In addition to the relatively large size of the market in the region and its fast development and growth, it has a small number of publicly traded companies (85). Another aspect of the SSM that differentiates it from other markets is the lack of the options market, which some studies have found to affect the price and volatility of the underlying market (Cornrad 1989; St. Pierre 1989). Although many government-owned companies have gone public, the government still owns the majority shares of their stocks, which may impact their stock return behavior. In addition, until early 2006, the SSM was inaccessible to foreign investors except indirectly through mutual funds. However, the SSM is now accessible to all investors, which indicates the ongoing process of market liberalization. These distinctive

attributes of the SSM, along with the lack of academic research on this market, provides our motivation for this research.

In this paper, we investigate the relationship between momentum profitability and trading volume in the SSM. The objective of this paper is to investigate whether momentum strategies exist in the SSM and whether trading volume affects momentum profitability. First, we examine if momentum profitability is driven by loser or winner portfolios. The existing literature is inconclusive and at times contradictory on this issue (Lee and Swaminathan 2000; Glaser and Weber 2003). Second, we investigate whether a 52-week high price momentum profitability exists in the SSM. We also compare the profitability of a pure momentum strategy and momentum based on trading volume. We further analyze the source of momentum profitability in the SSM. Specifically, we investigate whether less diffusion of information in the SSM leads to a stronger investor underreaction and consequently higher momentum profit.

The evidence on the relationship among trading volume, the 52-week high price, and momentum strategies is mainly based on studies conducted in developed markets (Jegadeesh and Titman 1993; Chan, Jegadeesh, and Lakonishok 1996; Rouwenhorst 1996). Fewer studies have investigated this relationship in the context of developing markets (Forner and Marhuenda 2003; Kang, Liu, and Ni 2002; Griffin and Martin 2003; Chan, Hameed, and Tong 2000). This study is intended to deepen our understanding of the SSM market, which is characterized by different structures from other developing markets. One explanation for the existence of momentum profit is that it is driven by investor underreaction (Jegadeesh and Titman 1993; Chan, Jegadeesh, and Lakonishok 1996). If this explanation is true, we expect a stronger momentum effect in less transparent markets such as the SSM. Because few analysts follow the SSM, information

diffusion is not as strong as in other developed markets. Therefore, we expect higher underreaction and higher momentum profitability. In addition, we examine whether the momentum profitability in SSM is driven by the winner portfolio as in Glaser and Weber (2003), or by the loser portfolio as in Lee and Swaminathan (2000). Furthermore, we compare the profitability of these three momentum strategies, the 52-week high price momentum, pure price momentum, and momentum driven by trading volume. We then compare and contrast this evidence with the existing evidence in the literature.

In summary, our empirical result shows the existence of price momentum strategy in the SSM. Moreover, the momentum strategy is more profitable when conditioned on high volume stocks than when it is conditioned on low volume stocks. High volume winner portfolio drives the momentum profit in the SSM. However, the 52 week-high price leads to a reversal in portfolio returns which contradicts the results of earlier studies conducted in the U.S and Australian markets. Buying stocks that are near to their 52-week high price and selling stock that are far from their 52 week-high price generate negative returns in the SSM.

This paper is organized as follows. Section II presents a literature review. Section III outlines the methodology. In section IV, data and empirical results are presented. Section V concludes the paper.

II. Literature Review

In their seminal paper, Jegadeesh and Titman (1993) examine the momentum strategy in the US equity market from 1965 to 1989 and find that buying the winning decile stocks, short selling the losing decile, and then holding this zero-cost portfolio for the next 3-12 months earns significant abnormal profits. For example, the 6-month formation period produces returns of about 1% per month regardless of the holding period. Chan et al. (1996) confirm the significant profitability of intermediate-horizon price momentum strategies for the US equity market for 1977 to 1993 period. Jegadeesh and Titman (2001) reexamine whether momentum strategies were still profitable during the 1990s. For example, the monthly mean return for a momentum portfolio based on a 6 x 6 strategy (formation x evaluation period) was 1.39 % from 1990 to 1998 and 1.23 % from 1965 to 1998.

Lee and Swaminathan (2000) introduce the effect of trading volume on the profitability of price momentum and find a strong relation between past returns and past trading volume that increases predicative power of future returns over an intermediate horizon. Using all firms listed on the NYSE and the AMEX from January 1965 through December 1995, they find that price momentum (winners-losers) is more pronounced for high volume firms than for low volume firms. For example, they find that for a 6 x 6 strategy, the price momentum return is 1.46% for the high volume firms and only 0.54 % for the low volume firms. The return difference between [(high winners-high losers) – (low winners-low losers)] is around 0.91% per month, or approximately 11% a year, and is statistically significant. On one hand, they find this difference in return (0.91%) to be mainly driven by the returns differential of loser portfolios (high volume loser-low volume loser). On the other hand, the return difference of the winner portfolio (high

volume winner-low volume winner) is relatively small. In most cases, they find high volume winners to underperform low volume winners. They interpret their result as buying high volume winners does not enhance price momentum as much as selling high volume losers. This result contradicts the findings of Glaser and Weber (2003) who investigate the relationship between trading volume and momentum for 441 large stocks listed on the Frankfurt Stock Exchange. Similar to Lee and Swaminathan (2000), they find that momentum profitability is stronger among high-turnover stocks. For example, in the 6 x 6 strategy, the price momentum (winner-loser) return is 1.16 % per month for high volume firms, and only 0.11 % per month for low volume firms. However, contrary to Lee and Swaminathan (2000), they find that momentum profit is driven by high volume winners. For example, in the 6 x 6 strategy, the return is 1.05%, and is mainly driven by the return differential of the winner. Therefore, buying high volume winners enhances momentum profitability in Glaser and Weber (2003), while selling high losers enhances momentum profitability in Lee and Swaminathan (2000). Additionally, in Glaser and Weber (2003), high turnover winners have higher returns than low turnover winners, while in Lee and Swaminathan (2000); high turnover winners have lower returns than low turnover winners.

Chui, Titman, and Wei (2000) examine the momentum strategy in eight Asian countries for various time periods and find momentum profits to be higher in stocks with high turnover ratios in five of these countries. They also find that when a country-neutral momentum strategy (no specific country momentum) is employed, momentum profits are five times higher among high-turnover stocks than among low-turnover stocks. Hameed and Yunato (2001) examine the relationship between turnover and momentum profitability in six Asian countries from 1979 to

1994. They find a momentum profit for the high turnover portfolio in only two countries (Malaysia and South Korea); however, they fail find this relationship in the other four countries (Hong Kong, Singapore, Taiwan, and Thailand).

Using a different methodology, Rouwenhorst (1999) finds that average turnover is positively related to momentum strategies in 16 out of 20 countries studied. In a similar study, Chan, Hameed, and Tong (2000) use a different proxy for volume (increase in volume for the previous period) to test the relation between trading volume and momentum strategies using several international stock market indices. They find that momentum is stronger following an increase in trading volume.

Our study is also motivated by the significant finding of George and Hwang (2004). George and Hwang (2004) add a new finding to the momentum literature by investigating the role of a readily available piece of information—the 52-week price high—on momentum profitability. They utilize all stocks in the Center for Research in Security Prices (CRSP) database from 1963 to 2001 and show that a strategy of purchasing stocks near their 52-week price high and selling stocks far from their 52-week price high, largely explains the momentum profit and is even more profitable than Jegadeesh and Titman's (1993) momentum strategy. They find that the predictive power of the nearness of the price to the 52-week high is strong whether or not the stocks have experienced extreme past returns. They interpret this result to mean that traders use the 52-week high as a reference point against which they evaluate the potential impact of news. "When good news has pushed a stock's price near to a new 52-week price high, traders are reluctant to bid the price of the stock higher even if the information warrants it. The information eventually prevails and the price moves up, resulting in a continuation. Similarly,

when bad news pushes a stock price far from its 52-week high, traders are initially unwilling to sell the stock at prices that are as low as the information implies. The information eventually prevails and the price falls” (George and Hwang 2004 p. 2146).

Marshall and Cahan (2005) apply the same test to the stocks listed on the Australian stock exchange from 1990 to 2003. Similar to George and Hwang (2004), they find that the 52-week high momentum strategy in the Australian market outperforms the price momentum of Jegadeesh and Titman (1993) and the industry momentum of Moskowitz and Grinblatt (1999). Specifically, they find that the 52-week price high strategy generates returns of 2.14% per month, as compared with 0.59% and 0.16% for the price and industry momentums, respectively.

The lack of a single theoretical explanation for the momentum anomaly has motivated numerous studies in this area of research. Several studies attempt to provide sound theoretical explanations for the source of the momentum strategy. Briefly, there are three strands of theoretical explanations. First, Jegadeesh and Titman (1993) and Chan, Jegadeesh, and Lakonishok (1996) argue that the underreaction of stock prices to information contained in past stock returns and past firm earnings gives rise to price momentum. Second, Barberis, Shleifer, and Vishny (1998), Daniel et al. (1998), and Hong and Stein (1999) develop models of investor behavior where they argue that price momentum is consistent with cognitive biases by which investors interpret imperfect information that leads to a time-series predictability of stock returns. Third, Conrad and Kaul (1998) argue that the profitability of momentum strategies is generated by cross-sectional variations in expected returns rather than by predictable time-series variations in security returns. They show that momentum strategies that involve buying stocks with high average mean returns and selling stocks with low average mean returns are profitable.

They argue that these differences in performance reflect cross-sectional variations in expected returns and risk.

Hong and Stein (1999) claim that stocks with low analyst coverage are prone to experiencing a slow diffusion of fundamental information. Based on this argument and the underreaction explanation of momentum (Chan et al. 1996), the SSM is a good candidate for testing this claim. The SSM, as a developing market, is less transparent than most developed markets and is followed by few analysts. Therefore, if these explanations are valid, we expect the SSM to experience stronger momentum than developed markets.

The SSM is characterized by a different structure and has experienced tremendous growth in trading volume in recent years. It is of great importance to both academics and practitioners to investigate momentum investment strategies in such a market. We investigate the profitability of the 52-week high momentum and other momentum strategies in the SSM, compare and contrast our results with earlier empirical results. This paper is the first study to explore these investment strategies in the SSM.

III. Methodology

For pure momentum and momentum based on trading volume, we follow the methodology used by Jegadeesh and Titman (1993) and Lee and Swaminathan (2001). At the start of each calendar month, all stocks are sorted independently on the basis of past returns and past trading volume. Based on this sorting, stocks are then assigned to one of five portfolios based on the geometric average monthly return over the previous j months ($j = 3, 6, 9, \text{ or } 12$), and to one of three portfolios based on the average trading turnover over the same time frame.

R1 represents the portfolio with the lowest past return (loser) over the formation period, while R5 represents the portfolio with the highest past return. T1 represents the portfolio with the lowest turnover over the formation period, while T3 represents the portfolio with the highest turnover. The intersections resulting from the two independent sorting procedures result in 15 price momentum-volume portfolios for each j/k (formation/evaluation) period. In each month, winners are bought and losers are sold, and the resulting zero-cost portfolios are held for k months ($k=3, 6, 9, \text{ or } 12$) producing returns with overlapping periods. The average buy-and-hold return is calculated for each k month.

For the 52-week high momentum strategy, we follow the methodology used by George and Hwang (2004). First we find stocks that are near their 52-week high price. This is calculated for each stock at the end of each month using the following formula:

$$\text{Ratio of nearness to the 52 - week high price} = \frac{P_{i,t-1}}{high_{i,t-1}}$$

Where

$p_{i,t-1}$ = the closing price of the stock at the end of the month, and

$high_{i,t-1}$ = the highest price of the stock during the previous 12-month period (52-week high). The 52-week high period ends on the last day of the month.

The stocks are then ranked according to this ratio, starting from stocks with the highest ratio (closest to the 52-week high price) to those with the lowest ratio (furthest from the 52-week high price). The next step is to construct equally weighted portfolios where the top third of the

ranked stocks represents the winner portfolio, and the bottom third represents the loser portfolio. We also use another sorting where the top fifth represents the winner portfolio and the bottom fifth represents the loser portfolio. Similar to Jegadeesh and Titman (1993), we calculate the evaluation period buy-and-hold returns. We then compare this 52-week high strategy with the pure momentum strategy and a momentum strategy based on trading volume.

IV – Data and Empirical Results

Our data set includes all firms listed in the SSM from January 1993 through December 2005. To be included in the data, the firms must have one year of data prior to the portfolio formation period. The final sample starts with 41 firms at the first formation period and ends with 71 firms at the last formation period. For each stock, the following information is collected: daily closing prices, number of daily shares traded, and number of shares outstanding at the end of that day. Trading volume is defined as the average daily turnover during the portfolio formation period, where daily turnover is the ratio of the number of shares traded each day to the number of shares outstanding at the end of the day. We then calculate the geometric average monthly return and average daily turnover for each stock during the k evaluation period (3, 6, 9, and 12 months) and calculate the buy-and-hold average monthly return for each j evaluation period (3, 6, 9, and 12 months).

The next section presents the results for three distinctive momentum strategies: the price momentum strategy, the volume and momentum strategy, and the 52-week price momentum strategy.

IV.1 The Price Momentum Strategy

Table 2.1 presents the results for the price momentum strategy. At the beginning of each month, stocks are ranked and grouped into five portfolios based on their returns during the previous 3, 6, 9, and 12 month, which is called formation period j . We then evaluate the performance of these portfolios during the next 3 to 12 months, which is called evaluation period (k). The first column shows the j formation period for 3, 6, 9, and 12 months. The second column shows R1, R3, and R5, where R1 represents the loser portfolio with the lowest returns, R5 represents the winner portfolio with the highest returns, and R3 represents the middle portfolio. R5 – R1 represents the momentum strategy of the winner – loser portfolio. We concentrate on extreme winner R5 and extreme loser R1, and show just one middle portfolio R3 for brevity. The third column shows the geometric average monthly return during the formation period. The fourth column shows the average daily turnover during the formation period. N represents the average number of firms for each portfolio. The next columns represent the average monthly return during the evaluation period (k) for 3, 6, 9, and 12 months, respectively. All returns and turnover numbers are in percentages.

The descriptive statistics in reported Table 2.1 show that returns during the formation period increase with the increase in turnover for all portfolios in all formation periods. The highest (lowest) turnover is associated with the winner (loser) portfolio, which is consistent with previous studies. One distinctive observation from this table is the positive returns momentum strategy (R5 – R1) for all evaluation periods. R5 – R1 (winners – losers) is positive for all 16 strategies and statistically significant for 11 strategies. This table indicates a continuation and momentum in returns during the intermediate horizon. The winner continues to outperform the

loser over the 3-to-12 month evaluation period. For example, in the $j3/k3$ strategy, the difference between the winner and loser portfolios is equal to 0.71% per month, or about 8.12% per year with t -statistics of 2.95. These results clearly indicate the existence of a price momentum strategy in the Saudi equity market, which is consistent with the results previously documented in the literature.

Table 2.2 presents the results for the price momentum strategy with a different sorting. We group stocks into three portfolios instead of the five shown in Table 2.1. The results of the three-portfolio sorting confirm the results of the five-portfolio sorting. The differences between $R3 - R1$ for all 16 strategies are positive and statistically significant. For example, in the $j3/k3$ strategy, the difference between the winner and loser portfolios ($R3 - R1$) is equal to 0.66% per month, or about 7.92% per year, with a t -statistic of 3.59.

To further examine the existence of a price momentum in the Saudi market, we split our data into two sub-periods. The first sub-period starts from January 1993 to June 1999, and the second from July 1996 to December 2005. Table 2.3 reports the results for the first sub-period using the five portfolio ranking. The descriptive statistics show a positive relation between turnover and return during the formation period. However, the return of the formation period during the first period is lower than the return using the whole sample. The loser and middle portfolios have a negative return, which might be due to the down market during that period. The results here are consistently support the existence and profitability of the momentum strategy in

the Saudi market. All 16 strategies yield superior returns and statistically significant results in most cases. The return for the momentum strategy in the first sub-period is stronger than that of the whole sample. For example, the return for j12k3 is equal to 0.92% per month, or about 11.04% per year, with a t -statistic of 3.09. This is consistent with Griffin et al. (2003), who find that momentum profit tends to be stronger during a down market.

Table 2.4 represents the results for the second sub-period. The return during the formation months (j) is higher than the return for the whole sample and first sub-sample, which may indicate a bull or up market during this period. The results of this table show a weaker momentum than the previous tables. Twelve of the 16 strategies have positive returns, while four strategies yield negative returns. However, all of the four negative return strategies are statistically insignificant.

Overall, the results of this section document the existence of a pure momentum strategy in the SSM, which is consistent with the findings of Jegadeesh and Titman's (1990) on momentum strategy. Winner stock continues to outperform loser stocks over the following 3 to 12 months. A surprising finding here is that our results do not indicate that a higher momentum in the SSM exist compare to those found in developed market. In other words, the less diffusion of information in the SSM doesn't lead to a higher than common momentum profit observed in developed markets.

IV.2 Momentum Portfolio Based On Price Momentum And Volume

In this section, we examine in depth the relationship between momentum strategy and volume. In addition to ranking stocks into five portfolios based on past returns as described in

the previous section, we independently rank stocks into three portfolios based on past turnover during the formation period. T1 represents the portfolio with the lowest turnover over the formation period, while T3 represents the portfolio with the highest turnover. T2 represents the portfolio in the middle. The intersections resulting from the two independent sorting of the five price-portfolio and three volume-portfolio (5 x 3 strategy) procedures, results in 15 price momentum-volume portfolios. In each month, winners are bought and losers are sold, and the resulting zero-cost portfolio is held for k months ($k = 3, 6, 9, \text{ or } 12$).

Table 2.5 shows the results of momentum strategy that is based on the intersection of five price momentum and three volume sorting (5x3). Our main finding here is that momentum is stronger for high turnover stocks. The difference between the winner and loser portfolios ($R5 - R1$), when conditioned on high volume firms (T3), is always higher than the difference conditioned on low volume firms (T1). This indicates that buying high-volume winners and selling high-volume losers is more profitable than buying low-volume winners and selling low-volume winners. In all cases, high-volume winners minus high-volume losers are positive, while low-volume winners minus low-volume losers are negative. For example, in the $j9/k9$ strategy, the high-volume winner portfolio return is 2.30% per month, while the high-volume loser portfolio is 1.46% per month. The difference equals 0.84% per month and is statistically significant at the 5% level. On the other hand, for the same strategy, the $j9/k9$ low-volume winner portfolio return is 1.31% per month, while the low-volume loser portfolio return is 2.12% per month. The difference is negative at 0.81% per month. The difference ($R5 - R1$) between the momentum strategy based on high-volume portfolio and the momentum of the low-volume portfolio in this case is 1.65% per month and is statistically significant at the 1% level. This

indicates that the high-volume-based momentum strategy is more profitable than the low-volume-based. T1-T3 column shows the difference between the high volume and the low volume for each portfolio. One key result from this table is that the difference in returns is negative for the loser portfolio (R1), and positive for the winner portfolio (R5). The results can be inferred to mean that for the loser portfolio, the low-volume stocks have higher returns than the high-volume stocks. While for the winner portfolio, the high-volume stocks have higher returns than the low-volume stocks. It can be concluded from this table that a momentum profit is driven by the return of a high-volume winner portfolio. For example, for the $j3/k3$ portfolio, the difference (T3-T1) for the loser portfolio (R1) is equal to -0.05%, while it is positive (0.94%) for the winner portfolio (R5). The difference between winner and loser portfolio (R5-R1) is equal to around 1% per month.

Our main result reported in this section is that a high-volume based momentum strategy is more profitable than a low-volume based strategy, which is consistent with the findings of Lee and Swaminathan (2000) and Glaser and Weber (2003). When we examine the relation between volume and momentum in depth, our results are also consistent with Glaser and Weber (2003); that momentum profit is driven by the high-volume winner portfolio (R5-R1 conditioned on TO3). However, our results contradict Lee and Swaminathan (2000) results who find momentum to be driven by the low-volume loser portfolio.

The descriptive statistics for the five price/three volume portfolio strategies is shown in Table 2.6. R1 represents the loser portfolio, R3 the middle portfolio, and R5 the winner portfolio; T1 represents the lowest turnover portfolio, T3 the highest turnover portfolio, and T2

the portfolio in the middle. Return represents the geometric average monthly return during the formation period, turnover represents the average daily turnover during the formation period, and N represents the average number of stocks in each portfolio. There is a positive relation between turnover and return for all j periods. The highest return is for the high-volume winner portfolio (R5/T3) with 8.16% per month in $j3$, while the lowest is for low-volume loser portfolio (R1/T3) with -5.23% per month in $j3$.

Table 2.7 shows the results of volume momentum using a different sorting. We rank stocks into three portfolios based on the returns during the formation period, and into three portfolios based on the turnover during the formation period. The interaction between these two sortings produces the volume momentum using a 3 price/3 volume portfolio sorting. Except for the momentum strategies in $j3/k6$, $j3/k9$, and $j6/k6$, out of 16 strategies, the returns of the high-volume winner portfolios are greater than the returns of the high-volume loser portfolios. The returns on high-volume based momentum (R3 – R1 conditioned on T3) portfolios are also higher than the low-volume based-momentum (R3 – R1 conditioned on T1) portfolios in all cases except for the three strategies mentioned above. The 3 x 3 sorting still confirms the 5 x 3 strategy reported in Table 2.5. It also shows that when we loosen the sorting and use the less extreme volume, momentum becomes lower than in the strategy implementing the more extreme volume. The higher the volume sorting, the higher the momentum profit, as it was shown in Table 2.4 and 2.5. The descriptive statistics for this 3 price/3 volume portfolio are presented in Table 2.8.

To further examine this issue, we use a third sorting method. We sort stocks into three portfolios according to past returns during the formation period and into five portfolios according to the turnover during the formation period. The interaction of these two independent sortings

produces 15 portfolios for each formation/evaluation (j/k) combination. The results of this sorting as reported in Table 2.9 are consistent with and conform to the previous sorting. All momentum strategies (R3-R1) based on high trading volume are more profitable than the momentum based on low trading volume. The high-volume winner portfolio continues to perform better than the high-volume loser portfolio; this strategy is also more profitable than the momentum based on low volume (low-volume winner minus low-volume loser.) .The descriptive statistics for this 3 price/5 volume portfolio are shown in Table 2.10.

In the following section, we examine the volume momentum strategy for two sub-sample periods. The sample is divided into two periods, the first period covers from January 1993 to June 1999, and the second from July 1999 to December 2005. We use the 5 x 3 sorting strategy for the sub-sample tests. Table 2.11 shows the results of volume momentum for the first sub-period. The difference between the high-volume winner and the high-volume loser is not significant in all cases, and it is negative for four of the 16 strategies. In this period, the momentum based on low volume is more profitable than the strategy based on high volume. The low volume stocks perform better than the high volume stocks, which can be seen from the negative return for most of the T3-T1 portfolios. This negative difference is more pronounced for the winner portfolio. This period is characterized by a downturn return in the market, which may indicate that in a downturn, the high-volume portfolio performs worse than the low-volume portfolio.

Table 2.12 shows the results for the second sub-period. For $j9$ and $j12$, the high-volume stocks perform better than the low-volume stocks, just as in the whole sample, the high-volume winner performs better than the high-volume loser, which causes the momentum based on high trading volume ($R5 - R3$) to be positive. However, for $j3$ and $j6$, the momentum based on low trading volume is more profitable than that based on high trading volume. Therefore, the results of this table are mixed and not conclusive.

Overall, this section indicates that incorporating volume into a momentum strategy affects its profitability. Except for the first sub-period, the evidence indicates that momentum based on high trading volume is more profitable than momentum based than low trading volume. The results also indicate that momentum profit is driven mainly by the return of high-volume winner portfolios.

IV.2 Results For The 52-Week High Price Momentum Strategy

For the 52-week high price momentum strategy, we follow the methodology used by George and Hwang (2004). First, we determine stocks that are near their 52-week high price. This is calculated for each stock at the end of each month using the following formula:

$$\text{Ratio of nearness to the 52 - week high price} = \frac{P_{i,t-1}}{high_{i,t-1}}$$

Where

$P_{i,t-1}$ = the closing price of the stock at the end of the month.

$high_{i,t-1}$ = the highest price of the stock during the previous 12-month period (52-week high-price). The 52-week high price period ends on the last day of the month. Stocks are then ranked according to the previous ratio, going from stocks with the highest ratio (closest to the 52-week high price) to those with the lowest ratio (furthest from the 52-week high price).

Table 2.13 shows the results of the 52-week high strategy using the three portfolio sortings. R1 represents the portfolio including stocks far from their 52-week high, which are labeled the loser portfolio, while R3 includes stocks near their 52-week high, which are labeled the winner portfolio. R2 is the middle portfolio. Except for the 3-month formation period, the results show that stocks far from their 52-week high price are more profitable than those near their 52-week high price. In other words, buying stocks near their 52-week high price and selling stocks far from their 52-week high price (R3 – R1) produces negative and statistically significant returns for all evaluation periods. Buying the loser portfolio (R1) and selling the winner portfolio (R3) would be more profitable. This result contradicts the results of George and Hwang (2004) and Marshall and Cahan (2005), who find that stocks near their 52-week high price perform better than stocks far from their 52-week high price during an evaluation period of 6 months.

To further examine this result, we sort stocks according to their nearness to their 52-week high price using five portfolios to see if a different sorting will affect the results. Table 2.14 shows the results of the five-portfolio sort, which confirm those of the three-portfolio sorts; the

evaluation periods $k6$, $k9$ and $k12$ still have a negative return, with statistically significant results for $k9$ and $k12$.

We also investigate this issue by splitting our sample into two sub-periods, the first ranging from January 1993 to June 1999, and the second from July 1999 to December 2005. We use the three-portfolio sort for the sub-sample tests. Table 2.15 presents shows that the results for the first sub-period are opposite those of the whole sample. The difference between R3 and R1 is always positive and statistically significant. This result is consistent with George and Hwang (2004) and Marshall and Cahan (2005). As shown in the previous section, the first sub-period is characterized by a down market; therefore, we can infer that the 52-week price strategy works in our example in a down market.

Table 2.16 shows the results for the second sub-period, which are consistent with the results of the whole sample; the strategy of buying stocks near their 52-week high price and selling those far from it produces a negative return. We find that investors are much more likely to sell a stock when price is near its high for the year, and more likely to buy a stock near its low for the year. The difference in the results for the first sub-period might be explained by the different behavior of investors during an up or down market.

Overall, and except for the first sub-period, the evidence from the whole sample with the five- and three-portfolio sorting and from the second sub-sample indicates that stocks far from their 52-week high price perform better than stocks near their 52-week high price for the 3, 6, 9,

and 12-months evaluation periods. These results contradict those of George and Hwang (2004) and Marshall and Cahan (2005).

V. CONCLUSIONS

Our paper documents the existence of a pure momentum strategy in the SSM. Price momentum profitability in the SSM is very similar in magnitude and significance to those found in developed markets. We also find that trading volume affects the profitability of a momentum strategy. Stocks possessing momentum combined with a high volume during the previous 3, 6, 9, and 12 months continue to perform better in the following 3, 6, 9, and 12 months than stocks with a low trading volume.

One explanation for the pure momentum profit is investor underreaction: stock prices rise when good news hits the market and will continue to rise after the market fully adjusts to public information. The opposite is true with bad news. The underreaction of investors lengthens this continuation of return. If this is true, we expect a market like the SSM, with less diffusion of information, to have a stronger investor underreaction and consequently momentum profit. However, our results indicate a momentum profit in the SSM that is very close to the level of profit documented in more transparent developed markets like the US, which have greater diffusion of information.

Our results regarding volume based momentum strategy are best accounted for by the theoretical explanation of Daniel, Hirshleifer, and Subrahmanyam (1998), who argue that stocks that are more difficult to evaluate generate stronger overconfidence among investors. If the

disagreement among investors is proxied by trading volume due to evaluation difficulty, then momentum caused by the self-biased overconfidence of investors should be more pronounced among high turnover stocks. Our results are consistent with this prediction and show a stronger momentum among high turnover stocks. The 52-week high price result contradicts the empirical result of George and Hwang (2004) for the US market. Our results indicate a reversal in stocks that have reached their 52-week high. George and Hwang (2004) argue that when a stock reaches its 52-week high price, investors are reluctant to bid the price higher even if the information warrants it. The information of good news eventually prevails and pushes the stock prices higher. One possible explanation of the different result obtained here for the SSM compared to the results for well developed financial markets such as US can be attributed to the diffusion of information and investors overreaction. Stocks might reach their 52-week high price because investors speculation moves the price to their 52-week high; however, when more accurate news reaches the market, the stocks drop below their 52-week high price.

The sub-sample results indicate a different pattern of result during the first sub-period, which is characterized by low returns. Future research in this area should investigate the effects of upturns and downturns in the SSM market regarding the profitability of momentum with trading volume, and with the 52-week high price.

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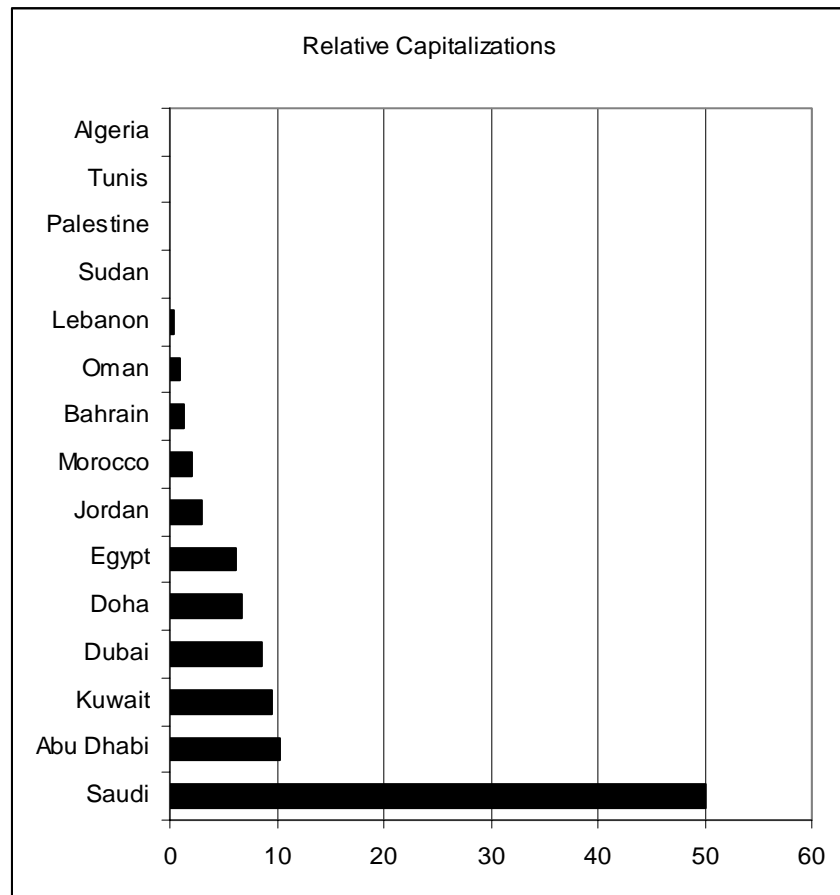
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Figure 1.1: Relative Stock Market Capitalization of All Arab Markets.

This figure shows the relative stock market capitalizations for 15 Arab stock markets.



Source: Arab Monetary Fund's annual report (2005)

Figure 1.2: Market Index Value

This figure shows the monthly market index value for period from January 1993 to December 2005.

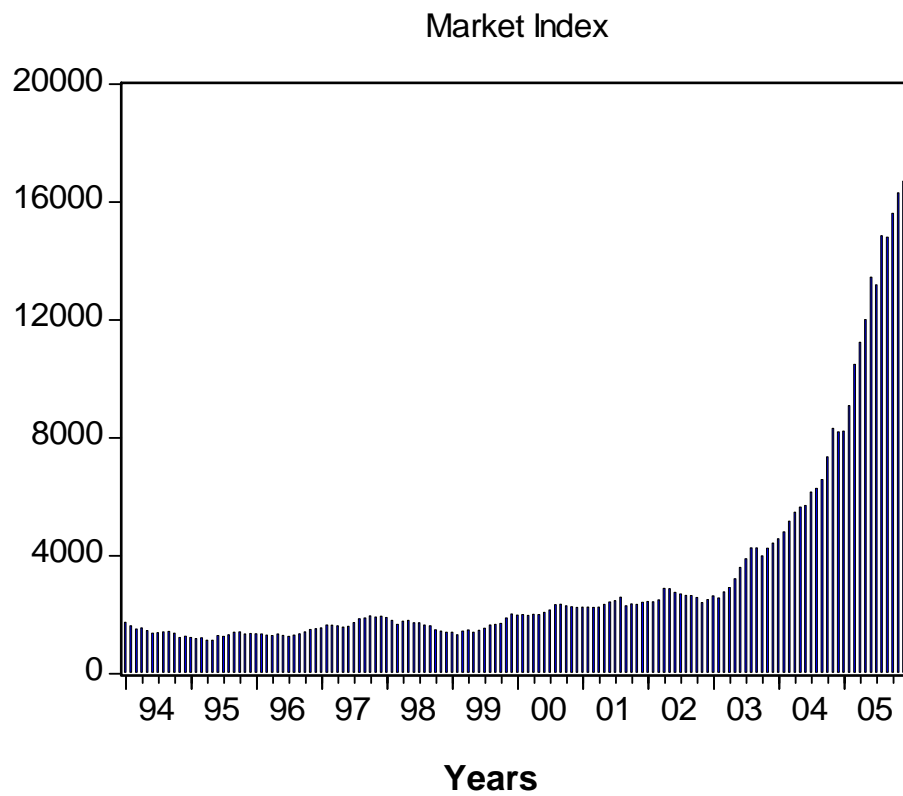


Figure 1.3: Market Trading Volume

This figure shows the monthly trading volume for the Saudi Stock Market from January 1994 to December 2005. (Trading volume numbers are in thousands)

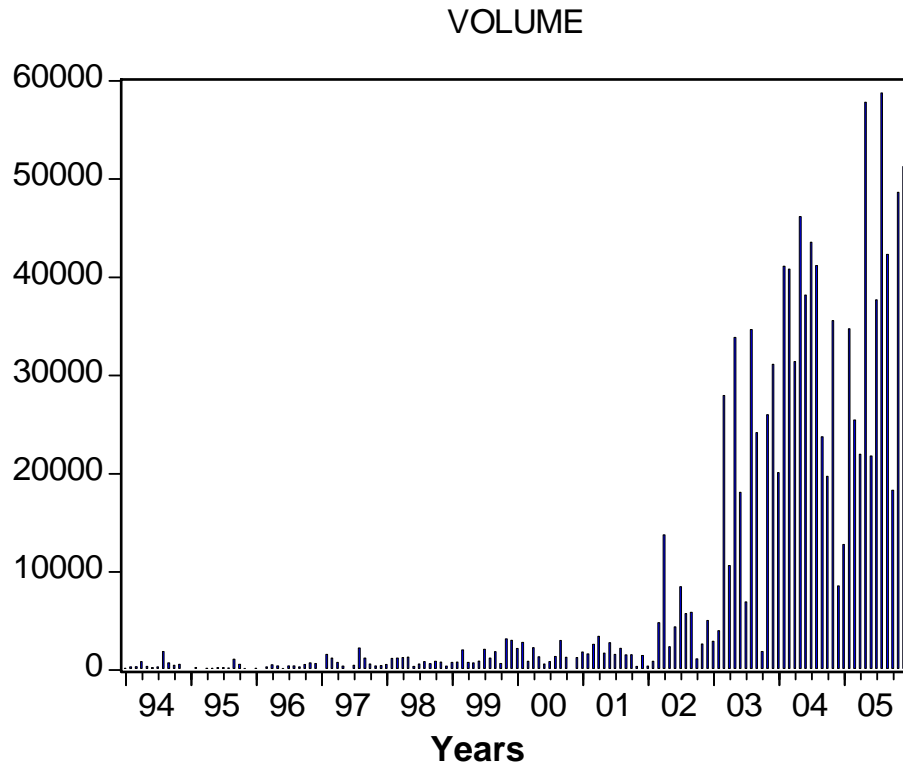


Table 2.1: Returns of Price Momentum Portfolios Based on Five Portfolios.

This table presents the average equal-weighted monthly returns of price momentum for the SSM from January 1993 to December 2005. At the beginning of each month stocks are ranked and grouped into five equally-weighted portfolios based on their returns during the previous J months = 3, 6, 9 and 12 months. Stocks with the lowest returns are assigned to loser portfolio (R1) and stocks with the highest returns are assigned to winner portfolio (R5). (R3) represents the middle portfolio. (R5 – R1) represents the momentum strategy of winners minus losers. K represents the evaluation periods in months = 3, 6, 9 and 12 months. Monthly evaluation returns are computed using the average monthly buy and hold during the evaluation period. *Return* is the geometric average monthly return during the formation period. *Turnover* is the average daily turnover during the formation period. N represents the average number of firms for each portfolio. All return and turnover numbers are in percentages. The t-statistics are reported in parentheses.

J	Portfolio	Returns	Turnover	N	Monthly Returns			
					K=3	K=6	K=9	K=12
3	R1	-4.46	0.62	11.00	0.90 (5.82)*	1.19 (8.28)*	1.72 (11.08)*	1.93 (13.11)*
	R3	0.25	0.81	11.00	1.37 (8.69)*	1.74 (11.80)*	1.94 (14.77)*	2.28 (16.51)*
	R5	6.15	1.61	11.00	1.61 (8.75)*	1.63 (11.27)*	1.78 (13.94)*	2.20 (16.53)*
	R5-R1				0.71 (2.95)*	0.43 (2.12)**	0.06 (0.29)	0.27 (1.37)
6	R1	-3.19	0.44	11.00	1.01 (6.49)*	1.48 (9.17)*	1.73 (10.92)*	2.12 (13.44)*
	R3	0.26	0.74	11.00	1.33 (9.00)*	1.61 (11.81)*	1.94 (14.58)*	2.18 (16.45)*
	R5	4.49	1.54	11.00	1.64 (8.89)*	1.64 (11.60)*	1.90 (14.85)*	2.32 (17.42)*
	R5-R1				0.63 (2.62)*	0.15 (0.72)	0.17 (0.82)	0.21 (1.00)
9	R1	-2.62	0.35	11.00	1.00 (6.30)*	1.28 (8.10)*	1.62 (10.87)*	2.00 (13.81)*
	R3	0.24	0.72	11.00	1.43 (8.33)*	1.70 (12.37)*	2.03 (14.60)*	2.23 (16.41)*
	R5	3.72	1.49	11.00	1.58 (8.68)*	1.69 (11.88)*	2.01 (15.06)	2.51 (17.35)
	R5-R1				0.57 (2.38)*	0.41 (1.91)***	0.39 (1.94)***	0.51 (2.52)**

12	R1	-2.33	0.34	11.00	0.78 (4.97)*	1.16 (8.27)*	1.54 (11.28)*	1.89 (14.20)*
	R3	0.24	0.59	11.00	1.49 (9.16)*	1.76 (12.67)*	2.00 (14.87)*	2.31 (16.31)*
	R5	3.21	1.40	11.00	1.55 (8.16)*	1.70 (11.61)*	2.11 (14.98)*	2.65 (16.79)*
	R5-R1				0.76 (3.09)*	0.54 (2.67)*	0.57 (2.89)*	0.76 (3.66)*

Significance levels: * = 1%, ** = 2%, *** = 10%.

Table 2.2: Returns of Price Momentum Portfolios Based on Three Portfolios.

This table presents the average equal-weighted monthly returns of price momentum for the SSM from January 1993 to December 2005. At the beginning of each month stocks are ranked and grouped into three equal portfolio based on their return during the previous J months= 3, 6, 9 and 12 months. Stocks with the lowest returns are assigned to loser portfolio (R1) and stocks with the highest returns are assigned to winner portfolio (R3). (R2) represents the middle portfolio. (R3 – R1) represents the momentum strategy of winners minus losers. K represents the evaluation periods in months = 3, 6, 9 and 12 months. Monthly evaluation returns are computed using the average monthly buy and hold during the evaluation period. *Return* is the geometric average monthly return during the formation period. *Turnover* is the average daily turnover during the formation period. N represents the average number of firms for each portfolio. All return and turnover numbers are in percentages. The t-statistics are reported in parentheses

J	Portfolio	Return	Turnover	N	Monthly Returns			
					K=3	K=6	K=9	K=12
3	R1	-3.32	0.64	18.00	0.90 (7.62)*	1.29 (11.66)*	1.75 (15.16)*	1.97 (17.67)*
	R2	0.25	0.79	19.00	1.35 (10.89)*	1.67 (15.19)*	1.90 (18.95)*	2.22 (21.29)*
	R3	4.64	1.40	18.00	1.56 (11.21)*	1.61 (15.00)*	1.79 (18.47)*	2.28 (21.96)*
	R3-R1				0.66 (3.59)*	0.32 (2.07)**	0.03 (0.23)	0.31 (2.03)**
6	R1	-2.23	0.49	18.00	0.96 (7.95)*	1.44 (11.83)*	1.71 (14.92)*	2.07 (18.00)*
	R2	0.28	0.84	19.00	1.33 (10.97)*	1.60 (15.19)*	1.89 (18.35)*	2.18 (21.16)*
	R3	3.61	1.56	18.00	1.71 (11.77)*	1.65 (15.45)*	1.95 (19.52)*	2.41 (22.54)*
	R3-R1				0.75 (3.96)*	0.21 (1.29)	0.25 (1.62)	0.33 (2.12)**
9	R1	-1.78	0.45	18.00	1.01 (8.00)*	1.33 (11.05)*	1.65 (14.75)*	2.05 (18.55)*
	R2	0.40	0.82	18.00	1.39 (10.61)*	1.73 (15.45)*	2.03 (18.55)*	2.28 (20.48)*
	R3	3.22	1.70	18.00	1.63 (11.91)*	1.70 (15.91)*	2.06 (20.17)*	2.53 (23.23)*
	R3-R1				0.62 (3.31)*	0.38 (2.34)**	0.41 (2.70)*	0.47 (3.06)*
12	R1	-1.46	0.44	18.00	0.97 (7.36)*	1.31 (11.50)*	1.69 (15.46)*	1.99 (19.04)*
	R2	0.45	0.83	18.00	1.46 (11.41)*	1.79 (15.95)*	2.03 (19.25)*	2.39 (21.79)*
	R3	2.89	1.75	18.00	1.71 (12.17)*	1.88 (15.97)*	2.24 (19.61)*	2.68 (22.12)*
	R3-R1				0.74 (3.82)*	0.57 (3.46)*	0.56 (3.52)*	0.69 (4.32)*

Significance levels: * = 1%, ** = 2%, *** = 10%.

Table 2.3: Returns of Price Momentum Portfolios from January 1993 to June 1999.

This table presents the average equal-weighted monthly returns of price momentum for the SSM from January 1993 to June 1999. At the beginning of each month stocks are ranked and grouped into five equal portfolio based on their return during the previous J months= 3, 6, 9 and 12 months. Stocks with the lowest returns are assigned to loser portfolio (R1) and stocks with the highest returns are assigned to winner portfolio (R5). (R3) represents the middle portfolio. (R5 – R1) represents the momentum strategy of winners minus losers. K represents the evaluation periods in months = 3, 6, 9 and 12 months. Monthly evaluation returns are computed using the average monthly buy and hold during the evaluation period. *Return* is the geometric average monthly return during the formation period. *Turnover* is the average daily turnover during the formation period .N represents the average number of firms for each portfolio. All return and turnover numbers are in percentages. The t-statistics are reported in parentheses.

J	Portfolio	Return	Turnover	N	Monthly Returns			
					K=3	K=6	K=9	K=12
3	R1	-5.77	0.21	9	-0.82 (-4.67)*	-0.72 (-5.77)*	-0.74 (-7.07)*	-0.67 (-7.95)*
	R3	-1.30	0.18	10	-0.74 (-4.25)*	-0.48 (-3.91)*	-0.41 (-3.95)*	-0.40 (-4.55)*
	R5	3.38	0.23	9	-0.40 (-2.16)**	-0.25 (-1.94)**	-0.17 (-1.63)*	-0.16 (-1.73)**
	R5-R1				0.42 (1.66)***	0.48 (2.64)*	0.57 (3.87)*	0.51 (4.00)*
6	R1	-4.58	0.18	9	-0.90 (-4.95)*	-0.81 (-6.38)*	-0.74 (-6.85)*	-0.59 (-6.79)*
	R3	-1.36	0.19	10	-0.54 (-3.46)*	-0.46 (-3.94)*	-0.40 (-4.20)*	-0.36 (-4.32)*
	R5	2.13	0.23	9	-0.24 (-1.17)	-0.18 (-1.35)*	-0.10 (-0.93)	-0.07 (-0.68)
	R5-R1				0.66 (2.43)**	0.63 (3.45)*	0.64 (4.18)	0.52 (4.05)*
9	R1	-4.01	0.18	9	-1.10 (-6.02)*	-0.92 (-7.07)*	-0.75 (-6.77)	-0.63 (-7.06)*
	R3	-1.28	0.20	10	-0.48 (-2.80)*	-0.45 (-3.77)*	-0.32 (-3.38)	-0.31 (-3.75)*
	R5	1.64	0.25	9	-0.25 (-1.29)	-0.09 (-0.69)	-0.01 (-0.09)	0.00 (0.01)
	R5-R1				0.86 (3.22)*	0.83 (4.42)*	0.74 (4.68)	0.63 (4.72)*
12	R1	-3.63	0.19	9	-1.21 (-6.39)*	-0.96 (-7.28)*	-0.80 (-7.29)	-0.65 (-7.24)*
	R3	-1.21	0.20	10	-0.64 (-3.71)*	-0.35 (-2.76)*	-0.29 (-2.90)	-0.30 (-3.52)*

R5	1.34	0.26	9	-0.29 (-1.46)	-0.09 (-0.62)	-0.01 (-0.10)	-0.01 (-0.11)
R5-R1				0.92 (3.37)*	0.87 (4.57)*	0.79 (4.85)	0.64 (4.68)*

Significance levels: * = 1%, ** = 2%, *** = 10%.

Table 2.4: Returns of Price Momentum Portfolios from July 1999 to December 2005.

This table presents the average equal-weighted monthly returns of price momentum for the SSM from July 1999 to December 2005. At the beginning of each month stocks are ranked and grouped into five equally-weighted portfolios based on their returns during the previous J months = 3, 6, 9 and 12 months. Stocks with the lowest returns are assigned to loser portfolio (R1) and stocks with the highest returns are assigned to winner portfolio (R5). (R3) represents the middle portfolio. (R5 – R1) represents the momentum strategy of winners minus losers. K represents evaluation periods in months = 3, 6, 9 and 12 months. Monthly evaluation returns are computed using the average monthly buy and hold during the evaluation period. *Return* is the geometric average monthly return during the formation period. *Turnover* is the average daily turnover during the formation period. N represents the average number of firms for each portfolio. All return and turnover numbers are in percentages. The t-statistics are reported in parentheses.

J	Portfolio	Return	Turnover	N	Monthly Returns			
					K=3	K=6	K=9	K=12
3	R1	-3.32	0.98	12	2.38 (10.26)*	2.84 (12.36)	3.83 (15.22)	4.17 (17.57)*
	R3	1.60	1.36	13	3.21 (13.62)*	3.66 (15.62)	3.99 (19.53)	4.62 (21.28)*
	R5	8.57	2.81	12	3.36 (11.55)*	3.26 (14.11)	3.47 (17.09)	4.26 (20.27)*
	R5-R1				0.98 (2.62)*	0.42 (1.28)	-0.36 (-1.11)	0.09 (0.29)
6	R1	-2.03	0.65	12	2.60 (11.54)*	3.39 (13.11)	3.79 (14.91)	4.38 (17.26)*
	R3	1.62	1.21	13	2.89 (12.96)*	3.36 (15.76)	3.90 (18.68)	4.31 (20.84)*
	R5	6.47	2.64	12	3.21 (11.44)*	3.16 (14.28)	3.57 (18.02)	4.33 (20.90)*
	R5-R1				0.61 (1.70)**	-0.23 (-0.69)	-0.22 (-0.68)	-0.05 (-0.14)
9	R1	-1.50	0.49	12	2.70 (11.82)*	3.06 (12.33)	3.54 (15.23)	4.12 (18.37)*
	R3	1.48	1.14	13	2.98 (11.16)*	3.44 (16.30)	3.94 (18.07)	4.29 (20.30)*
	R5	5.40	2.49	12	3.05 (10.96)*	3.12 (14.22)	3.64 (17.70)	4.54 (20.19)*
	R5-R1				0.34 (1.32)	0.06 (0.31)	0.10 (0.19)	0.42 (0.96)
12	R1	-1.30	0.45	12	2.35 (10.52)*	2.82 (13.47)	3.37 (16.44)	3.87 (19.47)*
	R3	1.38	0.89	13	3.16 (13.09)*	3.41 (16.22)	3.79 (18.45)	4.35 (19.87)*
	R5	4.68	2.28	12	2.98	3.10	3.77	4.72

R5-R1	(10.27)*	(13.74)	(17.52)	(19.29)*
	0.63	0.28	0.39	0.85
	(1.73)***	(0.92)	(1.32)	(2.68)*

Significance levels: * = 1%, ** = 2%, *** = 10%.

Table 2.5: Returns of Portfolios Based on 5 Price Momentum and 3 Turnover Portfolios.

This table presents the average equal-weighted monthly returns of portfolios based on price momentum and turnover for the SSM from January 1993 to December 2005. At the beginning of each month stocks are ranked and grouped into five equally-weighted portfolios based on their returns during the previous J months= 3, 6, 9 and 12 months. Stocks with the lowest returns are assigned to loser portfolio (R1) and stocks with the highest returns are assigned to loser portfolio (R1). (R3) represents the middle portfolio. (R5- R1) represents the momentum strategy of winners minus losers. Stocks are then independently sorted into three equal-weighted portfolios based on their average daily turnover during previous J months. Stocks with the lowest turnover are assigned to low volume portfolio (T1) and stocks with the highest turnover are assigned to high volume portfolio (T3). (T2) represents the middle portfolio. The intersections from the two independent sorting procedures result in 15 price momentum-volume portfolios for each J/K strategy. K represents evaluation periods in months = 3, 6, 9 and 12 months. Monthly evaluations returns are computed using the average monthly buy and hold during the evaluation period. The monthly returns are reported in percentage.

J	Port.	K3				K6				K9				K12			
		T1	T2	T3	T3-T1	T1	T2	T3	T3-T1	T1	T2	T3	T3-T1	T1	T2	T3	T3-T1
3	R1	1.08 (4.70)	0.61 (2.31)	1.03 (3.24)	-0.05 (-0.14)	1.17 (4.76)	0.89 (4.26)	1.56 (5.28)	0.40 (1.05)	1.60 (5.91)	1.39 (6.29)	2.22 (7.07)	0.63 (1.52)	1.66 (6.90)	1.82 (8.38)	2.38 (7.63)	0.72 (1.84)
	R3	1.06 (5.12)	0.95 (4.22)	2.16 (5.82)	1.10 (2.64)	1.50 (7.19)	1.31 (5.90)	2.44 (7.48)	0.94 (2.47)	1.79 (8.84)	1.76 (7.79)	2.31 (8.99)	0.52 (1.60)	2.16 (9.89)	1.98 (9.50)	2.74 (9.46)	0.58 (1.61)
	R5	0.84 (3.12)	2.08 (6.20)	1.79 (5.58)	0.94 (2.10)	0.99 (5.11)	2.29 (7.42)	1.57 (6.91)	0.57 (1.80)	1.12 (6.09)	2.21 (8.70)	1.90 (9.12)	0.78 (2.64)	1.22 (7.12)	2.55 (9.59)	2.61 (11.65)	1.39 (4.53)
	R5-R1	-0.24 (-0.68)	1.47 (3.50)	0.76 (1.64)	1.00 (3.38)	-0.17 (-0.54)	1.39 (3.80)	0.00 (0.01)	0.18 (0.72)	-0.48 (-1.40)	0.82 (2.43)	-0.33 (-0.90)	0.15 (0.62)	-0.44 (-1.43)	0.73 (2.14)	0.24 (0.63)	0.68 (2.77)
6	R1	1.39 (5.82)	0.50 (2.11)	1.17 (3.45)	-0.22 (-0.53)	1.64 (6.15)	1.00 (4.45)	1.91 (5.26)	0.27 (0.61)	1.93 (6.82)	1.27 (5.89)	2.06 (6.21)	0.13 (0.29)	2.29 (8.67)	1.79 (7.67)	2.32 (6.97)	0.02 (0.06)
	R3	1.37 (7.02)	0.76 (3.17)	1.90 (5.74)	0.53 (1.43)	1.59 (8.72)	1.03 (4.66)	2.28 (7.47)	0.69 (2.00)	1.86 (9.67)	1.50 (7.31)	2.51 (8.55)	0.66 (1.92)	2.04 (10.45)	1.97 (9.15)	2.58 (9.16)	0.54 (1.61)
	R5	1.16 (3.74)	2.07 (6.21)	1.63 (5.42)	0.47 (1.03)	1.16 (4.81)	2.14 (7.82)	1.58 (7.23)	0.42 (1.24)	1.07 (5.65)	2.31 (9.32)	2.12 (10.22)	1.05 (3.48)	1.40 (6.41)	2.60 (10.24)	2.71 (12.76)	1.31 (4.09)
	R5-R1	-0.23 (0.59)	1.57 (3.90)	0.46 (0.99)	0.68 (2.27)	-0.48 (-1.29)	1.15 (3.27)	-0.33 (-0.83)	0.15 (0.54)	-0.87 (-2.39)	1.04 (3.17)	0.06 (0.17)	0.93 (3.61)	-0.89 (-2.50)	0.81 (2.34)	0.39 (1.04)	1.28 (4.99)

9	R1	1.63 (6.50)	0.57 (2.23)	0.84 (2.55)	-0.79 (-1.93)	1.76 (6.46)	0.95 (4.13)	1.16 (3.48)	-0.59 (-1.39)	2.12 (8.10)	1.31 (5.64)	1.46 (5.03)	-0.66 (-1.71)	2.50 (10.44)	1.72 (7.59)	1.76 (6.02)	-0.74 (-1.99)
	R3	1.19 (5.99)	0.99 (4.02)	2.16 (5.14)	0.98 (2.16)	1.40 (8.14)	1.47 (6.89)	2.27 (7.16)	0.87 (2.47)	1.73 (8.97)	1.80 (8.88)	2.59 (8.19)	0.86 (2.38)	2.02 (9.80)	2.07 (9.84)	2.62 (9.13)	0.60 (1.71)
	R5	1.34 (3.89)	1.87 (6.11)	1.51 (5.18)	0.18 (0.39)	1.28 (5.05)	1.95 (8.00)	1.76 (7.52)	0.48 (1.34)	1.31 (5.79)	2.21 (9.63)	2.30 (10.33)	0.99 (2.95)	1.61 (5.84)	2.60 (10.89)	3.00 (12.88)	1.38 (3.76)
	R5-R1	-0.29 (-0.69)	1.31 (3.31)	0.67 (1.50)	0.96 (3.15)	-0.48 (-1.26)	1.00 (2.97)	0.59 (1.50)	1.07 (3.94)	-0.81 (-2.27)	0.90 (2.74)	0.84 (2.33)	1.65 (6.57)	-0.89 (-2.44)	0.88 (2.65)	1.24 (3.32)	2.13 (8.21)
12	R1	1.50 (6.25)	0.26 (1.08)	0.65 (1.91)	-0.85 (-2.08)	1.56 (8.81)	0.66 (2.93)	1.35 (4.19)	-0.21 (-0.60)	2.12 (11.82)	0.95 (4.47)	1.66 (5.23)	-0.46 (-1.31)	2.64 (13.83)	1.32 (6.31)	1.78 (6.10)	-0.86 (-2.52)
	R3	1.21 (5.69)	1.43 (5.62)	1.89 (5.00)	0.68 (1.62)	1.57 (7.85)	1.67 (7.74)	2.08 (6.75)	0.51 (1.43)	1.81 (8.90)	1.95 (9.44)	2.27 (7.83)	0.47 (1.35)	2.10 (9.72)	2.42 (10.95)	2.45 (8.10)	0.34 (0.95)
	R5	1.26 (3.80)	1.26 (4.03)	1.93 (6.00)	0.67 (1.40)	1.26 (5.02)	1.76 (7.09)	1.94 (7.84)	0.67 (1.83)	1.50 (5.71)	2.07 (8.94)	2.53 (10.93)	1.04 (2.90)	1.85 (5.64)	2.17 (9.87)	3.49 (13.54)	1.64 (3.96)
	R5-R1	-0.25 (-0.62)	1.00 (2.56)	1.28 (2.65)	1.53 (4.83)	-0.30 (-0.99)	1.10 (3.26)	0.59 (1.47)	0.89 (3.48)	-0.63 (-2.02)	1.12 (3.54)	0.87 (2.28)	1.50 (6.00)	-0.79 (-2.17)	0.85 (2.77)	1.71 (4.33)	2.50 (9.28)

Table 2.6: Descriptive Statistics for Portfolios Based on 5 Price Momentum and 3 Turnover Portfolios.

This table presents the descriptive statistics of portfolios that are created based on the intersection five price momentum portfolios and three volume portfolios for the SSM from January 1993 to December 2005. Stocks with the lowest returns are assigned to loser portfolio (R1) and stocks with the highest returns are assigned to loser portfolio (R1). (R3) represents the middle portfolio. Stocks with the lowest turnover are assigned to low volume portfolio (T1) and stocks with the highest turnover are assigned to high volume portfolio (T3). (T2) represents the middle portfolio. J (K) represents the formation (evaluation) periods in month = 3, 6, 9 and 12 months. Return represents the geometric average monthly returns during the formation period. Turnover represents the average daily turnovers during the formation period. N represents the average number of stocks in each portfolio. Return and turnover are reported in percentage.

J	Portfolio	Return	T1			T2			T3		
			Volume	N	Return	Volume	N	Return	Volume	N	
3	R1	-3.74	0.055	4	-4.50	0.382	4	-5.23	1.558	3	
	R3	0.13	0.052	4	0.41	0.428	4	0.22	2.047	4	
	R5	3.64	0.035	3	5.71	0.454	3	8.16	3.510	5	
6	R1	-2.68	0.062	4	-3.30	0.305	4	-3.67	1.071	3	
	R3	0.21	0.056	4	0.32	0.441	4	0.25	1.875	3	
	R5	2.73	0.037	3	4.30	0.421	3	5.71	3.254	5	
9	R1	-2.02	0.065	4	-2.87	0.261	4	-3.00	0.816	3	
	R3	0.21	0.062	4	0.36	0.460	4	0.15	1.710	3	
	R5	2.38	0.040	3	3.71	0.405	3	4.56	3.134	5	
12	R1	-1.68	0.064	4	-2.66	0.230	4	-2.63	0.787	3	
	R3	0.12	0.059	4	0.49	0.478	4	0.12	1.336	3	
	R5	2.06	0.042	3	3.26	0.389	3	3.92	2.964	5	

Table 2.7: Returns of Portfolios Based on 3 Price Momentum and 3 Turnover Portfolios.

This table presents the average equal-weighted monthly returns of portfolio based on price momentum and turnover for the SSM from January 1993 to December 2005. At the beginning of each month stocks are ranked and grouped into three equally-weighted portfolios based on their return during the previous J months= 3, 6, 9 and 12 months. Stocks with the lowest returns are assigned to loser portfolio (R1) and stocks with the highest returns are assigned to loser portfolio (R1). (R3) represents the middle portfolio. (R5-R1) represents the momentum strategy of winners minus losers. Stocks are then independently sorted into three equally-weighted portfolios based on their average daily turnover during previous J months. Stocks are then independently sorted into three equal weighted portfolio based on average daily turnover during previous J months. Stocks with the lowest turnover are assigned to low volume portfolio (T1) and stocks with the highest turnover are assigned to high volume portfolio (T3). (T2) resents the middle portfolio. The intersections from the two independent sorting procedures result in 15 price momentum-volume portfolios for each J/K strategy. K represents evaluation periods in months = 3, 6, 9 and 12 months Monthly evaluations returns are computed using the average monthly buy and hold during the evaluation period. The monthly returns are reported in percentage.

J	Port.	K3				K6				K9				K12			
		T1	T2	T3	T3-T1	T1	T2	T3	T3-T1	T1	T2	T3	T3-T1	T1	T2	T3	T3-T1
3	R1	1.04	0.52	1.20	0.15	1.21	0.88	1.87	0.66	1.58	1.40	2.36	0.78	1.72	1.78	2.47	0.75
		(5.99)	(2.77)	(4.67)	(0.51)	(7.04)	(5.63)	(7.50)	(2.21)	(8.26)	(8.64)	(9.45)	(2.52)	(9.33)	(10.88)	(10.55)	(2.55)
	R2	1.19	1.06	1.82	0.63	1.55	1.35	2.14	0.59	1.71	1.78	2.23	0.52	2.05	2.09	2.53	0.48
		(7.06)	(5.72)	(6.50)	(1.95)	(9.71)	(8.14)	(8.90)	(2.08)	(11.57)	(10.58)	(10.95)	(2.09)	(13.07)	(12.53)	(11.72)	(1.82)
R3	0.93	1.78	1.88	0.95	1.15	2.08	1.58	0.43	1.33	2.02	1.95	0.62	1.59	2.43	2.70	1.11	
	(4.86)	(7.18)	(7.21)	(2.82)	(7.99)	(9.51)	(8.71)	(1.80)	(9.67)	(11.10)	(11.37)	(2.72)	(10.65)	(13.00)	(14.32)	(4.45)	
R3-R1	-0.12	1.26	0.68	0.80	-0.06	1.20	-0.28	-0.22	-0.25	0.62	-0.41	-0.16	-0.13	0.65	0.22	0.36	
	(-0.45)	(4.10)	(1.84)	(3.43)	(-0.26)	(4.50)	(-0.94)	(-1.16)	(-1.04)	(2.56)	(-1.40)	(-0.84)	(-0.55)	(2.65)	(0.76)	(1.83)	
6	R1	1.16	0.68	1.07	-0.09	1.34	1.18	1.87	0.53	1.70	1.50	1.98	0.28	2.09	1.92	2.25	0.16
		(6.69)	(3.69)	(3.96)	(-0.29)	(7.33)	(6.91)	(6.61)	(1.61)	(8.77)	(9.01)	(8.20)	(0.93)	(11.27)	(11.06)	(9.14)	(0.53)
	R2	1.20	1.01	1.82	0.62	1.41	1.31	2.12	0.71	1.70	1.64	2.37	0.67	1.86	2.11	2.60	0.74
		(7.09)	(5.25)	(6.83)	(2.01)	(10.04)	(7.50)	(9.22)	(2.68)	(11.60)	(9.93)	(10.67)	(2.58)	(12.83)	(12.57)	(11.80)	(2.88)
R3	1.07	1.78	2.13	1.06	1.25	1.88	1.76	0.51	1.31	2.11	2.32	1.01	1.60	2.46	2.98	1.38	
	(5.02)	(7.62)	(7.70)	(2.89)	(7.18)	(9.82)	(9.64)	(1.99)	(8.41)	(12.20)	(12.94)	(4.12)	(8.88)	(13.82)	(15.93)	(5.21)	
R3-R1	-0.09	1.10	1.06	1.15	-0.09	0.70	-0.11	-0.02	-0.39	0.61	0.34	0.73	-0.49	0.54	0.73	1.22	
	(-0.33)	(3.72)	(2.68)	(4.74)	(-0.36)	(2.73)	(-0.33)	(-0.07)	(-1.54)	(2.55)	(1.16)	(3.76)	(-1.90)	(2.18)	(2.41)	(6.12)	

9	R1	1.20	0.74	1.14	-0.06	1.49	1.08	1.45	-0.04	1.93	1.46	1.57	-0.36	2.31	1.96	1.88	-0.42
		(6.63)	(3.84)	(3.98)	(-0.19)	(8.01)	(6.12)	(5.43)	(-0.12)	(10.13)	(8.27)	(7.21)	(-1.23)	(13.15)	(11.17)	(8.26)	(-1.49)
	R2	1.35	0.97	1.92	0.56	1.66	1.31	2.26	0.60	1.95	1.68	2.52	0.57	2.20	2.05	2.65	0.45
		(7.60)	(5.09)	(6.11)	(1.62)	(10.35)	(8.10)	(8.77)	(2.03)	(11.62)	(10.88)	(10.19)	(1.97)	(12.41)	(12.65)	(10.93)	(1.53)
	R3	1.19	1.74	1.87	0.68	1.22	1.84	1.96	0.74	1.27	2.13	2.58	1.30	1.49	2.51	3.30	1.81
		(5.36)	(7.86)	(7.53)	(1.97)	(7.08)	(9.86)	(10.44)	(2.81)	(8.46)	(12.23)	(13.91)	(5.19)	(8.80)	(14.10)	(16.82)	(6.68)
	R3- R1	-0.01	1.00	0.73	0.74	-0.27	0.76	0.51	0.78	-0.66	0.67	1.00	1.66	-0.82	0.55	1.42	2.23
		(-0.05)	(3.42)	(1.92)	(3.07)	(-1.07)	(2.94)	(1.60)	(3.77)	(-2.67)	(2.68)	(3.51)	(8.67)	(-3.34)	(2.20)	(4.71)	(11.32)
12	R1	1.43	0.53	1.04	-0.38	1.69	0.89	1.44	-0.26	2.19	1.22	1.74	-0.46	2.62	1.62	1.78	-0.85
		(7.65)	(2.77)	(3.39)	(-1.08)	(9.85)	(5.13)	(5.76)	(-0.85)	(12.57)	(7.34)	(7.56)	(-1.60)	(16.18)	(10.06)	(8.04)	(-3.11)
	R2	1.23	1.37	1.81	0.59	1.60	1.71	2.10	0.51	1.81	1.98	2.33	0.52	2.20	2.40	2.59	0.39
		(6.83)	(6.78)	(6.48)	(1.81)	(9.48)	(9.76)	(8.79)	(1.76)	(11.59)	(12.37)	(10.18)	(1.90)	(13.00)	(14.23)	(11.25)	(1.39)
	R3	1.34	1.49	2.19	0.85	1.39	1.89	2.26	0.87	1.64	2.15	2.81	1.17	1.76	2.36	3.69	1.93
		(5.97)	(6.71)	(8.26)	(2.38)	(7.57)	(9.91)	(10.23)	(2.92)	(8.28)	(12.07)	(13.52)	(4.01)	(8.28)	(13.54)	(16.49)	(6.13)
	R3- R1	-0.09	0.96	1.15	1.23	-0.30	1.00	0.82	1.12	-0.56	0.94	1.07	1.63	-0.86	0.74	1.91	2.77
		(-0.30)	(3.30)	(2.83)	(4.90)	(-1.19)	(3.88)	(2.47)	(5.33)	(-2.11)	(3.85)	(3.45)	(7.97)	(-3.23)	(3.10)	(5.98)	(13.25)

Table 2.8: Descriptive Statistics Portfolios Based on 3 Price Momentum and 3 Turnover Portfolios.

This table presents the descriptive statistics of portfolios that are created based on the intersection three price momentum portfolios and three volume portfolios for the SSM from January 1993 to December 2005. Stocks with the lowest returns are assigned to loser portfolio (R1) and stocks with the highest returns are assigned to loser portfolio (R1). (R3) represents the middle portfolio. Stocks with the lowest turnover are assigned to low volume portfolio (T1) and stocks with the highest turnover are assigned to high volume portfolio (T3). (T2) represents the middle portfolio. J (K) represents the formation (evaluation) periods in month = 3, 6, 9 and 12 months. Return represents the geometric average monthly returns during the formation period. Turnover represents the average daily turnover during the formation period. N represents the average number of stocks in each portfolio. Return and turnover are reported in percentage

J	Portfolio	Return	T1			T2			T3		
			Volume	N	Return	Volume	N	Return	Volume	N	
3	R1	-2.73	0.055	6	-3.32	0.374	7	-3.98	1.601	5	
	R2	0.18	0.050	6	0.34	0.418	6	0.22	1.966	6	
	R3	2.80	0.041	6	4.26	0.422	6	6.43	3.313	7	
6	R1	-1.91	0.062	6	-2.44	0.344	7	-2.84	1.133	5	
	R2	0.13	0.054	7	0.31	0.416	6	0.27	1.986	6	
	R3	2.06	0.041	5	3.33	0.450	6	4.55	3.181	7	
9	R1	-1.47	0.063	6	-2.16	0.296	7	-2.29	0.955	5	
	R2	0.19	0.062	7	0.35	0.440	6	0.15	1.746	6	
	R3	1.65	0.041	5	2.99	0.438	6	3.74	3.071	7	
12	R1	-1.20	0.066	6	-2.02	0.275	7	-2.07	0.837	5	
	R2	0.09	0.060	7	0.46	0.454	6	0.13	1.458	6	
	R3	1.49	0.043	5	2.47	0.393	6	3.37	3.067	7	

Table 2.9: Returns of Portfolios Based on 3 Price Momentum and 5 Turnover Portfolios.

This table presents the average equal-weighted monthly returns of portfolios based on price momentum and turnover for the SSM from January 1993 to December 2005. At the beginning of each month stocks are ranked and grouped into three equally-weighted portfolios based on their return during the previous J months= 3, 6, 9 and 12 months. Stocks with the lowest returns are assigned to loser portfolio (R1) and stocks with the highest returns are assigned to winner portfolio (R3). (R2) represents the middle portfolio. (R3-R1) represents the momentum strategy of winners minus losers. Stocks are then independently sorted into five equally-weighted portfolios based on average daily turnover during previous J months. Stocks are then independently sorted into three equal weighted portfolio based on their average daily turnover during previous J months. Stocks with the lowest turnover are assigned to low volume portfolio (T1) and stocks with the highest turnover are assigned to high volume portfolio (T3). (T2) represents the middle portfolio. The intersections from the two independent sorting procedures result in 15 price momentum-volume portfolios for each J/K strategy. K represents evaluation periods in months = 3, 6, 9 and 12 months Monthly evaluations returns are computed using the average monthly buy and hold during the evaluation period. The monthly returns are reported in percenta

J	Port.	K3				K6				K9				K12			
		T1	T3	T5	T5-T1	T1	T3	T5	T5-T1	T1	T3	T5	T5-T1	T1	T3	T5	T5-T1
3	R1	1.16	0.64	1.24	0.07	1.38	0.90	1.71	0.32	1.83	1.28	2.26	0.43	1.91	1.71	2.41	0.50
		(5.06)	(2.54)	(3.50)	(0.18)	(5.58)	(4.30)	(5.41)	(0.82)	(6.57)	(6.15)	(6.92)	(1.02)	(7.60)	(8.00)	(7.70)	(1.26)
	R2	1.10	1.00	2.42	1.32	1.17	1.43	2.53	1.37	1.27	1.93	2.36	1.10	1.49	2.15	2.53	1.03
		(5.20)	(4.50)	(5.45)	(2.81)	(7.10)	(6.66)	(6.75)	(3.49)	(8.44)	(8.69)	(7.87)	(3.39)	(10.15)	(10.25)	(8.54)	(3.26)
R3	0.73	1.92	1.87	1.14	0.99	2.09	1.71	0.72	1.23	2.13	2.15	0.92	1.57	2.65	3.02	1.45	
	(3.11)	(5.69)	(5.35)	(2.51)	(6.07)	(7.47)	(6.86)	(2.22)	(7.99)	(9.16)	(9.27)	(3.04)	(8.17)	(11.04)	(11.71)	(4.21)	
R3-R1	-0.44	1.27	0.63	1.07	-0.39	1.19	0.00	0.40	-0.60	0.85	-0.11	0.49	-0.34	0.95	0.61	0.95	
	(-1.33)	(3.07)	(1.24)	(3.48)	(-1.28)	(3.45)	(0.01)	(1.57)	(-1.81)	(2.72)	(-0.29)	(1.90)	(-1.04)	(2.97)	(1.52)	(3.65)	
6	R1	1.51	0.58	0.68	-0.83	1.71	1.07	1.48	-0.23	2.13	1.43	1.42	-0.71	2.40	1.81	1.54	-0.87
		(6.29)	(2.30)	(1.85)	(-1.94)	(6.08)	(4.85)	(3.76)	(-0.49)	(7.06)	(6.66)	(4.67)	(-1.63)	(8.69)	(8.68)	(5.10)	(-2.12)
	R2	1.08	1.04	2.18	1.11	1.23	1.33	2.36	1.13	1.46	1.70	2.71	1.26	1.62	2.15	2.92	1.29
		(5.88)	(4.02)	(5.59)	(2.69)	(7.73)	(5.77)	(7.39)	(3.30)	(8.52)	(7.93)	(8.51)	(3.62)	(9.10)	(9.82)	(9.18)	(3.68)
	R3	0.60	1.78	2.46	1.85	0.85	1.75	1.97	1.12	1.05	1.98	2.51	1.45	1.32	2.24	3.27	1.95
		(2.50)	(6.26)	(6.24)	(3.62)	(4.89)	(7.25)	(7.85)	(3.34)	(6.15)	(8.74)	(10.47)	(4.53)	(6.27)	(9.85)	(12.76)	(5.52)
	R3-R1	-0.91	1.19	1.77	2.68	-0.86	0.68	0.49	1.35	-1.08	0.55	1.08	2.16	-1.08	0.43	1.74	2.82
		(-2.66)	(3.14)	(3.10)	(7.97)	(-2.53)	(2.07)	(1.11)	(4.82)	(-3.01)	(1.75)	(2.80)	(8.27)	(-3.07)	(1.40)	(4.33)	(10.61)

9	R1	1.57 (6.19)	1.02 (3.78)	1.22 (3.05)	-0.34 (-0.75)	1.88 (6.77)	1.20 (5.10)	1.37 (3.66)	-0.51 (-1.12)	2.33 (8.23)	1.49 (6.63)	1.21 (4.20)	-1.12 (-2.75)	2.66 (10.93)	1.94 (9.00)	1.32 (4.41)	-1.34 (-3.52)
	R2	1.34 (5.49)	0.78 (3.29)	2.22 (4.88)	0.88 (1.76)	1.47 (7.06)	1.30 (6.13)	2.27 (6.62)	0.80 (2.04)	1.67 (7.14)	1.70 (8.30)	2.58 (7.84)	0.91 (2.30)	1.82 (7.19)	2.03 (9.49)	2.71 (8.20)	0.89 (2.16)
	R3	0.75 (3.37)	1.61 (6.28)	2.06 (6.13)	1.31 (2.98)	0.89 (5.29)	1.85 (7.29)	2.26 (8.76)	1.37 (4.09)	1.01 (6.99)	2.13 (8.68)	2.85 (11.31)	1.84 (5.73)	1.18 (8.58)	2.27 (9.80)	3.70 (14.07)	2.52 (7.58)
	R3-R1	-0.82 (-2.41)	0.59 (1.57)	0.84 (1.58)	1.65 (5.26)	-1.00 (-3.02)	0.64 (1.85)	0.89 (2.01)	1.89 (6.88)	-1.32 (-4.07)	0.64 (1.91)	1.64 (4.19)	2.96 (11.75)	-1.48 (-5.18)	0.33 (1.05)	2.38 (5.83)	3.86 (15.55)
12	R1	1.65 (6.80)	0.88 (3.36)	0.82 (1.78)	-0.83 (-1.70)	1.92 (8.25)	1.10 (5.03)	0.93 (2.92)	-0.99 (-2.56)	2.37 (9.86)	1.32 (6.26)	1.14 (4.07)	-1.24 (-3.36)	2.67 (13.14)	1.82 (8.87)	0.96 (3.61)	-1.72 (-5.23)
	R2	0.93 (3.74)	1.33 (5.36)	2.42 (5.81)	1.49 (3.11)	1.28 (5.37)	1.80 (7.98)	2.49 (7.12)	1.21 (2.90)	1.44 (6.57)	2.08 (9.75)	2.68 (8.20)	1.24 (3.18)	1.76 (7.54)	2.51 (11.21)	2.81 (8.38)	1.04 (2.58)
	R3	1.18 (4.68)	1.53 (5.37)	2.31 (6.60)	1.14 (2.45)	1.35 (6.43)	2.04 (7.73)	2.59 (8.72)	1.24 (-2.29)	1.56 (6.91)	2.31 (9.20)	3.19 (11.60)	1.63 (4.36)	1.74 (6.87)	2.41 (10.01)	4.17 (14.21)	2.43 (5.99)
	R3-R1	-0.47 (-1.35)	0.65 (1.69)	1.50 (2.60)	1.97 (5.91)	-0.58 (-1.83)	0.94 (2.75)	1.65 (3.62)	2.23 (8.13)	-0.82 (-2.47)	1.00 (3.06)	2.05 (4.94)	2.87 (10.95)	-0.93 (-2.89)	0.59 (1.88)	3.21 (7.47)	4.14 (15.60)

Table 2.10: Descriptive Statistics Portfolios Based on 3 Price Momentum and 3 Turnover Portfolios

This table presents the descriptive statistics for portfolios based that are created based on intersection three price momentum portfolios and three volume portfolios for the SSM from January 1993 to December 2005. Stocks with the lowest returns are assigned to loser portfolio (R1) and stocks with the highest returns are assigned to winner portfolio (R3). (R2) represents the middle portfolio. Stocks with the lowest turnover are assigned to low volume portfolio (T1) and stocks with the highest turnover are assigned to high volume portfolio (T3). (T2) represents the middle portfolio. J (K) represents the formation (evaluation) periods in month = 3, 6, 9 and 12 months. Return represents the geometric average monthly returns during the formation period. Turnover represents the average daily turnover during the formation period. N represents the average number of stocks in each portfolio. Return and turnover are reported in percentage

J	Portfolio	Return	T1			T3			T5		
			Volume	N	Return	Volume	N	Return	Volume	N	
3	R1	-2.93	0.030	4	-3.48	0.335	4	-4.04	2.014	3	
	R2	0.14	0.026	4	0.36	0.420	4	-0.02	2.473	4	
	R3	2.85	0.024	3	4.31	0.412	3	6.93	4.449	4	
6	R1	-2.00	0.037	4	-2.54	0.330	4	-2.86	1.189	3	
	R2	0.00	0.030	4	0.43	0.421	4	0.22	2.586	3	
	R3	2.00	0.024	3	3.36	0.399	3	4.80	4.244	4	
9	R1	-1.48	0.041	3	-2.11	0.308	4	-2.41	0.99	3	
	R2	-2.41	0.992	4	0.06	0.031	4	0.22	2.197	3	
	R3	1.56	0.024	3	2.80	0.386	3	3.94	4.083	4	
12	R1	-1.20	0.042	3	-1.99	0.275	4	-2.07	0.911	3	
	R2	-0.01	0.030	3	0.53	0.414	3	0.19	1.804	3	
	R3	1.32	0.025	3	2.27	0.337	3	3.34	3.886	4	

Table 2.11: Returns of Portfolios Based on Price Momentum and Turnover from January 1993 to June 1999.

This table presents the average equal-weighted monthly returns for portfolio based on price momentum and turnover for the SSM from January 1993 to June 1999. At the beginning of each month stocks are ranked and grouped into five equally-weighted portfolios based on their returns during the previous J months= 3, 6, 9 and 12 months. Stocks with the lowest returns are assigned to loser portfolio (R1) and stocks with the highest returns are assigned to loser portfolio (R1). (R3) represents the middle portfolio. (R5 – R1) represents the momentum strategy of winners minus losers. Stocks are then independently sorted into three equal weighted portfolio based on their average daily turnover during previous J months. Stocks with the lowest turnover are assigned to low volume portfolio (T1) and stocks with the highest turnover are assigned to high volume portfolio (T3). (T2) resents the middle portfolio. The intersections from the two independent sorting procedures result in 15 price momentum-volume portfolios for each J/K strategy. K represents evaluation periods in months = 3, 6, 9 and 12 months Monthly evaluations returns are computed using the average monthly buy and hold during the evaluation period. The monthly returns are reported in percentage.

J	Port.	K3				K6				K9				K12			
		T1	T2	T3	T3-T1	T1	T2	T3	T3-T1	T1	T2	T3	T3-T1	T1	T2	T3	T3-T1
3	R1	-0.40 (-1.33)	-1.17 (-4.44)	-0.82 (-2.36)	-0.42 (-0.91)	-0.62 (-3.05)	-0.78 (-3.48)	-0.76 (-3.45)	-0.14 (-0.46)	-0.64 (-3.65)	-0.80 (-4.19)	-0.75 (-4.45)	-0.12 (-0.48)	-0.62 (-4.38)	-0.59 (-4.01)	-0.81 (-5.47)	-0.19 (-0.95)
	R3	-0.60 (-2.22)	-0.88 (-3.38)	-0.76 (-2.09)	-0.16 (-0.35)	-0.31 (-1.51)	-0.68 (-3.37)	-0.45 (-2.02)	-0.14 (-0.46)	-0.10 (-0.50)	-0.54 (-2.87)	-0.60 (-3.86)	-0.50 (-2.01)	-0.06 (-0.35)	-0.55 (-3.45)	-0.61 (-4.42)	-0.55 (-2.61)
	R5	-0.44 (-1.66)	0.15 (0.45)	-0.83 (-2.36)	-0.39 (-0.89)	0.00 (0.02)	0.04 (0.17)	-0.76 (-3.38)	-0.76 (-2.59)	0.07 (0.42)	0.10 (0.51)	-0.64 (-3.89)	-0.72 (-2.98)	0.19 (1.17)	0.09 (0.48)	-0.75 (-5.72)	-0.94 (-4.45)
	R5-R1	-0.04 (-0.09)	1.33 (3.11)	0.00 (-0.01)	0.03 (0.10)	0.63 (2.24)	0.82 (2.42)	0.00 (0.01)	-0.62 (-2.95)	0.71 (2.85)	0.91 (3.26)	0.11 (0.46)	-0.60 (-3.51)	0.81 (3.66)	0.68 (2.87)	0.07 (0.34)	-0.75 (-5.03)
6	R1	-0.77 (-2.18)	-1.16 (-4.54)	-0.70 (-1.97)	0.07 (0.13)	-0.82 (-3.75)	-0.97 (-4.77)	-0.60 (-2.59)	0.22 (0.67)	-0.77 (-4.13)	-0.85 (-4.52)	-0.59 (-3.28)	0.17 (0.67)	-0.64 (-4.19)	-0.52 (-3.59)	-0.63 (-4.18)	0.01 (0.04)
	R3	-0.15 (-0.63)	-0.92 (-3.61)	-0.54 (-1.71)	-0.39 (-0.98)	-0.06 (-0.31)	-0.86 (-4.66)	-0.46 (-2.08)	-0.39 (-1.30)	0.02 (0.13)	-0.67 (-4.38)	-0.53 (-3.61)	-0.55 (-2.34)	0.12 (0.80)	-0.60 (-4.43)	-0.59 (-4.12)	-0.71 (-3.43)
	R5	0.32 (0.96)	-0.19 (-0.61)	-0.87 (-2.22)	-1.19 (-2.32)	0.27 (1.22)	0.10 (0.43)	-0.89 (-3.92)	-1.16 (-3.65)	0.21 (1.13)	0.27 (1.29)	-0.76 (-4.83)	-0.97 (-3.97)	0.29 (1.73)	0.30 (1.55)	-0.76 (-6.09)	-1.05 (-5.03)
	R5-R1	1.09 (2.21)	0.97 (2.42)	-0.17 (-0.31)	-1.26 (-3.47)	1.09 (3.40)	1.06 (3.51)	-0.29 (-0.89)	-1.38 (-6.07)	0.97 (3.63)	1.12 (3.95)	-0.17 (-0.70)	-1.14 (-6.41)	0.92 (3.97)	0.83 (3.46)	-0.13 (-0.69)	-1.06 (-7.06)

9	R1	-0.79 (-2.41)	-1.32 (-5.01)	-1.05 (-2.86)	-0.25 (-0.49)	-1.01 (-4.02)	-0.85 (-4.11)	-0.95 (-4.24)	0.06 (0.18)	-0.83 (-4.21)	-0.73 (-3.81)	-0.74 (-4.12)	0.09 (0.35)	-0.62 (-4.12)	-0.51 (-3.40)	-0.79 (-5.27)	-0.17 (-0.76)
	R3	0.21 (0.85)	-0.90 (-3.12)	-0.78 (-2.32)	-0.99 (-2.36)	0.03 (0.15)	-0.50 (-2.52)	-0.86 (-4.42)	-0.89 (-3.09)	0.19 (1.06)	-0.36 (-2.21)	-0.80 (-5.41)	-0.99 (-4.27)	0.22 (1.43)	-0.46 (-3.36)	-0.70 (-5.41)	-0.92 (-4.57)
	R5	0.50 (1.44)	-0.32 (-1.05)	-0.97 (-2.96)	-1.47 (-3.07)	0.55 (2.34)	0.02 (0.08)	-0.86 (-4.22)	-1.42 (-4.51)	0.48 (2.38)	0.21 (0.92)	-0.70 (-4.42)	-1.18 (-4.58)	0.41 (2.50)	0.18 (0.95)	-0.57 (-3.49)	-0.98 (-4.23)
	R5-R1	1.29 (2.55)	1.00 (2.45)	0.08 (0.17)	-1.21 (-3.47)	1.56 (4.37)	0.87 (2.69)	0.08 (0.28)	-1.47 (-6.43)	1.31 (4.42)	0.93 (3.15)	0.04 (0.15)	-1.27 (-6.85)	1.03 (4.35)	0.69 (2.89)	0.22 (0.98)	-0.81 (-5.05)
12	R1	-0.86 (-2.18)	-1.10 (-3.89)	-1.60 (-4.78)	-0.74 (-1.42)	-1.05 (-4.16)	-0.88 (-4.09)	-1.02 (-4.66)	0.03 (0.09)	-0.73 (-3.96)	-0.80 (-4.09)	-0.85 (-5.28)	-0.12 (-0.48)	-0.50 (-3.35)	-0.60 (-3.93)	-0.82 (-5.61)	-0.31 (-1.46)
	R3	-0.23 (-0.79)	-0.84 (-2.61)	-0.91 (-3.21)	-0.68 (-1.68)	0.08 (0.38)	-0.44 (-1.82)	-0.73 (-3.55)	-0.81 (-2.78)	0.16 (0.89)	-0.36 (-1.87)	-0.73 (-4.96)	-0.89 (-3.81)	0.23 (1.58)	-0.38 (-2.42)	-0.80 (-6.58)	-1.03 (-5.36)
	R5	0.49 (1.44)	-0.40 (-1.13)	-1.05 (-3.28)	-1.55 (-3.28)	0.60 (2.47)	0.10 (0.38)	-0.99 (-4.85)	-1.59 (-4.96)	0.52 (2.70)	0.21 (0.89)	-0.77 (-4.05)	-1.30 (-4.75)	0.37 (2.30)	0.29 (1.34)	-0.68 (-4.43)	-1.05 (-4.70)
	R5- R1	1.36 (2.51)	0.70 (1.57)	0.55 (1.18)	-0.81 (-2.33)	1.65 (4.45)	0.97 (2.88)	0.03 (0.10)	-1.62 (-7.00)	1.25 (4.33)	1.00 (3.28)	0.08 (0.31)	-1.18 (-6.28)	0.87 (3.65)	0.89 (3.45)	0.14 (0.67)	-0.73 (-4.69)

Table 2.12: Returns of Portfolios Based on Price Momentum and Turnover from July 1999 to December 2005.

This table presents the average equal-weighted monthly returns for portfolio based on price momentum and turnover for the SSM from July 1999 to December 2005. At the beginning of each month stocks are ranked and grouped into five equally-weighted portfolios based on their returns during the previous J months= 3, 6, 9 and 12 months. Stocks with the lowest returns are assigned to loser portfolio (R1) and stocks with the highest returns are assigned to loser portfolio (R1). (R3) represents the middle portfolio. (R5-R1) represents the momentum strategy of winners minus losers. Stocks are then independently sorted into three equal weighted portfolio based on their average daily turnover during previous J months. Stocks with the lowest turnover are assigned to low volume portfolio (T1) and stocks with the highest turnover are assigned to high volume portfolio (T3). (T2) represents the middle portfolio. The intersections from the two independent sorting procedures would result in 15 price momentum-volume portfolios for each J/K strategy. K represents evaluation periods in months = 3, 6, 9 and 12 months. Monthly evaluations returns are computed using the average monthly buy and hold during the evaluation period. The monthly returns are reported in percentage.

J	Port.	K3				K6				K9				K12			
		T1	T2	T3	T3-T1	T1	T2	T3	T3-T1	T1	T2	T3	T3-T1	T1	T2	T3	T3-T1
3	R1	2.07	2.32	2.90	0.83	2.36	2.50	3.91	1.55	3.09	3.51	5.23	2.14	3.18	4.14	5.59	2.41
		(6.58)	(5.50)	(5.78)	(1.47)	(6.38)	(7.75)	(7.72)	(2.53)	(7.43)	(10.10)	(9.68)	(3.19)	(8.70)	(11.92)	(10.61)	(3.88)
	R3	2.43	2.42	5.08	2.65	2.99	2.91	5.34	2.35	3.33	3.61	5.21	1.88	3.98	4.02	6.09	2.11
		(8.54)	(7.49)	(8.53)	(4.24)	(9.46)	(8.64)	(9.59)	(3.83)	(10.95)	(10.56)	(12.55)	(3.72)	(11.63)	(13.18)	(12.75)	(3.67)
	R5	2.75	3.63	3.45	0.70	2.47	4.10	3.04	0.58	2.68	3.92	3.52	0.84	2.75	4.54	4.75	2.00
(5.37)		(7.01)	(7.60)	(0.91)	(6.77)	(8.37)	(9.49)	(1.07)	(7.77)	(9.77)	(11.87)	(1.67)	(8.74)	(10.91)	(15.21)	(3.89)	
R5-R1	0.68	1.32	0.55	-0.13	0.11	1.60	-0.86	-0.97	-0.41	0.41	-1.71	-1.30	-0.43	0.40	-0.84	-0.41	
	(1.20)	(1.98)	(0.78)	(-0.28)	(0.19)	(2.74)	(-1.51)	(-2.47)	(-0.66)	(0.78)	(-3.02)	(-3.22)	(-0.79)	(0.74)	(-1.47)	(-1.06)	
6	R1	2.53	2.17	3.30	0.77	2.94	2.96	4.76	1.82	3.36	3.39	5.07	1.71	3.84	4.10	5.66	1.82
		(8.56)	(5.76)	(5.83)	(1.33)	(7.91)	(8.19)	(7.07)	(2.57)	(8.38)	(9.90)	(8.30)	(2.43)	(10.40)	(10.37)	(9.34)	(2.71)
	R3	2.48	2.23	4.18	1.70	2.80	2.69	4.84	2.04	3.20	3.41	5.36	2.16	3.44	4.22	5.53	2.09
		(9.10)	(6.05)	(7.90)	(3.05)	(10.89)	(7.61)	(9.63)	(3.85)	(11.37)	(10.69)	(11.00)	(4.05)	(11.62)	(12.73)	(12.23)	(4.02)
	R5	2.45	4.01	3.04	0.58	2.53	3.90	2.97	0.43	2.39	4.05	3.74	1.35	3.12	4.57	4.66	1.54
(4.20)		(7.63)	(7.59)	(0.79)	(5.18)	(8.83)	(10.06)	(0.77)	(6.59)	(10.43)	(13.25)	(2.66)	(6.75)	(11.44)	(16.56)	(2.87)	
R5-R1	-0.08	1.84	-0.27	-0.19	-0.40	0.94	-1.79	-1.39	-0.97	0.66	-1.33	-0.36	-0.73	0.46	-1.00	-0.27	
	(-0.13)	(2.89)	(-0.38)	(-0.43)	(-0.63)	(1.66)	(-2.84)	(-3.28)	(-1.53)	(1.29)	(-2.26)	(-0.88)	(-1.16)	(0.82)	(-1.72)	(-0.68)	

9	R1	2.75	2.50	2.91	0.16	3.04	2.79	3.47	0.43	3.49	3.39	3.85	0.36	3.95	4.01	4.54	0.59
		(8.75)	(6.16)	(5.56)	(0.27)	(8.46)	(7.31)	(5.65)	(0.65)	(10.06)	(8.77)	(7.39)	(0.60)	(12.63)	(10.39)	(8.74)	(1.04)
	R3	1.93	2.41	4.90	2.97	2.44	2.96	5.18	2.73	2.91	3.42	5.76	2.85	3.41	3.98	5.71	2.30
		(6.80)	(6.85)	(6.92)	(4.14)	(10.28)	(9.39)	(9.97)	(5.06)	(9.90)	(11.42)	(11.06)	(4.96)	(10.54)	(12.83)	(12.37)	(4.18)
	R5	2.65	3.52	2.90	0.25	2.42	3.39	3.22	0.80	2.62	3.72	3.98	1.35	3.51	4.42	4.99	1.48
		(3.88)	(7.69)	(7.22)	(0.32)	(4.63)	(9.51)	(9.95)	(1.30)	(5.56)	(11.08)	(13.02)	(2.35)	(5.53)	(12.53)	(16.12)	(2.32)
	R5-R1	-0.10	1.02	-0.01	0.09	-0.62	0.60	-0.25	0.37	-0.87	0.33	0.12	0.99	-0.45	0.41	0.44	0.89
		(-0.15)	(1.68)	(-0.01)	(0.20)	(-0.98)	(1.15)	(-0.40)	(0.88)	(-1.44)	(0.64)	(0.21)	(2.55)	(-0.71)	(0.78)	(0.77)	(2.23)
12	R1	2.52	1.70	2.88	0.36	2.68	2.29	3.69	1.01	3.35	2.80	4.14	0.79	3.99	3.36	4.35	0.36
		(9.00)	(4.43)	(5.26)	(0.64)	(13.51)	(5.99)	(6.64)	(1.98)	(16.00)	(7.97)	(7.42)	(1.53)	(17.66)	(9.36)	(8.69)	(0.73)
	R3	2.34	2.99	4.42	2.08	2.74	3.11	4.62	1.88	3.09	3.53	4.99	1.89	3.57	4.33	5.38	1.81
		(8.09)	(8.84)	(7.03)	(3.23)	(9.04)	(10.59)	(9.20)	(3.35)	(9.84)	(12.31)	(10.58)	(3.46)	(10.31)	(14.08)	(10.94)	(3.10)
	R5	2.40	2.43	3.55	1.15	2.26	2.94	3.53	1.27	2.96	3.38	4.33	1.37	4.06	3.50	5.75	1.69
		(3.77)	(5.29)	(8.00)	(1.42)	(4.48)	(8.06)	(10.40)	(2.02)	(5.20)	(10.11)	(14.15)	(2.27)	(5.42)	(11.06)	(17.05)	(2.37)
	R5-R1	-0.12	0.73	0.67	0.79	-0.42	0.65	-0.16	0.26	-0.39	0.58	0.19	0.58	0.07	0.15	1.40	1.33
		(-0.20)	(1.22)	(0.92)	(1.66)	(-0.93)	(1.23)	(-0.26)	(0.67)	(-0.78)	(1.20)	(0.32)	(1.50)	(0.12)	(0.31)	(2.38)	(3.15)

Table 2.13: Returns of Momentum Portfolios Based on 52 Week-High Price Based on 3 Portfolios.

This table presents the average equal-weighted monthly returns of portfolios that are created based on 52 week-high price for all the firms in the SSM during the period from January 1993 to December 2005. At the beginning of each month stocks are sorted into three equally-weighted portfolios according to the ratio of the current price to its 52 week high. Stocks with the lowest ratio (furthest from the 52-week high price) are assigned to the loser portfolio (R1). Stocks with the highest ratio (closest to the 52-week high price) are assigned to the winner portfolio (R3). (R3-R1) represents the 52 week-high price momentum strategy of winner –loser portfolio. K represents monthly evaluation periods (J = 3, 6, 9 and 12 months). Monthly evaluation returns are computed using the average monthly buy and hold during the evaluation period. The t-statistics are reported in parentheses. The monthly returns are reported in percentage.

J	Portfolio	Monthly Returns			
		K=3	K=6	K=9	K=12
52 Week-High Price	R1	1.37 (8.95)*	1.65 (12.37)*	2.16 (16.22)*	2.62 (18.92)*
	R2	1.36 (10.44)*	1.73 (15.28)*	2.04 (19.13)*	2.42 (22.26)*
	R3	1.42 (12.49)*	1.62 (17.23)*	1.75 (21.06)*	2.00 (24.57)*
	R3-R1	0.050 (0.26)	-0.031 (-0.19)	-0.407 (-2.61)*	-0.624 (-3.90)*

Significance levels: * = 1%, ** = 2%, *** = 10%.

Table 2.14: Returns of Momentum Portfolios Based on 52 Week-High Price Based on 5 Portfolios.

This table presents the average equal-weighted monthly returns of portfolios that are created based on 52 week-high price for all the firms in the SSM during the period from January 1993 to December 2005. At the beginning of each month stocks are ranked to five equally-weighted portfolios according to the ratio of the current price to its 52 week high. Stocks with the lowest ratio (furthest from the 52-week high price) are assigned to the loser portfolio (R1). Stocks with the highest ratio (closest to the 52-week high price) are assigned to the winner portfolio (R5). (R5-R1) represents the 52 week momentum strategy of winner –loser portfolio. K represents monthly evaluation period = 3, 6, 9 and 12 months. Monthly evaluation return is computed using the average monthly buy and hold during the evaluation period. The t-statistics are reported in parentheses. The monthly returns are reported in percentage.

J	Portfolio	Monthly Returns			
		K=3	K=6	K=9	K=12
52 Week-High Price	R1	1.30 (6.79)*	1.61 (9.10)*	2.16 (11.92)*	2.63 (13.95)*
	R2	1.36 (7.11)*	1.71 (10.34)*	2.11 (13.86)*	2.56 (16.31)*
	R3	1.36 (8.21)*	1.71 (11.77)*	2.05 (14.42)*	2.44 (16.70)*
	R4	1.58 (10.05)*	1.83 (14.44)*	1.90 (16.91)*	2.12 (19.43)*
	R5	1.30 (8.89)*	1.48 (12.58)*	1.69 (16.15)*	2.00 (18.81)*
	R5-R1	0.0008 (0.00)	-0.126 (-0.59)	-0.464 (-2.23)**	-0.635 (-2.94)*

Significance levels: * = 1%, ** = 2%, *** = 10%.

Table 2.15: Returns of Momentum Portfolios Based on 52 Week-High Price from January 1993 to June 1999.

This table presents the average equal-weighted monthly returns from portfolios that are created based on 52 week-high price for all the firms in the SSM during the period January 1993 to June 1999. At the beginning of each month stocks are ranked to three equally-weighted portfolios according to the ratio of the current price to its 52 week high. Stocks with the lowest ratio (furthest from the 52-week high price) are assigned to the loser portfolio (R1). Stocks with the highest ratio (closest to the 52-week high price) are assigned to the winner portfolio (R5). (R3-R1) represents the 52 week momentum strategy of winner –loser portfolio. K represents monthly evaluation period = 3, 6, 9 and 12 months. Monthly evaluation return is computed using the average monthly buy and hold during the evaluation period. The t-statistics are reported in parentheses. The monthly returns are reported in percentage.

J	Portfolio	Monthly Returns			
		K=3	K=6	K=9	K=12
52 Week-High Price	R1	-1.00 (-6.89)*	-0.84 (-8.70)*	-0.69 (-8.97)*	-0.61 (-9.10)*
	R2	-0.79 (-6.04)*	-0.46 (-4.96)*	-0.40 (-4.99)*	-0.37 (-5.27)*
	R3	-0.25 (-1.78)**	-0.04 (-0.36)	0.10 (1.17)	0.14 (1.90)***
	R3-R1	0.753 (3.77)*	0.800 (5.77)*	0.787 (6.89)*	0.749 (7.58)*

Significance levels: * = 1%, ** = 2%, *** = 10%.

Table 2.16: Returns of Momentum Portfolios Based on 52 Week-High Price from July 1999 to December 2005.

This table presents the average equally-weighted monthly returns of portfolio that are created based on 52 week-high price for all the firms in the SSM during the period July 1999 to December 2005. At the beginning of each month stocks are ranked to three equally-weighted portfolios according to the ratio of the current price to its 52 week high. Stocks with the lowest ratio (furthest from the 52-week high price) are assigned to the loser portfolio (R1). Stocks with the highest ratio (closest to the 52-week high price) are assigned to the winner portfolio (R3). (R3-R1) represents the 52 week momentum strategy of winner –loser portfolio. K represents monthly evaluation period = 3, 6, 9 and 12 months. Monthly evaluation return is computed using the average monthly buy and hold during the evaluation period. The t-statistics are reported in parentheses. The monthly returns are reported in percentage.

J	Portfolio	Monthly Returns			
		K=3	K=6	K=9	K=12
52-Week High Price	R1	3.25 (13.69)*	3.62 (17.11)*	4.41 (20.94)*	5.18 (23.77)*
	R2	3.04 (15.51)*	3.45 (19.75)*	3.96 (24.50)*	4.62 (28.17)*
	R3	2.75 (16.76)*	2.95 (21.15)*	3.07 (25.14)*	3.48 (29.06)*
	R3-R1	-0.50 (-1.72)***	-0.68 (-2.68)*	-1.34 (-5.53)*	-1.70 (-6.87)*

Significance levels: * = 1%, ** = 2%, *** = 10%.