INSTITUTIONAL OWNERSHIP, EQUITY RETURN AND PRICE MOMENTUM ANOMALY

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Abstract

This paper examines whether momentum profit and institutional holdings are related. The empirical result shows that after controlled for the size effect, momentum profits are positively related to institutional holdings, especially for small-capitalization firms. Our finding confirms that institution investors tend to have positive-feedback trading in smaller firms. Furthermore, we find that the equity return is positively related to the institutional trading, which supports the hypothesis that institutional investors are better informed than individual investors.

Keywords: Momentum, Institutional Holding, Positive-Feedback Trading

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1. Introduction

Numerous studies show that momentum trading strategy is consistently profitable in different stock markets (Jegadeesh and Titman, 1993; Rouwenhorst 1998, 1999). Since momentum strategy is against the efficient market hypothesis, it has attracted substantial research. While some researchers believe that momentum profits come from the compensation for bearing systematic risk (Conrad and Kaul, 1998; Chordia and Shivakumar, 2002), others argue that behavioral model, such as under-reaction, can explain the momentum effect (Hong *et al.*, 2000; Jegadeesh and Titman, 2001). If under-reaction to firm specific information causes the momentum, momentum should be related to various proxies for the quality and type of information generated about the company; and to the relative amounts of information disclosed publicly and generated privately (Jegadeesh and Titman, 2001).

In recent years, several empirical studies have tried to find the key characteristics of firms for momentum effect. For instance, Jegadeesh and Titman (1993) report that smaller firms have stronger momentum. Lesmond *et al. (*2004) show that the price level of stocks is the most important cross-sectional predicator of momentum. Hong *et al.* (2000) indicate that after controlling for sizes, firms followed by fewer stock analysts have greater momentum. However, little research has considered the effect of institutional ownership on momentum although institutional investors play an important role in the equity market.

Our research tries to fill this gap in the literature. According to Gompers and Mertick (2001), institutional investors hold over half of the market value of common stocks in the United States. It is believed that institutional investors are more sophisticated than individual investors since institutions have superior access to information from companies. Therefore, stock prices of firms with higher institutional ownership should reflect these firms' information faster and momentum effect in these firms should be lower due to lower probability of under-reaction to information. From this point, momentum effect might be negatively related to the institutional ownership.

On the other hand, some studies have shown that institutional investors tend to have feedback trading and herding behaviors and that the post-herding return is positively related to the change of institutional holding (Nofsinger and Sias, 1999; Burch and Swaminathan, 2001; Sias, 2004). These findings imply that firms with higher institutional ownership might have stronger momentum profits. Since institutional ownership has two conflicting ways to affect momentum of stocks, our goal is to find out the dominant one empirically and to clarify the relationship between the price momentum and institutional ownership.

The rest of the paper is organized as followings: Section 2 presents relevant literature about momentum and relationship between institutional trading and equity returns. Section 3 explains the resource of data and methodology. Section 4 reports the empirical evidence on the relation of momentum

and institutional ownership. The last section summarizes the result.

2. Literature Review

2.1 Cross-Section Determinants of Momentum

Jegadeesh and Titman (1993) document that stocks have momentum profits in three to twelve months over the period from 1965 to 1989. They find that momentum profits are not due to the systematic risk or delayed stock price reaction to common factors. According to their research, small firms tend to have greater momentum. Daniel and Titman (1999) report that momentum effects are stronger for growth stocks than value stocks and claim that it is easier to evaluate value stocks than growth stocks. Since investors tend to be more overconfident about their ability to interpret ambiguous information, momentum effect is stronger in growth stocks.

Hong *et al.* (2000) test the gradual-information-diffusion model of Hong and Stein (1999) and report that the profitability of momentum strategies declines with firm size. Furthermore, stocks with low analyst exhibit higher momentum profit after controlling for size. Lee and Swaminathan (2000) investigate the relation between momentum profits and stock turnover and show that past trading volume could predict both the magnitude and persistence of price momentum. Lesmond *et al.* (2004) confirm that stocks with higher transaction cost tend to generate larger momentum profits. They contend that momentum strategies require frequent trading in high cost securities and such trading cost might prevent profitability of these strategies. Arena *et al.* (2008) show that stocks with high idiosyncratic volatility have greater momentum returns than low idiosyncratic volatility stocks.

2.2 Institution Investor and Equity Return

In financial literatures, institutional ownership of stocks has been widely used as a proxy for investor sophistication. Institutional investors usually have relative advantage in gathering and processing information than individual investors. Previous research shows that investment behaviors of institutional investors might be different from those of individual investors. For example, institutional portfolio managers are monitored by the common rule "prudent man" and may have special demand for stock characteristics.

Badrinath *et al.* (1995) show that returns on the portfolio of stocks with higher institutional ownership lead the returns on the portfolio of stocks with lower institutional ownership even the firm size is controlled. Gompers and Metrick (2001) find that institutional investors tend to buy large companies and double the share of stock market from 1980 to 1996. These investors contribute to the price increase in large firms and the level of institutional holding can help to forecast the future returns.

Sias and Starks (1997) confirm that securities with higher institutional ownership reflect market-wide information prior to securities with lower institutional ownership. According to their research, institutional holding level could be seen as a proxy for institutional trading and institutional investors have a greater marginal influence on the price of high institutional holding firms. Nofsinger and Sias (1999) report a strong positive correlation between changes in institutional ownership and contemporaneous returns. They suggest that institutional herding might be not irrational since they find no evidence of return reversal in the two years following the herding period. Further analysis suggests that institutional investor engage in positive-feedback trading which is largely restricted to smaller firms.

Burch and Swaminathan (2001) investigate how institutions trade in response to price momentum and earnings momentum. They find that institutions engage on momentum trading over the subsequent three quarters in response to past returns but not past earning news. They also show that momentum is stronger when past returns are accompanied by earning news of the same sign. Sias (2004) investigates the behavior of institution herding and demonstrates that the fraction of institution buying this quarter is positively related to the fraction of institution buying last quarter. Furthermore, he finds that institutional investors are more likely to herd in smaller firms. Since informational cascades are more likely in smaller firms, he concludes that institutional herding mainly results from institutions' inferring information from each other's trading.

3. Data and Methodology

Our sample consists of all firms on the New York Stock Exchange (NYSE) and American Stock Exchange (AMEX). We exclude NASDAQ firms because most of them are smaller than firms in NYSE and AMEX. We also eliminate prime, closed-end fund, real estate investment trust, American Depository Receipt and foreign companies. In addition, our sample is restricted to common stocks which have complete monthly return series in the CRSP database and institutional ownership in the CDA/Spectrum for the period 1980-2004. CDA/Spectrum classifies all institutional investors into five types: (1) bank (2) insurance company (3) investment company (4) investment advisor and (5) other institutional investor. At the end of each quarter, we divide each firm's aggregated institutional holdings by the number of shares outstanding to calculate the percentage of holding by institutions. Also, firm characteristics come from COMPUSTAT database.

Table I shows the average institutional ownership and firm size of our sample each year. As Table I indicates, both the average institutional holding and firm size increase dramatically over the past 25 years. By December 2004, the average institutional holding is 54.7% which highlights the important influence of institutional investors. Table I also suggests that level of institution ownership is positively related to firm size because the correlation coefficients between institutional holding and natural log of firm size almost exceed 0.6. To focus on the role of institutional holding, we use the procedures in Badrinath and Noe (1995) to control for firm size.

At the beginning of each period, firms are first sorted into five portfolios based on their sizes (capitalization). The first portfolio consists of firms with the smallest size and the fifth with the biggest size. Within each of the five size-based portfolios, firms are sorted again into ten portfolios according to the level of their institutional ownerships. Therefore, each of the five size portfolios is divided into ten institutional-holding-based portfolios. Finally, firms of the lowest institutional holding portfolio in each of the five size-based portfolios are rearranged into a new portfolio (portfolio H1). Firms of the second lowest institutional holding portfolio in each size-based portfolio are recollected into the next new portfolio (portfolio H2), and so on. With this method, we can create ten portfolios (H1 to H10) which have similar firm size but different institutional holding levels. Specifically, the institutional holding level in portfolio H1 will be lower than that in portfolio H2 and portfolio H10 will have the highest institutional holding level.

Table I. Descriptive Statistics for Sample

Year	No. of Firms	Mean Institutional Holding	Mean Size (millions)	Correlation Coefficient
1980	1879	0.210	629	0.656
1981	1908	0.216	570	0.641
1982	1928	0.228	646	0.673
1983	1991	0.240	751	0.653
1984	2000	0.264	731	0.660
1985	1952	0.289	918	0.663
1986	1920	0.300	1030	0.630
1987	1971	0.312	1005	0.642
1988	1953	0.310	1112	0.650
1989	1908	0.312	1388	0.614
1990	1920	0.337	1274	0.632
1991	1965	0.344	1635	0.633
1992	2054	0.358	1710	0.635
1993	2124	0.373	1839	0.615
1994	2175	0.386	1775	0.599
1995	2194	0.403	2323	0.597
1996	2297	0.398	2700	0.588
1997	2330	0.426	3487	0.614
1998	2362	0.426	3994	0.601
1999	2260	0.446	4733	0.592
2000	2093	0.437	5113	0.637
2001	1964	0.462	4945	0.646
2002	1920	0.502	4115	0.645
2003	1849	0.527	5297	0.638
2004	1832	0.547	5937	0.643

This table reports the descriptive statistics of our samples. The correlation coefficient is calculated from institutional holding fraction and natural log of firm size. Mean sizes are in millions.

As for the measurement of momentum, we follow the methodology of Jegadeesh and Titman (1993) to operate the relative-strength trading. Our research focuses on the difference of monthly returns between the extreme winner and loser deciles over the three-, six-, nine- and twelve-month holding periods. Although they sort firms into ten deciles based on the past returns, we only sort our sample into three portfolios according to their past performance. Since our purpose is to investigate the relationship between momentum profits and institutional holding level, we need to sort the sample by size or institutional holding into ten sub-samples respectively. If we also follow their ten-class classification in the past returns, the universe of our sample will be expanded into 100 portfolios. Thus, the number of firms in each portfolio might become too small and each portfolio will lack enough diversification.

4. Empirical Results

4.1 Size-Based Price Momentum

Since institutional holding are related to the firm size, we begin our analysis of momentum in firm size. Hong *et al.* (2000) suggest that investors can obtain more momentum profits in small to mid-sized firms. We repeat a similar experiment over the period from January 1980 to December 2004. Each month, all firms are sorted into ten size-based quintiles on the base of their previous three-, six-, nine- and twelve-month size. Portfolio S1 contains the smallest firms and Portfolio S10 contains the largest firms. Within each decile, firms are grouped into three portfolio based on their monthly raw return over the past three, six, nine and twelve months respectively. Portfolio P1 contains the worst-performance firms and portfolio P3 contains the best-performance firms. Within each

portfolio, stocks are equally weighted and held for three, six, nine and twelve months respectively. The time-series average monthly returns for all portfolios are calculated respectively with overlapping past portfolios and P3-P1 is used to measure the momentum profit.

Table II reports the relation between momentum and firm size. As shown in the second columns of panel B and Panel C, there is significant momentum in the full sample for the 6-month and 9-month periods. The relative-strength strategy which buys past winner (P3) and shorts past loser (P1) generates 0.384% per month in the next six-month holding period and 0.403% per month in the next nine-month holding period. The next columns reveal the relation between momentum and firm size. Consistent with the previous literature, Table II and Figure 1 show a negative relation between momentum profits and firm size except the smallest stocks whose momentum is actually negative. According to Hong *et al.* (2000), this negative momentum is due to the fact that these smallest firms may have limited investor participation, which can cause more pronounced supply-shock-induced reversal.

Figure 1. Momentum Profit and Firm Size

This figure reveals the relationship between momentum profits (P3-P1) and firm size. Portfolio S1 contains the smallest firms and S10 contains the largest firms.

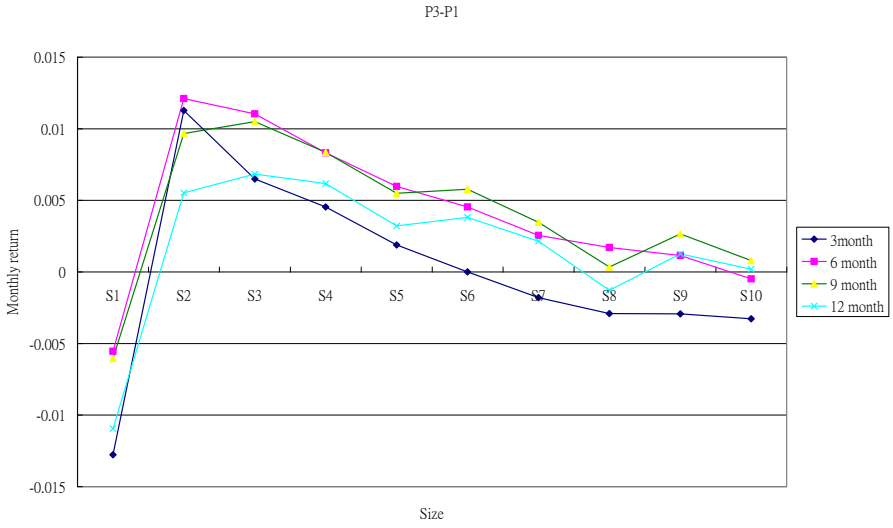

Table II. Momentum Strategies Sorted by Size (1980-2004)

Panel A: 3 Month (K=3)											
		Size Class									
Past	All	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
P1	0.01317	0.02774	0.00386	0.00888	0.01022	0.01164	0.01239	0.01419	0.01458	0.01401	0.01354
	(3.71)	(4.05)	(0.89)	(2.21)	(2.72)	(3.16)	(3.57)	(4.35)	(4.42)	(4.42)	(4.69)
P2	0.01384	0.01771	0.01265	0.01318	0.01342	0.01479	0.01356	0.01427	0.01357	0.01306	0.01201
	(5.51)	(4.32)	(4.24)	(4.72)	(4.73)	(5.12)	(4.93)	(5.47)	(5.17)	(5.14)	(4.84)
P3	0.01292	0.01496	0.01513	0.01537	0.01476	0.01352	0.01239	0.01240	0.01167	0.01108	0.01026
	(4.68)	(3.73)	(4.68)	(4.98)	(4.62)	(4.36)	(4.11)	(4.29)	(4.23)	(4.13)	(3.94)
P3-P1	-0.00025	-0.01278	0.01127	0.00649	0.00454	0.00188	0.00000	-0.00180	-0.00291	-0.00293	-0.00328
	(-0.13)	(-3.01)***	(4.59)***	(2.88)***	(2.31)**	(0.99)	(0.00)	(-1.04)	(-1.55)*	(-1.60)*	(-1.76)**
Median Size		10	29	60	110	203	368	672	1233	2540	8316
Median IH		5.9%	11.8%	19.4%	27.6%	35.6%	41.3%	45.3%	50.3%	54.3%	54.4%
Panel B: 6 Month (K=6)											
		Size Class									

Past	All	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
P1	0.01072	0.02432	0.00416	0.00551	0.00728	0.00883	0.00955	0.01099	0.01191	0.01159	0.01197
	(3.02)	(3.65)	(0.93)	(1.38)	(1.87)	(2.38)	(2.69)	(3.42)	(3.68)	(3.61)	(4.08)
P2	0.01354	0.01848	0.01258	0.01262	0.01332	0.01364	0.01390	0.01356	0.01355	0.01307	0.01191
	(5.39)	(4.71)	(4.34)	(4.53)	(4.67)	(4.76)	(5.11)	(5.26)	(5.03)	(5.09)	(4.75)
P3	0.01456	0.01877	0.01627	0.01655	0.01561	0.01481	0.01408	0.01354	0.01361	0.01274	0.01149
	(5.27)	(4.96)	(5.20)	(5.43)	(5.06)	(4.72)	(4.66)	(4.68)	(4.77)	(4.63)	(4.29)
P3-P1	0.00384	-0.00555	0.01211	0.01104	0.00832	0.00598	0.00453	0.00255	0.00170	0.00115	-0.00048
	(1.85)**	(-1.32)*	(4.64)***	(4.77)***	(3.72)***	(2.99)***	(2.41)***	(1.46)*	(0.89)	(0.58)	(-0.25)
Median Size		10	30	61	111	203	370	672	1230	2521	8111
Median IH		6.0%	12.0%	20.0%	27.4%	35.2%	40.6%	44.6%	49.7%	53.7%	53.8%

Panel C: 9 Month (K=9)

		Size Class									
Past	All	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
P1	0.01087	0.02562	0.00684	0.00573	0.00728	0.00873	0.00916	0.01040	0.01229	0.01095	0.01113
	(3.06)	(3.89)	(1.53)	(1.44)	(1.85)	(2.30)	(2.57)	(3.19)	(3.69)	(3.34)	(3.71)
P2	0.01326	0.01930	0.01275	0.01313	0.01283	0.01339	0.01345	0.01319	0.01316	0.01287	0.01166
	(5.27)	(5.09)	(4.45)	(4.62)	(4.48)	(4.70)	(4.97)	(5.14)	(4.99)	(5.03)	(4.63)
P3	0.01490	0.01956	0.01650	0.01623	0.01564	0.01422	0.01493	0.01386	0.01263	0.01360	0.01192
	(5.40)	(5.17)	(5.15)	(5.32)	(5.05)	(4.52)	(4.96)	(4.83)	(4.44)	(4.91)	(4.45)
P3-P1	0.00403	-0.00606	0.00966	0.01049	0.00836	0.00549	0.00577	0.00346	0.00034	0.00265	0.00079
	(2.03)**	(-1.46)*	(3.81)***	(4.75)***	(3.59)***	(2.66)***	(3.06)***	(1.93)**	(0.18)	(1.31)*	(0.42)
Median Size		11	32	64	116	214	387	699	1275	2631	8566
Median IH		6.5%	12.7%	21.0%	28.9%	36.4%	42.5%	45.9%	51.1%	54.7%	54.6%

Panel D: 12 Month (K=12)

		Size Class									
Past	All	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
P1	0.01203	0.02806	0.00902	0.00755	0.00843	0.00985	0.00987	0.01061	0.01307	0.01194	0.01157
	(3.36)	(4.21)	(1.96)	(1.90)	(2.14)	(2.60)	(2.77)	(3.25)	(3.93)	(3.67)	(3.85)
P2	0.01295	0.01890	0.01265	0.01277	0.01234	0.01317	0.01308	0.01307	0.01263	0.01243	0.01181
	(5.14)	(5.12)	(4.38)	(4.55)	(4.30)	(4.61)	(4.87)	(5.10)	(4.80)	(4.84)	(4.67)
P3	0.01368	0.01710	0.01455	0.01438	0.01459	0.01307	0.01367	0.01276	0.01178	0.01320	0.01175
	(4.94)	(4.76)	(4.68)	(4.77)	(4.66)	(4.13)	(4.53)	(4.44)	(4.10)	(4.72)	(4.31)
P3-P1	0.00165	-0.01096	0.00552	0.00684	0.00616	0.00322	0.00381	0.00214	-0.00129	0.00126	0.00018
	(0.81)	(-2.48)***	(1.96)**	(3.06)***	(2.69)***	(1.62)*	(2.02)**	(1.24)	(-0.75)	(0.66)	(0.10)
Median Size		11	33	66	119	219	398	712	1299	2673	8683
Median IH		6.7%	13.2%	21.7%	29.4%	36.8%	42.7%	46.2%	51.4%	54.9%	54.5%

This table reports the average monthly returns of momentum portfolios formed on the previous K months' raw returns and held for K months. Each month, NYSE and AMEX stocks are ranked in ascending order based on the lagged returns and divided into three equal-weighted portfolios. Portfolio P1 is formed by the loser stocks and P3 is formed by the winner stocks over the previous K months. The table presents the time-series average monthly returns of holding these portfolios for K months. In addition, firms are sorted into ten portfolios each month based on their previous capitalizations. Portfolio S1 includes the smallest firms and S10 includes the largest firms. Within each decile, firms are equally sorted into three portfolios (P1 to P3) based on their lag raw returns. This table also reports the time-series average monthly return of holding these portfolios in each size class for K months. Median sizes are in millions and t-statistics are in parenthesis.

***, **, * are statistically significant at the 1, 5, and 10 % levels respectively. Since we focus on the momentum profit (P3-P1), we do not report the significance of P1, P2 and P3. However, most of these coefficients are significant.

4.2 Institutional Holding-Based Momentum

Next, we use similar method to calculate institutional holding-based momentum. Each month, all samples are respectively sorted into ten portfolios on the previous three-month, six-month, nine-month and twelve-month institutional holdings. Within each portfolio (H1-H10), firms are then sorted into three portfolios (P1-P3) based on their past three-, six-, nine- and twelve-month returns and held for the corresponding months to calculate the average monthly returns. Again, the average monthly returns of P3-P1 are used to measure the momentum profits.

Figure 2 presents the relation between institutional holdings and momentum profits. As shown in Figure 2, momentum profit initially increases with institutional holdings and reaches the top in fourth decile. Then, it declines with institutional holding. Table III reports the detail of momentum profits for each period. According to P3-P1, momentum profits are more significant in the six-month and nine-month period. Specifically, Panel B shows that the maximal momentum for the six-month period occurs when the institutional holding level is around 24.4% and the profit is 0.697% per month (t-statistics=2.91). Panel C indicates that the maximal profit (0.72%) for holding nine months occurs when institutional holding is 24.8%.

Figure 2. Momentum Profit and Institutional Holding

This figure reveals the relationship between momentum profits (P3-P1) and institutional holding. Portfolio H1 contains firms with the lowest institutional holding and H10 contains firms with the highest institutional holding.

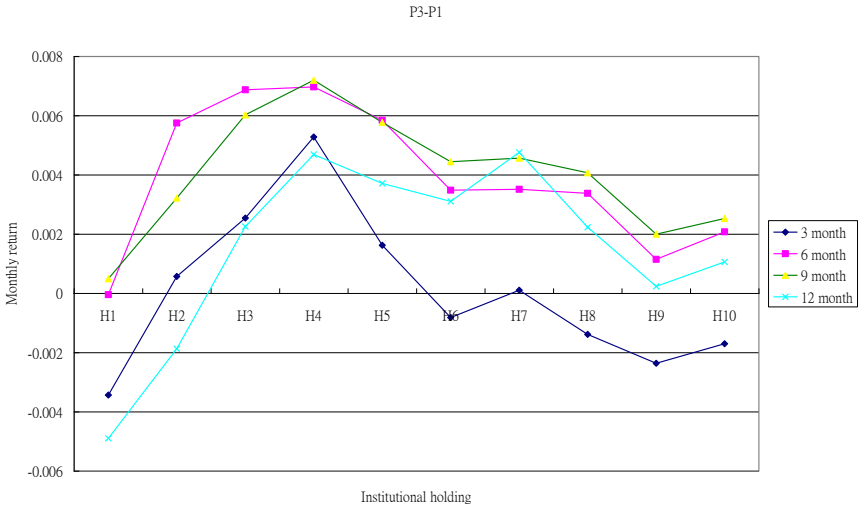

Table III. Momentum Strategies Sorted by Institutional Holding

Panel A: 3 Month (K=3)											
		Institutional Holding Class									
Past	All Stocks	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10
P3-P1	-0.00025	-0.00343	0.00057	0.00254	0.00528	0.00163	-0.00082	0.00011	-0.00139	-0.00236	-0.00170
	(-0.13)	(-0.94)	(0.18)	(1.04)	(2.33)***	(0.79)	(-0.46)	(0.06)	(-0.75)	(-1.36)*	(-0.97)
Median IH		2.4%	9.0%	16.3%	23.9%	31.8%	39.8%	47.6%	55.3%	63.1%	74.6%
Median Size		22	41	83	146	234	389	616	871	1161	1222
Panel B: 6 Month (K=6)											
		Institutional Holding Class									
Past	All	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10
P3-P1	0.00384	-0.00005	0.00575	0.00687	0.00697	0.00585	0.00348	0.00351	0.00338	0.00115	0.00208
	(1.85)**	(-0.01)	(1.68)**	(2.65)***	(2.91)***	(2.64)***	(1.83)**	(1.99)**	(1.90)**	(0.60)	(1.10)
Median IH		2.7%	9.5%	16.8%	24.4%	32.3%	40.2%	48.0%	55.4%	63.1%	74.3%
Median Size		23	42	87	150	242	400	631	888	1173	1250
Panel C: 9 Month (K=9)											
		Institutional Holding Class									
P3-P1	0.00403	0.00049	0.00322	0.00603	0.00720	0.00577	0.00445	0.00457	0.00407	0.00200	0.00253
	(2.03)**	(0.14)	(0.94)	(2.32)**	(3.01)***	(2.72)***	(2.30)**	(2.52)***	(2.27)**	(1.03)	(1.38)*
Median IH		2.9%	9.9%	17.2%	24.8%	32.7%	40.6%	48.2%	55.6%	63.2%	74.1%
Median Size		23	44	90	156	247	406	649	900	1187	1276
Panel D: 12 Month (K=12)											
		Institutional Holding Class									
Past	All	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10
P3-P1	0.00165	-0.00490	-0.00187	0.00226	0.00469	0.00371	0.00310	0.00476	0.00223	0.00024	0.00106
	(0.81)	(-1.30)*	(-0.55)	(0.81)	(1.88)**	(1.73)**	(1.60)*	(2.64)***	(1.23)	(0.13)	(0.59)
Median IH		3.1%	10.2%	17.5%	25.3%	33.1%	40.9%	48.4%	55.7%	63.2%	74.0%
Median Size		24	45	93	159	250	418	662	911	1204	1298

This table reports the average monthly returns of momentum portfolios formed based on the previous K months' raw returns and held for K months. Each month, all stocks are sorted into ten portfolios (H1 to H10) based on their previous institutional holdings. Then, firms in every decile are equally divided into three portfolios (P1 to P3) based on their lag raw returns. Portfolio P1 is formed by the losers and P3 is formed by the winners. This table presents the time-series average monthly returns of buying winners and short-selling losers (P3-P1) for K months. Median sizes are in millions and t-statistics are in parenthesis. ***, **, * are statistically significant at the 1, 5, and 10 % levels respectively.

As discussed earlier in Table I, there is a strongly positive relationship between institution ownership and firm size. Therefore, the inverted U-shape relationship between momentum and institutional holding in Table III might be caused by the effect of firm size. We need to eliminate this effect before making any conclusion about the relationship between momentum and institutional holdings.

4.3 Institutional Holding-Based Price Momentum (Controlled for Size)

In order to control the effect of firm size on momentum, the method similar to Badrinath and Noe (1995) is utilized to create ten portfolios with different institutional holdings but similar firm sizes. Table IV reports momentum profits for these portfolios. Before we discuss the momentum of these

portfolios, it is essential to check whether we have created appropriate portfolios with desired size and institutional holding characteristics. The last rows of each panel in Table IV report the median firm size in millions for each of the ten portfolios. As shown in Table IV, this method is effective since the median sizes across the ten portfolios in each panel remain almost unchanged respectively. For example, the last row of Panel A shows the level of firm size in the three-month period. Although the median institutional holding level ranges from 5.8% in the lowest decile to 69.4% in the highest decile, the range of firm size is only from 261 millions to 315 millions. Other panels have similar results.

Figure 3 plots the relation between the momentum and firm's institutional holding level (controlled for firm size). As shown in this figure, there is a positive relation between momentum profits and institutional holding levels. In addition, the momentum profits are more significant in the six-month and nine-month holding periods.

Table IV. Momentum Strategies Sorted by Institutional Holding (Controlled for Size)

Panel A: 3 Month (K=3)											
	Institutional Holding Class(controlled for size)										
Past	All	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10
P3-P1	-0.00025	0.00003	0.00116	-0.00179	-0.00097	0.00023	-0.00175	-0.00156	0.00132	0.00076	0.00062
	(-0.13)	(0.01)	(0.42)	(-0.73)	(-0.45)	(0.11)	(-0.70)	(-0.78)	(0.65)	(0.39)	(0.32)
Median IH		5.8%	15.2%	21.8%	28.0%	34.2%	39.9%	45.4%	51.2%	57.4%	69.4%
Median Size		261	271	274	277	278	283	287	292	303	315
Panel B: 6 Month (K=6)											
Past	All	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10
P3-P1	0.00384	0.00354	0.00412	0.00262	0.00279	0.00372	0.00272	0.00475	0.00457	0.00538	0.00419
	(1.85)**	(1.25)	(1.42)*	(1.07)	(1.21)	(1.69)**	(1.08)	(2.33)***	(2.22)**	(2.47)***	(2.10)**
Median IH		6.2%	15.8%	22.5%	28.7%	35.0%	40.7%	45.9%	51.5%	57.7%	69.2%
Median Size		271	279	284	282	289	292	294	301	311	322
Panel C: 9 Month (K=9)											
Past	All	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10
P3-P1	0.00403	0.00246	0.00484	0.00333	0.00292	0.00432	0.00389	0.00382	0.00542	0.00430	0.00442
	(2.03)**	(0.95)	(1.93)**	(1.41)*	(1.27)	(1.99)**	(1.69)**	(1.78)**	(2.56)***	(1.96)**	(2.27)**
Median IH		6.5%	16.3%	23.0%	29.4%	35.6%	41.3%	46.3%	51.7%	57.8%	69.1%
Median Size		281	287	291	288	300	300	303	308	318	329
Panel D: 12 Month (K=12)											
Past	All	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10
P3-P1	0.00165	-0.00125	0.00166	0.00193	-0.00016	0.00316	0.00151	0.00245	0.00298	0.00180	0.00292
	(0.81)	(-0.48)	(0.66)	(0.82)	(-0.07)	(1.45)*	(0.65)	(1.15)	(1.39)*	(0.79)	(1.42)*
Median IH		6.9%	16.8%	23.5%	30.0%	36.0%	41.8%	46.7%	52.0%	58.0%	69.0%
Median Size		289	295	299	297	307	307	312	316	325	336

This table reports the average monthly return of momentum portfolios formed based on the previous K months' raw returns and held for K months. Each month, all stocks are sorted into five portfolios based on their previous market capitalization. Within each quintile, firms are further sorted into ten portfolios based on their previous institutional holdings. Then, all firms are then aggregated into ten portfolios based on their institutional holding decile rank. Thus, these new ten portfolios have different institutional holding levels but similar sizes. Within each new portfolio, stocks are ranked in ascending order based on the lagged returns and equally divided into three subgroups (P1 to P3). This table presents the time-series average monthly returns of buying winners and short-selling losers (P3-P1) for K months. Median sizes are in millions and t-statistics are in parenthesis.

***, **, * are statistically significant at the 1, 5, and 10 % levels respectively.

Figure 3. Momentum Profit and Institutional Holding (Controlled for Size)

This figure reveals the relationship between momentum profits (P3-P1) and institutional holding after controlled for the effect of firm size. Portfolio H1 contains firms with the lowest institutional holding and H10 contains firms with the highest institutional holding.

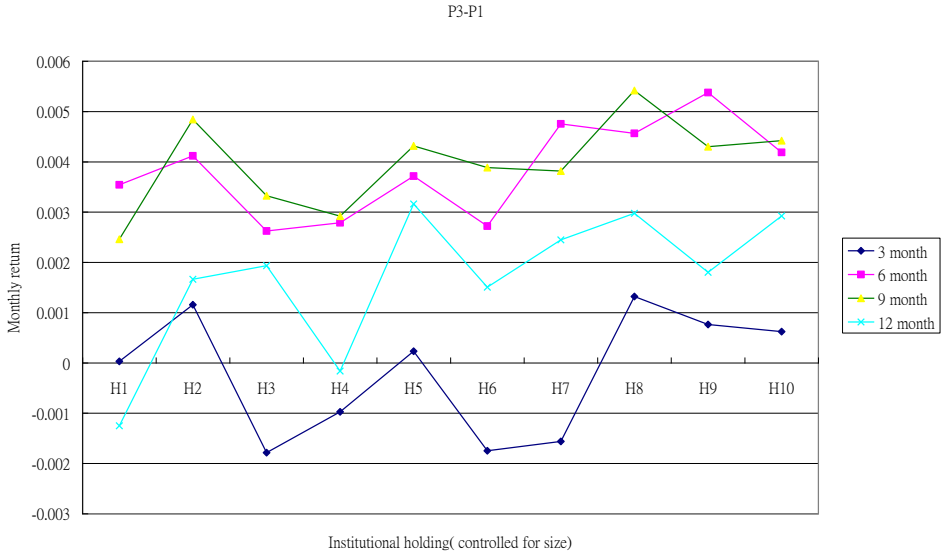

Table IV presents the detailed momentum profits. Since momentum is more significant in the six-month and nine-month periods, we focus on the Panel B and Panel C. As shown in the table, the P3-P1 profits are more significant in portfolios with higher institutional holding level. Because we also confirm that smaller firms have higher momentums as previous literature, investors might use this relationship between momentums and institutional holdings to achieve higher momentum profits. For example, investors could choose stocks with small firm sizes but high institutional holdings to make more profits. We will test this hypothesis in section 4.4.

4.4 Two-Way Sorting on Size and Institutional Holding

In order to verify our finding in section 4.3, we use a two-way sorting procedure to cut samples based on their past firm sizes and institutional holdings. For brevity, we only report the six-month and nine-month period since their momentum profits are more significant. For instance, all firms are sorted into three portfolios each month based on their size over the past six month. Within each size-based portfolio (S1 to S3), firms are sorted into three portfolios (H1 to H3) according to their past six-month institutional holding level. Therefore, every firm in our sample is assigned to one of the nine portfolios formed by its firm size and institutional holding. Within each of the nine portfolios, firms are ranked in ascending order and equally divided into three portfolios (P1 to P3) based on the past six-month raw return. Then, momentum profit is measured by the average monthly return of relative strength trading strategy (P3-P1) for holding six months. Similar procedure is conducted with the nine-month period data.

Table V shows the results of two-way sorting portfolios. As shown in the S1 portfolio, momentum profits are higher for stocks with higher institutional holdings. The differences of momentum profit between H1 and H3 are 0.748% per month (with t-statistics=2.45) for the six-month holding period and 0.794% (with t-statistics=2.63) for the nine-month holding period per month. However, this positive relationship between the momentum and institutional holding seems to be weaker in larger firms.

Table V. Momentum Strategies Sorted by Size and Institutional Holding (1/1980-12/2004)

Panel A: 6 Month			
	Size Class		
Institutional Holding	S1(Small)	S2(Median)	S3(Large)
H1(Low)	P3-P1=0.00102(0.27)	P3-P1=0.00572(2.55)***	P3-P1=0.00097(0.50)
H2(Median)	P3-P1=0.00755(2.40)***	P3-P1=0.00547(2.91)***	P3-P1=0.00107(0.59)
H3(High)	P3-P1=0.00850(3.63)***	P3-P1=0.00439(2.40)***	P3-P1=0.00091(0.47)
H3-H1	P3-P1=0.00748(2.45)***	P3-P1=-0.00134(-0.76)	P3-P1=-0.00006(-0.05)
Panel B: 9 Month			
	Size Class		
Institutional Holding	S1(Small)	S2(Median)	S3(Large)
H1(Low)	P3-P1=0.00010(0.03)	P3-P1=0.00673(3.02)***	P3-P1=0.00087(0.46)
H2(Median)	P3-P1=0.00542(1.66)**	P3-P1=0.00522(2.72)***	P3-P1=0.00225(1.24)
H3(High)	P3-P1=0.00803(3.29)***	P3-P1=0.00538(2.86)***	P3-P1=0.00139(0.76)
H3-H1	P3-P1=0.00794(2.63)***	P3-P1=-0.00135(-0.77)	P3-P1=0.00052(0.41)

This table reports the average monthly returns of momentum portfolios formed by sorting on size and institutional holding level. The relative momentum portfolios are constructed according to three- and six-month lag raw returns and held for the corresponding months. Each month, all stocks are sorted by their previous market capitalization and assigned to three groups. Size class S1 contains the smallest firms and S3 contains the largest firms. Within each class, firms are sorted by their previous institutional holding level and grouped into three sub-samples (H1 to H3). In each portfolio formed by size and institutional holding, firms are ranked in ascending order on the lagged returns and equally divided into three portfolios. Portfolio P1 is formed by equally weighting the worst-performing stocks and portfolio P3 is formed by the best-performing stocks. P3-P1 momentum profits for holding six and nine months are presented in panel A and B respectively. T-statistics are in parenthesis.

***, **, * are statistically significant at the 1, 5, and 10 % levels respectively.

4.5 Return Autocorrelation and Institutional Holding

In section 4.3 and 4.4, we found that after controlling firm size, stocks with higher institutional holding exhibit greater momentum profits. Also, this relationship seems to be stronger in small firms. In this part, we use a regression method to reexamine this relationship.

Each quarter, the two-way sorting procedures based on firm sizes and institutional holdings of six- and nine-month periods are performed respectively. For example, all firms are classified into three portfolios based on their sizes over the past six month. Within each of the three size-based portfolios (S1 to S3), firms are sorted into five subgroups (H1 to H5) based on their institutional holdings over the past six month. Therefore, each stock is assigned to one of the fifteen portfolios. We also use similar procedures to deal with the nine-month period data.

Next, we run cross-sectional regressions of returns on institutional holding level and other important firm characteristics (past return, firm size and book to market ratio) for the fifteen portfolios respectively. These independent variables are selected because they are related to stock returns according to previous literature (Gompers and Metrick, 2001). After estimating each set of cross-sectional regression functions, we compute the time-series means for each coefficient and calculate t-statistics of these estimates.

Table VI only reports the average coefficient on one important independent variable (past return) in these regression functions. We focus on this coefficient because it could be used to measure the autocorrelation of stock returns. If the momentum effect is more apparent in stocks with higher institutional holdings, we should expect greater return autocorrelations in these firms. Thus, the average coefficient on past return in portfolio H5 should be greater that that in portfolio H1 in our experiment.

According to Table VI, most of the average coefficients on past return are positive and significant. This result is consistent with our previous finding that the momentum profit is significant in six-month and nine-month periods. Since we are interested in smaller firms, we focus on the S1 portfolio of both Panels. As shown in Table VI, the differences of return autocorrelation coefficients between portfolio H1 and H5 are 0.05643 (with t-statistics=1.95) in the six-month period and 0.0609 (with t-statistics=2.15) in the nine-month period. This result consists with

the hypothesis that there is positive relationship between return autocorrelation and institutional holding, which indicates a stronger momentum effect, in smaller firms. Based on our finding, the positive relationship between momentum and institutional holding seems to be stronger in smaller firms.

Table VI. Institutional Holding and Return Autocorrelation

Panel A: 6 Month

	Size Class		
Institutional Holding Class	S1(Small)	S2(Median)	S3(Large)
H1(Low)	0.05799 (2.67)***	0.05567 (3.30)***	0.01981 (0.85)
H2	0.07677 (4.10)***	0.04298 (2.21)**	0.01377 (0.70)
H3(Median)	0.07562 (3.09)***	0.04060 (2.62)***	0.06016 (3.04)***
H4	0.08023 (4.57)***	0.05554 (3.25)***	0.04364 (2.64)***
H5(High)	0.11442 (5.65)***	0.03624 (2.16)**	0.03671 (1.77)**
H5-H1	0.05643(1.95)**	-0.01943(-1.03)	0.0169(0.73)

Panel B: 9 Month

	Size Class		
Institutional Holding Class	S1(Small)	S2(Median)	S3(Large)
H1(Low)	0.05504 (2.49)***	0.05029 (3.11)***	0.02075 (0.78)
H2	0.09114 (3.79)***	0.06183 (3.51)***	0.04421 (1.92)**
H3(Median)	0.08496 (4.89)***	0.03522 (1.55)*	0.09198 (3.95)***
H4	0.09668 (3.47)***	0.08565 (4.26)***	0.09381 (4.72)***
H5(High)	0.11594 (5.21)***	0.06901 (3.47)***	0.07741 (2.91)***
H5-H1	0.06090(2.15)**	0.01872(0.90)	0.05666(2.14)**

This table reports the time-series average coefficient of return autocorrelation from the cross-sectional regressions. Each quarter, all stocks are sorted by previous market capitalization and assigned to three classes. Within each class, firms are sorted by their previous institutional holdings and grouped into five portfolios. Within each of the 15 portfolios formed by size and institutional holding, stock returns are regressed on institutional holding and other firm characteristics. Specifically, the estimated equation is $R_{t+1}=\alpha+\beta_1 IHt+\beta_2 Rt+\beta_3 Ln\ (Size)t+\beta_4 BMt$

R_{t+1} is stock return. IHt is firm's institutional holding at the beginning of each period. Ln (Size)t is the natural logarithm of market capitalization at the beginning of each period. The book to market ratio (BMt) is firm's book value at the beginning of each period divided by its price. The table reports the time-series average of coefficient β_2, with t-statistics in the parenthesis.

***, **, * are statistically significant at the 1, 5, and 10 % levels respectively.

Previous literatures show that there is strong positive correlation between changes in institutional ownership and contemporaneous stock return, especially for smaller firms (Nofsinger and Sias, 1999). Some researchers attribute this relation to the impact of institutional trading (Sias *et al*, 2001). Meanwhile, evidence shows that institutional investors herd in equity market and their herding is stronger in smaller capitalization firms (Sias, 2004). Also, institutional tend to have positive-feedback trading in smaller firms (Nofsinger and Sias, 1999). Since herding and feedback trading both contribute to higher autocorrelations in stock returns, smaller capitalization firms with high institutional holding may have greater return autocorrelation due to these activities by institution investors. This reason may explain why smaller firms with higher institution holdings exhibit greater momentum than corresponding securities with lower institutional holdings.

4.6 Institutional Change and Equity Returns

Since momentum might be related to the institutional herding and feedback trading, we plan to examine whether the quarterly change of institutional holding can predict next quarter's stock return. Each quarter, we run a cross-sectional regression of quarterly stock return on some firm characteristics (past return, firm size and book to market ratio) and change of institutional holding. The result in Panel A of Table VII reveals a positive relationship between stock return and past quarter's change of institutional

holding. This relationship indicates that the buying of institutional investors in the past quarter has positive impact on today's return.

According to the literature, change of institutional holding in the past quarter is also positively related to stock return in the same period. These two relationships suggest that the magnitude of momentum may be positively related to trading of institutional investors. Since institutional holding is a proxy for institutional trading, momentum would be positively related to the institutional holding.

Since CDA/Spectrum classifies all institutional investors into five types, we use this classification to run the regression again. According to the result in Panel B, institutional holding change in independent advisors has the greatest power to predict next quarter's return.

Table VII. Relationship of Past Institutional Holding's Change and Equity Return

Panel A		
Explanatory Variable	Average coefficient	t-statistics
Constant	0.04595	1.69*
Change in all institutional holding(ΔIHt)	0.02525	2.04**
Last quarter's return(Rt)	0.00453	0.43
Ln Size	-0.00130	-0.78
Book-to-market(BMt)	0.01110	3.34***
Panel B		
Explanatory Variable	Average coefficient	t-statistics
Constant	0.04746	1.75*
Change in Banks' holding (ΔIHt_1)	-0.03542	-1.19
Change in Insurance companies' holding (ΔIHt_2)	0.00412	0.09
Change in Investment companies' holding (ΔIHt_3)	0.02215	0.54
Change in Independent investment advisors' holding (ΔIHt_4)	0.05188	2.91***
Change in other institutional holding (ΔIHt_5)	0.04022	0.89
Last quarter's return(Rt)	0.00469	0.45
Ln Size	-0.00143	-0.87
Book-to-market(BMt)	0.01111	3.34***

This table reports the time-series average coefficients for cross-sectional regressions of quarterly return on previous change of institutional holding and other firm characteristics. The estimated equation for Panel A is $R_{t+1}=\alpha+\beta_1\Delta IHt+\beta_2\ Rt+\beta_3 Ln\ (Size)t+\beta_4\ BMt$

R_{t+1} is stock return. ΔIHt is change of institutional holding in the past quarter. Ln (Size)t is the natural logarithm of market capitalization at the beginning of each period. The book to market ratio (BMt) is firm's book value at the beginning of each quarter divided by its price. The estimated equation for Panel B is

$R_{t+1}=\alpha+\beta_1\Delta IH_1t+\beta_2\Delta IH_2t+\beta_3\Delta IH_3t+\beta_4\Delta IH_4t+\beta_5\Delta IH_5t+\beta_6\ Rt+\beta_7\ Ln(Size)t+\beta_8\ BMt$

where institutional investors are classified into five groups.

***, **, * are statistically significant at the 1, 5, and 10 % levels respectively.

Furthermore, we examine the positive-feedback trading of institutional investors. Each quarter, changes of institutional holdings are regressed on last quarter's returns, firm sizes and book-to-market ratios. As shown in Table VIII, most of the coefficients on past return are positive and significant. This finding indicates that most institutional investors, except for those which Spectrum labels as "Other", have positive-feedback trading behaviors. Moreover, Investment companies and independent investment advisors tend to be more active in feedback trading since their coefficients are greater than those of banks and insurance companies.

Table VIII. Positive-Feedback Trading of Institutional Investors

	Dependent Variable					
Explanatory Variables	Changes in All institutional investors	Change in Banks' holding	Change in Insurance companies' holding	Change in Investment companies' holding	Change in Independent advisors' holding	Change in Other institutional holding
Constant	0.00863	0.00195	0.00065	-0.00036	0.00581	0.00058
	(2.52)**	(1.46)	(1.04)	(-0.45)	(2.09)**	(0.49)
Last return (Rt)	0.01690	0.00274	0.00157	0.00504	0.00781	-0.00028
	(14.13)***	(6.71)***	(5.28)***	(11.38)***	(9.82)***	(-1.19)
Ln Size	-0.00213	-0.00014	-0.00003	0.00011	-0.00027	0.00004
	(-3.58)***	(-1.12)	(-0.50)	(1.48)	(-1.24)	(0.38)
Book-to-market	-0.00028	-0.00041	-0.00028	-0.00034	-0.00076	-0.00034
(BMt)	(-0.91)	(-2.44)**	(-2.60)***	(-2.61)***	(-1.51)*	(-3.57)***

This table presents the time-series average coefficients for cross-sectional regressions of quarterly institutional holding's change on past returns and other firm characteristics. The estimated equation is $\Delta IHi_{,t+1} = \alpha + \beta_1 Rt + \beta_2 Ln\ (Size)t + \beta_3 BMt$
$\Delta IHi_{,t+1}$ is change of institutional holdings for all institutions or that for banks, insurance companies, investment companies, independent advisors and other institutions respectively. Rt is return over the past quarter. Ln (Size)t is the natural logarithm of market capitalization at the beginning of each period. The book to market ratio (BMt) is firm's book value at the beginning of each quarter divided by its price.
***, **, * are statistically significant at the 1, 5, and 10 % levels respectively.

5. Conclusion

Over the past two decades, momentum strategy has attracted a lot of attentions by researchers and practitioners in financial markets and various studies have tried to find out cross-sectional determinants of momentum. Empirical evidence suggests that momentum is related to several firm characteristics (e.g. firm size, price level and book-to–market ratio). Although these factors are important, little research has considered the influence of institutional investors who account for over half of the equity ownerships and play important roles in stock market.

This paper tries to investigate whether momentum is related to the institutional holdings. After controlling the effect of firm size on momentum, we find that momentum is positively related to institutional holdings. Moreover, this relationship seems to be stronger in small-capitalization firms. Our finding is consistent with previous literature that institutional investors tend to herd and have positive-feedback trading in smaller firms. The implication of this result is that investors can choose smaller firms with higher institutional holdings to achieve more momentum profits.

Furthermore, we also show that the change of institutional holdings is positively related to the next quarter's return. This result suggests that institutional investors are somewhat smarter than individual investors, which is consistent with the belief that institutional investors are better informed than individual investors.

References

1. Arena, M., Haggard, K. and Yan, X. (2008), "Price momentum and idiosyncratic volatility", *Financial Review*, Vol. 43, pp.159-190.
2. Badrinath, S.G., Kale, J.R. and Noe, T.H. (1995), "Of shepherds, sheep, and the cross-autocorrelations in equity returns", *Review of Financial Studies*, Vol. 8, pp.401-430.
3. Burch, T.R. and Swaminathan, B. (2001), "Are institutions momentum traders?", Working paper, University of Miami and Cornell University.
4. Chordia, T. and Shivakumar, L. (2002), "Momentum, business cycle, and time-varying expected returns", *Journal of Finance*, Vol. 57, pp.985–1019.
5. Conrad, J. and Kaul, G. (1998), "An anatomy of trading strategies", *Review of Financial Studies*, Vol. 11, pp.489–519.
6. Daniel, K. and Titman, S. (1999), "Market efficiency in an irrational world", *Financial Analysts Journal*, Vol. 55, pp.28–40.
7. Gompers, P.A. and Metrick, A. (2001), "Institutional investors and equity prices", *Quarterly Journal of Economics*, Vol. 116, pp.229-259.
8. Hong, H. and Stein, J.C. (1999), "A unified theory of underreaction, momentum trading, and overreaction in asset markets", *Journal of Finance*, Vol. 54, pp.2143–2184.
9. Hong, H., Lim, T. and Stein, J.C. (2000), "Bad news travels slowly: Size, analyst coverage, and the profitability of momentum strategies", *Journal of Finance*, Vol. 55, pp.265-295.
10. Jegadeesh, N. and Titman, S. (1993), "Returns to buying winners and selling losers: Implications for stock market efficiency", *Journal of Finance*, Vol. 48, pp.65-91.
11. Jegadeesh, N. and Titman, S. (2001), "Momentum, Working paper", University of Illinois and University of Texas and the NBER.
12. Lee, C. and Swaminathan, B. (2000), "Price momentum and trading volume", *Journal of Finance*, Vol. 55, pp.2017-2069.
13. Lesmond, D., Schill, M. and Zhou, C. (2004), "The illusory nature of momentum profits", *Journal of Financial Economics*, Vol. 71, pp. 349-380.
14. Nofsinger, J.R. and Sias, R.W. (1999), "Herding and feedback trading by institutional and individual investors", *Journal of Finance*, Vol. 54, pp.2263-2295.
15. Rouwenhorst, K.G (1998), "International momentum strategies", *Journal of Finance*, Vol. 53, pp.267-284.
16. Rouwenhorst, K.G (1999), "Local return factors and turnover in emerging stock markets", *Journal of*

Finance, Vol. 54, pp.1439-1464.
17. Sias, R.W. and Starks, L.T. (1997), "Return autocorrelation and institutional investors", *Journal of Financial Economics*, Vol. 46, pp.103-131.
18. Sias, R.W., Starks, L.T. and Titman, S. (2001), "The price impact of institutional trading", Working paper, University of Arizona and University of Texas.
19. Sias, R.W. (2004), "Institutional herding", *Review of Financial Studies*, Vol. 17, pp.165-206.