

Herding in China Equity Market

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Abstract

This study explores herding behavior and investors' asymmetric reactions to good news and bad news in China equity market. Turnover effect on herding is tested. Data covers from Jan 2004 to June 2009, including current financial panic period.

Even though there do not exist herding behavior in China equity market, we demonstrate the existence of asymmetric reaction that investors' tendency toward herding is significantly higher during market downstream. This study partly supports the turnover effect that low turnover stocks significantly converge to market return than high turnover stocks during extreme market conditions.

Keywords: China equity market, Herd, Turnover rate, Asymmetric reaction

1. Introduction and literature reviews

Herding is an irrational behavior and low information cost strengthens herding. Banerjee (1992) defines herding as 'everyone doing what everyone else is doing, even when their information suggests doing something different'. Prechter and Parker (2007) suggest that uncertainty about valuation may cause herding. Kultti and Miettinen (2006) set up a standard sequential decision model; they purpose that if the cost of the information about the predecessors' actions is very expensive then all the agents will act according to their own signals. If observing is free one acts in herding behavior. Facing financial panic, investors may not have enough time to collect and analyze valuable information from many disorderly data. Investors may herd during financial panic.

Previous examinations of market wide herding have weak or no evidence and most of scholars use Cross-Sectional Standard Deviation (CSSD) or Cross-Sectional Absolute Deviation (CSAD) to measure the existence of herding. Christie and Huang (1995) find no herding using daily and monthly returns for NYSE and Amex firms; Chang, Chen and Khorana (2000) develop a non-linear model and find herding in South Korea and Taiwan markets, but do not find herding evidence in USA, Hong Kong and Japan markets. Gleason, Mathur and Peterson (2004) find no herding behavior among the sector ETFs using intraday data of the American Stock Exchange. Caparrelli, D'Arcangelis and Cassuto (2004) examine Italian stock market and find a nonlinear relationship between the dispersion and returns. Henker, Henker and Mitsios (2006) find no market wide herding in Australian market.

Whether investors react asymmetric to good news and bad news is another topic. Christie and Huang (1995) do not support asymmetry, while Chang et al. (2000) show that herding measure is higher when market is declining than it is advancing. Henker et al. (2006) find partly support.

This study purposes that turnover rate (traded volume/total shares) may influence herding. No previous studies discuss the turnover rate, we purpose that low turnover rate stocks may have higher tendency to herd market. Gregoriou and Ioannidis (2006) use FTSE 100 data and find that high trading volume stocks have more available information. Chordia and Swaminathan (2000) find low trading volume stocks respond more slowly to information. Avery and Zemsky (1998) point out that as investors have no sufficient information; they may observe and follow other investors' action. Based on above empirical findings, we hypothesize the turnover effect on herding and will testify this effect in this study. Since there are no previous studies about turnover effect, the test of turnover effect is the most important contribution of this study.

Based on data of International Monetary Fund (2007), China equity market has 3.7 times growth during period

2002 to 2006; world equity market grows only 1.87 times at the same period. Contrasting to the importance of China equity market in worldwide financial markets, there are scarce researches discussing about herding behavior in China, one of the most prosperous emerging markets. Previous studies only discuss about the herding in dual-share. Zhou (2007) investigates the herding behavior in China's A and B markets and finds the existence of significant herding in both A and B share markets. Chong and Su (2006) examine the co-movement between the A shares and H shares of twenty-one cross-listed Chinese companies and find a small portion of sample have a co-movement. Contrasting to previous studies focusing on herding in dual share, this study aims to discuss about the market wide herding in China in Shanghai market and Shenzhen market.

The remainder of this paper is partitioned as follows: (1) the methodology and data that include herding measurement, hypotheses and the source of data; (2) results of the empirical tests; (3) conclusions.

2. Methodology and Data

2.1 Herding Measurement

Christie and Huang (1995) and Chang et al. (2000) propose that investors herd during periods of high market volatility. When herd exists, the returns of individual stock converge towards the returns on the aggregate market – market index. Thus, herding results in a smaller difference between the returns on the individual stock and the market index. We use two alternative measures of dispersion, CSSD and CSAD, to identify herding behavior.

The cross-sectional standard deviation (CSSD) method is proposed by Christie and Huang (1995) and be expressed as

$$CSSD_t = \sqrt{\frac{\sum_{i=1}^{N_t} (R_{i,t} - R_{m,t})^2}{N_t - 1}} \quad (1)$$

Chang et al. (2000) define the cross-sectional absolute deviation (CSAD) as

$$CSAD_t = \frac{1}{N_t} \sum_{i=1}^{N_t} |R_{i,t} - R_{m,t}| \quad (2)$$

In this study, $R_{i,t}$ is the return of stock i during time period t ; $R_{m,t}$ is the return of market index during the same time period t ; N_t is the number of stock listed in equity market during time period t . Shanghai equity market and Shenzhen equity market have their own CSSD and CSAD values at time period t . Shanghai composite index and Shenzhen composite index are used as proxies to measure Shanghai equity market index and Shenzhen equity market index.

2.2 Test of Herding

Herding will be more prevalent during periods of market stress, which is defined in terms of extreme market returns.

$$CSSD_t = \alpha + \beta_1 D_t^U + \beta_2 D_t^L + \varepsilon_t \quad (3)$$

Where

$D_t^U = 1$, if the return on the market for time period t lies in the extreme upper tail of the returns distribution,

and

$D_t^L = 1$, if the return on the market for time period t lies in the extreme lower tail of the returns distribution,

This study adopts 5% to define extreme market upward and downward. If herd exists, $CSSD_t$ will be smaller during periods of market stress. Statistically significant negative values for β_1 and β_2 would indicate the presence of herding.

If individual is rational, individual asset should have different sensitivity to the market return. So, β_1 and β_2 be zero, or not significantly positive and negative, indicates that rational model is fit.

Chang et al. (2000) argue that the model in Eq. (3) requires defining what is meant by market stress and they propose a nonlinear relationship between CSAD and market return as follows:

$$CSAD_t = \theta + \gamma_1 |R_{m,t}| + \gamma_2 R_{m,t}^2 + \varepsilon_t \quad (4)$$

If herd exists, then γ_2 will be significantly negative.

Gleason et al. (2004) suggest dependent variables in Eqs. (3) and (4) could be swapped, which are expressed in the following equations:

$$CSAD_t = \alpha + \beta_1 D_t^U + \beta_2 D_t^L + \varepsilon_t \quad (5)$$

$$CSSD_t = \theta + \gamma_1 |R_{m,t}| + \gamma_2 R_{m,t}^2 + \varepsilon_t \quad (6)$$

To test the turnover rate (traded volume/ total shares) effect on herding, we define High Turnover Standard Deviation (*HTSD*)、Low Turnover Standard Deviation (*LTSD*)、High Turnover Absolute Deviation (*HTAD*) and Low Turnover Absolute Deviation (*LTAD*) as follows:

$$HTSD_t = \sqrt{\frac{\sum_{h=1}^{N_t/2} (R_{h,t} - R_{m,t})^2}{N_t/2}} \quad (7)$$

$$LTSD_t = \sqrt{\frac{\sum_{l=1}^{N_t/2} (R_{l,t} - R_{m,t})^2}{N_t/2}} \quad (8)$$

$$HTAD_t = \frac{1}{2N_t} \sum_{h=1}^{N_t/2} |R_{h,t} - R_{m,t}| \quad (9)$$

$$LTAD_t = \frac{1}{2N_t} \sum_{l=1}^{N_t/2} |R_{l,t} - R_{m,t}| \quad (10)$$

Where t is time period, R_i is return of stocks i . $R_{m,t}$ is market return. When a stock's turnover rate is higher than median value of turnover at the same time period (month) in the same stock market, this stock is classified into high turnover stock ($R_{h,t}$); otherwise, it is a low turnover stock ($R_{l,t}$). N_t is the number of stock at time period t . Shanghai market and Shenzhen market has its own four herding measures, *HTSD*, *LTSD*, *HTAD* and *LTAD* for each month. To verify the turnover effect on herding, these four herding measures are treated as dependent variable in Eqs. (3) to (6).

2.3 Herding Hypothesis

We hypothesize low turnover stock will have higher tendency to herd market return. The *HTSD* and *HTAD* are used to measure the degree of high turnover rate stocks disperse from market return; the *LTSD* and *LTAD* are used to measure the degree of low turnover rate stocks disperse from market return. Based on the statements of Gregoriou and Ioannidis (2006) and Avery and Zemsky (1998), low turnover stock is lacking sufficient information and the lack of information will lead low turnover stock more tender to herd market return than high turnover stock. Low dispersion from market return means higher tendency to herd market. If turnover rate effect exists, the dispersion measurements, SD, AD, should be higher when turnover rate is high.

Hypothesis 1: The mean value of *HTSD* (*HTAD*) will be significantly higher than *LTSD* (*LTAD*).

Herding is information dissemination. During extreme market situation, noise traders do not know the value of new information and need to make decision in a short period; they will herd. Based on Kultti and Miettinen (2006), it takes no cost to observe the change of market return; investors will tend to herd market return during extreme market situation. Herding is an irrational behavior and does not follow traditional hypothesis that people are rational. Based on traditional market hypothesis such as the Capital Asset Pricing Model that investors are rational then herd will not exist. To test the existence of herding and turnover effect on herding, regression models, Equation 11 and Equation 12 are used. These two equations are similar to Equation 3 and Equation 4, but the dependent variable Y which is denoted as herding measures: *CSSD*, *CSAD*, *HTSD*, *LTSD*, *HTAD* and *LTAD*.

$$Y_t = \alpha + \beta_1 D_t^U + \beta_2 D_t^L + \varepsilon_t \quad (11)$$

$$Y_t = \theta + \gamma_1 |R_{m,t}| + \gamma_2 R_{m,t}^2 + \varepsilon_t \quad (12)$$

The percentage of upper or lower tail of market return distribution can be set up as we want, and present study

uses 5%.

Similar to the regression models of many researchers such as Christie and Huang (1995) and Chang et al. (2000), the coefficient of β_1, β_2 or γ_2 are used to test herd. If herd exists in China equity market during extreme market situation, the value of *CSSD* or *CSAD* will become smaller, this means that β_1, β_2 or γ_2 will be significantly negative. The significantly negative β_1 means investors herd during extreme upward market situation. The significantly negative β_2 means investors herd during extreme downward market situation. The significantly negative γ_2 means investors herd during extreme upward and downward market situation.

Hypothesis 2: If β_1, β_2 or γ_2 are significantly negative when dependent variables are *CSSD* and *CSAD*, herd exists in China equity market.

2.4 Turnover Effect Hypothesis

To testify the turnover effect, the sample is divided into two groups based on the turnover value of the stocks in each market, Shanghai and Shenzhen. The value of *HTSD, LTSD, HTAD* and *LTAD* will be calculated for each month. If turnover effect exists, the value of *LTSD* or *LTAD* will become significantly smaller during extreme market situations, while *HTSD* or *HTAD* will not become significantly smaller during extreme market. This means that β_1, β_2 or γ_2 are significantly negative only when dependent variables are *LTSD* or *LTAD*; and β_1, β_2 or γ_2 are not significantly negative when dependent variables are *HTSD* or *HTAD*.

Hypothesis 3: If turnover effect exists, β_1, β_2 or γ_2 are significantly negative only when dependent variables are *LTSD* or *LTAD*.

2.5 Asymmetric Reaction

To ground on Christie and Huang (1995) and Chang et al. (2000), markets' reactions towards good news and bad news would appear to be diverse; If the dispersion is higher in up market, relative to down market, it is because investors are more fear of the extreme movements in down market.

Christie and Huang (1995) use the difference between β_1 and β_2 to measure asymmetric reaction. β_1 and β_2 are estimated based on Equation (11) and the dependent variable *Y* denotes as dispersion measures: *CSSD, CSAD, HTSD, LTSD, HTAD* and *LTAD*.

Chang et al. (2000) suggest other models to verify the asymmetric reaction. Equation 13 is used when the monthly market return, $R_{m,t}$, is greater and equal to zero; this is the upward market. Equation 14 is used when the monthly return, $R_{m,t}$, is less than zero; this is the downward market. The

$$Y_t = \alpha + \gamma_{1,up} |R_{m,t}| + \gamma_{2,up} (R_{m,t})^2 + \varepsilon_t \quad (13)$$

$$Y_t = \alpha + \gamma_{1,down} |R_{m,t}| + \gamma_{2,down} (R_{m,t})^2 + \varepsilon_t \quad (14)$$

Hypothesis 4: If $H_0: \beta_1 - \beta_2 = 0$ ($\gamma_{2,up} - \gamma_{2,down} = 0$) is rejected, then the degree of herding appears to be asymmetric during up market and down market.

2.6 Data

We obtain monthly data of listed stocks and market index from China database of Taiwan economic journal (TEJ) for period January, 2004 to June, 2009 which covering current financial panic. Shanghai composite index and Shenzhen composite index are chosen as proxies of markets because these two indices are the longest existing index in respective market.

3. Results

3.1 Descriptive statistics

Table 1 shows that mean value of Shenzhen market return, 1.77%, is higher than Shanghai market return, 1.456%. Shenzhen's higher market return accompanies with higher standard deviation value. During the 66 months' sampling periods, Shanghai has 40 months' market return greater than zero. As for Shenzhen, there is 41 months' market return greater than zero. The mean value and standard deviation value of Cross-Sectional Standard Deviation (*CSSD*), *HTSD* and *LTSD* of Shenzhen market are all higher than Shanghai market. The mean value and standard deviation value of Cross-Sectional Absolute Deviation (*CSAD*), *HTAD* and *LTAD* of Shenzhen market are closer to Shanghai market.

Table 1 also shows that mean value of absolute deviation (*AD*) is higher than mean value of standard deviation (*SD*) in both markets. Mean value of *HTSD* is higher than *LTSD* in both markets; mean value of *HTAD* is higher

than *LTAD* in both markets. The mean value of *HTSD* and *LTSD* for Shanghai stock market is 0.032 and 0.019, respectively. The difference between mean value of *HTSD* and *LTSD* for Shanghai stock market is 0.013 and t value of paired mean test is 2.01, which is significant at 5%. The mean value of *HTAD* and *LTAD* for Shanghai stock market is 0.114 and 0.087, respectively. The difference between mean value of *HTAD* and *LTAD* for Shanghai stock market is 0.027 and t value of paired mean test is 3.34, which is significant at 1%.

The mean value of *HTSD* and *LTSD* for Shenzhen stock market is 0.059 and 0.019, respectively. The difference between mean value of *HTSD* and *LTSD* for Shenzhen stock market is 0.033 and t value of paired mean test is 2.05, which is significant at 5%. The mean value of *HTSD* and *LTSD* for Shanghai stock market is 0.032 and 0.019, respectively. The difference between mean value of *HTAD* and *LTAD* for Shenzhen stock market is 0.037 and t value of paired mean test is 4.67, which is significant at 1%. The above significant mean difference between *HTSD* (*HTAD*) and *LTSD* (*LTAD*) means low turnover stock has significant low dispersion from market return. This support hypothesis 1 that low turnover stocks has a significant tendency to herd than high turnover stocks.

3.2 Herding test using Shanghai data

Model A in Table 2 show that there do not exist herding behavior in Shanghai equity market. Here, the β_1 and β_2 coefficients are not significantly negative when different dependent variables are used, indicating no convergence of the individual stocks returns to the Shanghai composite index return. Five of six regressions show significantly positive β_1 coefficient, Shanghai's stocks demonstrate higher dispersion during extreme upward market situation.

Model B in Table 2 show the same results, there do not exist herding behavior in Shanghai equity market. The γ_2 is not significantly negative. This result points to the absence of herding during periods of high market stress in Shanghai.

The negative adjusted R square value is shown in Table 2 when Model B is implemented for *HTSD*. Based on the statement of Greene(1993), this is because X (independent variables) and Y (dependent variable) has a sample correlation of zero, but too many X are added into the regression model which will makes negative adjusted R square value.

3.3 Herding test using Shenzhen data

Model A in Table 3 show that there do not exist herding behavior in Shenzhen equity market. Here, the β_1 and β_2 coefficients are not significantly negative when different dependent variables are used, indicating no convergence of the individual stocks returns from the Shenzhen composite index return. One of the six regressions shows significantly positive β_1 coefficient, low turnover stocks demonstrate higher dispersion during extreme upward market situation.

Model B in Table 3 show the same results, there do not exist herding behavior in Shenzhen equity market. The γ_2 is not significantly negative. This result points to the absence of herding during periods of high market stress in Shenzhen.

Again, there are several negative adjusted R square values are shown in Table 3. The explanation is that X (independent variables) and Y (dependent variable) has a sample correlation of zero, but too many X are added into the regression model.

The findings in 3.2 and 3.3 show that hypothesis 2 is not supported; there does not exist herding behavior in China equity market.

3.4 Turnover effect on herding

To evaluate the turnover effect on herding, we test hypothesis 3 to examine β_1 , β_2 or γ_2 are significantly negative only when dependent variables are *LTSD* or *LTAD*.

The results partly support turnover effect on herding. From Table 2 and Table 3, we can notice that regressions with different dependent variables coincidentally show that β_1 , β_2 or γ_2 are not significantly negative. Turnover effect does not exist in full samples.

We further analyze Table 4 and Table 5 which samples are divided into upward (market return is positive) sample and downward (market return is negative) sample. For Shanghai market, there is forty monthly market returns greater than zero, the upward market situations. The largest market return value is 27.4% and the lowest market return value is 0.19% in the upward market situation. As for the Shanghai downward market situation, market returns range from -0.06% to -23.6%. For Shenzhen market, there is forty-one monthly market returns greater than zero, the upward market situations. During the upward market situation, market return ranges from 0.36%

to 28.9%. As for the Shenzhen downward market situation, market returns range from -0.58% to -23.4%.

The coefficient of $\gamma_{2,down}$, -3.47, is significantly negative when *LTAD* is dependent variable in evaluating Shenzhen equity market. Low turnover stocks show a significant tendency to herd market return during extreme downward situation in Shenzhen.

3.5 Asymmetric reactions test

All data support hypothesis 4, Investors have asymmetric reactions to good news and bad news. Shanghai investors' asymmetric reactions are shown in Table 4. All regressions show that difference between β_1 and β_2 is significantly positive based on the t value. Since the values of dependent variables are small, the coefficient value and the differences are also small but still significantly different. Herding is more likely to happen during downward market. Finding is consistent when based on Change et al. (2000), the difference between $\gamma_{2,up} - \gamma_{2,down}$ is significantly positive. Result supports Shanghai investors tender to herd when facing bad news.

Shenzhen investors' asymmetric reactions are shown in Table 5. All regressions show that difference between β_1 and β_2 is significantly positive. Herding is more likely to happen during downward market. Finding is consistent when based on Change et al. (2000), the difference between $\gamma_{2,up} - \gamma_{2,down}$ is significantly positive. Result supports Shenzhen investors tender to herd when facing bad news.

4. Conclusions

We have six herding measures to examine investment behavior in China equity market. Even though this study does not support the existence of herding, we still have some interesting findings. Finding supports that low turnover stocks tend to herd than high turnover stock and investors tend to herd in downward market. The turnover effect on herding is partly supported; low turnover stocks show a significant tendency to herd market during extreme downward situation.

The finding can offer China government some suggestions in set up information mechanisms. Owing to investors tend to herd during downward market and low turnover stocks have significantly tendency toward herd than high turnover stocks, China government should establish an information monitoring system to regulate listed companies to offer prompt and sufficient information for investors to reduce herd in downward market and more rigid requirements should be set up for low turnover stocks.

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Table 1. Statistics data

Shanghai equity market					Shenzhen equity market				
item	Mean	Standard deviation	Maxi -mum	Mini -mum	item	Mean	Standard deviation	Maxi -mum	Mini -mum
Composite index return (%)	1.456	9.8	27.5	-23.6	Composite index return (%)	1.77	10.6	28.9	-23.5
CSSD	0.026	0.031	0.179	0.004	CSSD	0.042	0.073	0.473	0.0004
HTSD	0.032	0.041	0.312	0.006	HTSD	0.059	0.107	0.745	0.007
LTSD	0.019	0.031	0.212	0.005	LTSD	0.026	0.07	0.514	0.001
CSAD	0.101	0.046	0.233	0.046	CSAD	0.099	0.041	0.240	0.046
HTAD	0.114	0.045	0.238	0.058	HTAD	0.117	0.048	0.328	0.057
LTAD	0.087	0.048	0.236	0.029	LTAD	0.080	0.045	0.247	0.031

Table 2. Herding and Turnover effect in Shanghai equity market

Model A: $Dispersion_t^a = \alpha + \beta_1 D_t^U + \beta_2 D_t^L + \varepsilon_t$						
Model B: $Dispersion_t = \alpha + \gamma_1 R_{m,t} + \gamma_2 R_{m,t}^2 + \varepsilon_t$						
Dispersion	β_1	β_2	Adj R ²	γ_1	γ_2	Adj R ²
CSSD	0.065 (3.92***)	-0.012 (-0.71)	0.179	0.048 (0.247)	0.348 (0.428)	0.037
HTSD	0.047 (1.95)	-0.016 (-0.66)	0.037	0.151 (0.570)	-0.255 (-0.229)	-0.011
LTSD	0.082 (5.41***)	-0.008 (-0.51)	0.300	-0.057 (-0.304)	0.956 (1.22)	0.094
CSAD	0.092 (3.68***)	-0.014 (-0.57)	0.157	0.024 (0.086)	1.113 (0.960)	0.120
HTAD	0.086 (3.43***)	-0.017 (-0.69)	0.139	0.009 (0.033)	1.029 (0.884)	0.090
LTAD	0.089 (3.31***)	-0.011 (-0.417)	0.125	0.037 (0.129)	1.128 (0.932)	0.124

Note: a. $D_t^U = 1$, if the return on the market for time period t lies in the extreme upper 5% of the returns distribution, and $D_t^L = 1$, if the return on the market for time period t lies in the extreme lower 5% of the returns distribution. Dispersion has several different measurements such as CSSD, CSAD, HTSD, LTSD, HTAD and LTAD.

1.*** Significance at 1% level.

2. Value in parentheses is t value.

Table 3 Herding and turnover effect in Shenzhen equity market

Model A: $Dispersion_t^a = \alpha + \beta_1 D_t^U + \beta_2 D_t^L + \varepsilon_t$						
Model B: $Dispersion_t = \alpha + \gamma_1 R_{m,t} + \gamma_2 R_{m,t}^2 + \varepsilon_t$						
Dispersion	β_1	β_2	Adj R ²	γ_1	γ_2	Adj R ²
CSSD	0.021 (0.484)	-0.027 (-0.63)	-0.021	0.328 (0.727)	-0.76 (-0.43)	-0.012
HTSD	0.0014 (0.022)	-0.037 (-0.58)	-0.026	0.220 (0.328)	-0.634 (-0.24)	-0.029
LTSD	0.040 (0.953)	-0.019 (-0.45)	-0.013	0.477 (1.12)	-1.04 (-0.620)	0.018
CSAD	0.049 (2.08)	-0.013 (-0.563)	0.041	0.197 (0.807)	-0.055 (-0.057)	0.053
HTAD	0.022 (0.774)	-0.012 (-0.41)	-0.019	0.404 (1.39)	-1.15 (-1.00)	0.014
LTAD	0.078 (3.14***)	-0.012 (-0.47)	0.113	0.223 (0.87)	0.279 (0.275)	0.143

Note: a. $D_t^U = 1$, if the return on the market for time period t lies in the extreme upper 5% of the returns distribution, and $D_t^L = 1$, if the return on the market for time period t lies in the extreme lower 5% of the returns distribution. Dispersion has several different measurements such as CSSD, CSAD, HTSD, LTSD, HTAD and LTAD.

1.*** Significance at 1% level.

2. Value in parentheses is t value.

Table 4. Asymmetric test and turnover effect in Shanghai equity market

$y_t^a = \alpha + \beta_1 D_t^U + \beta_2 D_t^L + \varepsilon_t$					
Dependent variable y_t	coefficient		Dependent variable y_t	coefficient	
	β_1	β_2		β_1	β_2
CSSD	0.065	-0.012	CSAD	0.092	-0.014
	(27***)			(24***)	
HTSD	0.047	-0.016	HTAD	0.086	-0.017
	(15***)			(24***)	
LTSD	0.082	-0.008	LTAD	0.089	-0.011
	(34***)			(21***)	
$upward^* y_t = \alpha + \gamma_{1,up} R_{m,t} + \gamma_{2,up} (R_{m,t})^2 + \varepsilon_t$ $downward^* y_t = \alpha + \gamma_{1,down} R_{m,t} + \gamma_{2,down} (R_{m,t})^2 + \varepsilon_t$					
	Upward market b		Downward market b		Difference
	$\gamma_{1,up}$	$\gamma_{2,up}$	$\gamma_{1,down}$	$\gamma_{2,down}$	$\gamma_{1,up} - \gamma_{1,down}$
CSSD	0.05 (0.19)	0.709 (0.60)	0.07 (0.57)	-0.167 (-0.32)	0.876 (4.16***)
CSAD	-0.003 (-0.008)	1.90 (1.27)	0.158 (0.48)	-0.25 (-0.18)	2.15 (5.88***)
HTSD	0.199 (0.48)	-0.197 (-0.12)	0.03 (0.23)	0.021 (0.04)	-0.218 (-0.76)
LTSD	-0.09 (-0.344)	1.62 (1.48)	0.103 (0.81)	-0.35 (-0.635)	1.97 (9.64***)
HTAD	0.024 (0.06)	1.54 (0.99)	0.03 (0.098)	0.29 (0.21)	1.25 (3.45***)
LTAD	-0.038 (-0.104)	2.16 (1.44)	0.28 (0.75)	-0.78 (-0.47)	2.95 (7.32***)

Note: a. $D_t^U = 1$, if the return on the market for time period t lies in the extreme upper 5% of the returns distribution, and $D_t^L = 1$, if the return on

the market for time period t lies in the extreme lower 5% of the returns distribution. y_t have several different measurements such as *CSSD*, *CSAD*, *HTSD*, *LTSD*, *HTAD* and *LTAD*.

b. upward market means monthly market return, $R_{m,t}$, is greater and equal to zero; downward market means monthly return, $R_{m,t}$, is less than zero.

1. *** Significance at 1% level.
2. Value in parentheses is t value.

Table 5. Asymmetric test and turnover effect in Shenzhen equity market

	$y_t = \alpha + \beta_1 D_t^U + \beta_2 D_t^L + \varepsilon_t$				
Model	coefficient		Model	coefficient	
	$B_1 \beta \beta_1 - \beta_2$			$\beta_1 \beta_2 \beta_1 - \beta_2$	
CSSD	0.021 -0.027 0.048 (6.39***)		CSAD	0.049 -0.013 0.062 (15.2***)	
HTSD	0.001 -0.037 0.038 (3.44***)		HTAD	0.022 -0.012 0.034 (6.81***)	
LTSD	0.040 -0.019 0.059 (8.04***)		LTAD	0.078 -0.012 0.090 (20.8***)	
$\text{upward' } y_t = \theta + \gamma_{1,up} R_{m,t} + \gamma_{2,up} (R_{m,t})^2 + \varepsilon_t$ $\text{downward' } y_t = \theta + \gamma_{1,down} R_{m,t} + \gamma_{2,down} (R_{m,t})^2 + \varepsilon_t$					
	Upward market		Downward market		Difference
	$\gamma_{1,up}$	$\gamma_{2,up}$	$\gamma_{1,down}$	$\gamma_{2,down}$	$\gamma_{1,up} - \gamma_{1,down}$
CSSD	0.282 (0.43)	-0.13 (-0.39)	0.513 (1.49)	-1.75 (-1.28)	1.42 (2.94***)
CSAD	0.146 (0.48)	0.552 (0.455)	0.412 (1.16)	-1.41 (-1.00)	1.96 (5.80***)
HTSD	-0.02 (-0.02)	0.12 (0.03)	0.865 (1.92)	-2.77 (-1.56)	2.88 (4.10***)
LTSD	0.585 (0.97)	-0.77 (-0.32)	0.307 (0.89)	-1.29 (-0.94)	0.52 (1.12)
HTAD	0.308 (0.79)	-0.72 (-0.47)	0.687 (1.79)	-2.27 (-1.5)	1.55 (4.00***)
LTAD	-0.015 (-0.06)	1.82 (1.74)	0.982 (2.24**)	-3.47 (-2.00 **)	5.29 (13.8***)

Note: a. $D_t^U = 1$, if the return on the market for time period t lies in the extreme upper 5% of the returns distribution, and $D_t^L = 1$, if the return on the market for time period t lies in the extreme lower 5% of the returns distribution. y_t have several different measurements such as *CSSD*, *CSAD*, *HTSD*, *LTSD*, *HTAD* and *LTAD*.

b. upward market means monthly market return, $R_{m,t}$, is greater and equal to zero; downward market means monthly return, $R_{m,t}$, is less than zero.

1. *** Significance at 1% level.
2. Value in parentheses is t value.