Is the Disposition Effect Related to Momentum in the Chinese Stock Market?

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Abstract

This paper examines whether the framework of prospect theory and mental accounting proposed by Grinblatt and Han (2005) can be applied to analysing the relationship between the disposition effect and momentum in the Chinese stock market. Based on Chinese stock firm-level data with the sample period from January 1998 to June 2013, this study finds no empirical evidence for the relation between the disposition and momentum effects in the Chinese stock market as predicted by the Grinblatt and Han (2005) model. Our findings suggest that the Grinblatt and Han (2005) model may not be applicable to the Chinese stock market possibly because of the short-selling regulation in the Chinese stock market.

Keywords: **Disposition Effect, Momentum, Prospect Theory, Mental Accounting**

JEL Classification: **G10 G15 G18**

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1. Introduction

The disposition effect, as first labelled by Shefrin and Statman (1985), refers to the tendency of individuals to profit their gaining transactions (winners) too early and the reluctance to realize their losing transactions (losers). Many studies show that combining the prospect theory (Kahneman and Tversky 1979) with mental accounting (Thaler 1985) offers a plausible explanation for this effect and its relation to the patterns in cross-sectional stock returns. Barberis and Huang (2001) find that the prospect theory combined with the concept of individual mental accounting works best in explaining the cross-sectional expected return patterns, such as the profitability of momentum strategy. Frazzini (2006) finds that the prospect theory and mental accounting framework can act as a leading role in explaining the features of the cross-sectional stock returns. Grinblatt and Han (2002, 2005) show that prospect theory and mental accounting can explain the profitability generated by return-based momentum strategies.

Grinblatt and Han (2002, 2005) develop a theoretical model of equilibrium asset prices based on the prospect theory and mental accounting that link the disposition effect to the profitability of return-based momentum strategies. They assume that the presence of disposition-prone investors have the prospect theory preferences combined with mental accounting, and show that these investors (referred as PT/MA investors hereafter) in the stock market cause momentum in stock prices. According to their model, the demand for a stock by PT/MA investors deviate from that of fully rational investors, with the distortions being inversely related to the unrealized profit these investors have experienced on the stock. Consequently, a stock that has been privy to prior good news has excess selling pressure relative to a stock that has been

privy to adverse information. Such demand perturbation tends to generate price under reaction to public information. This distorts equilibrium prices relative to those predicted by standard utility theory. In equilibrium, past winners tend to be undervalued and past losers tend to be overvalued. As the above mispricing gets corrected, return predictability arises. Hence past winners will continue to go up and past losers will continue to go down. This leads to return-based momentum as well documented in Jegadeesh and Titman (1993).

There are also many studies on the disposition effect in the Chinese stock market. For example, using data of individual investors, Shumway and Wu (2006) find that a large majority of Chinese investors exhibit the disposition effect, and their findings suggest that disposition does indeed drive momentum. However, their studies employ a model different from Grinblatt and Han (2005)'s and are based on a relatively small sample with a short time frame from January 2001 to March 2004. Moreover, most of the studies on the disposition effect in the Chinese stock market follow Odean's (1998) methodology based on individual trading data (e.g., Feng and Seasholes 2003; Chen et al. 2004; Ng and Wu 2007). Odean (1998)'s methodology suffers from a range of limitations as argued by Brown et al., (2006). For example, Odean (1998)'s methodology sets reference price as the average of the purchase prices, which implies homoscedasticity in investments because of the equally weighted reference price for all investors and stocks. In contrast, there are few studies using aggregate market-wide trading data to examine the relation between the disposition effect and momentum in the Chinese stock market.

In this study, we employ the framework proposed by Grinblatt and Han (2005) to examine the relationship between the disposition effect and momentum in the Chinese

stock market using aggregate market-wide trading data. We follow the Grinblatt and Han (2005) approach to estimate the unrealized capital gain overhang and test three hypotheses implied by their model. We find no empirical evidence for the positive association between the expected stock returns and the unrealized capital gains or for the connection between the disposition effect and momentum in China as predicted by Grinblatt and Han (2005) model. Instead, we find that the association between the expected stock returns and the variable measuring unrealized capital gains is positive when the variable itself is positive and negative when the variable itself is negative. Our findings suggest that the discrepancies in the findings between Grinblatt and Han (2005)'s and ours are not due to different sample periods, but maybe due to the short-selling restriction in the Chinese stock market. Most empirical studies rarely look at short positions when computing various measures for the disposition effect. This may lead to an inconsistent "disposition effect".

Here arouses an immediate question/assumption of the disposition effect, which means investors can easily take short position on any stock. However, this assumption is highly diverged from the reality in most countries[1], especially the Chinese stock market. Opposite to the US stock market, the Chinese stock market totally bans short sales during our test sample period. Many researchers use short-sales constraints to explain some anomalies documented in financial markets. The disposition effect states that investors are more willing to realize their gains than their losses. Hence, they sell more in the bull market than in the bear market. If the market is constrained from short selling, investors cannot short stocks in bear market if they do not hold the

[1] According to Bris et al (2007), out of 46 countries, 21 do not allow and/or practice short sales due to either restrictive regulations or huge costs on shorting stocks.

underlying securities, resulting in an overpricing effect. Under the assumption of heterogeneous expectations among investors, Miller (1977) theorizes that short-selling constraints lead investable securities to reflect more of the optimistic investors' opinions than of the average potential investors' opinions, resulting in the securities' prices to be upward biased. This is because stock price will be overvalued as pessimistic investors cannot take short position on their bearish beliefs and remain out of the market. Relative to the Chinese stock market, the US stock market is way more shortable. During our sample period, investors can short any stock in the US stock market. However, no stocks can be shorted in the Chinese stock market even though investors are willing to pay higher shorting cost. The opposite short-sales regulations make the US stock market and the Chinese stock market hugely different , resulting in an inconsistent dispositional effect when their markets are in the down trend.

The remaining of the paper is organized as follows. The next section describes the test hypotheses and data used in our study. Section 3 presents the empirical results. Our concluding remarks are found in the final section.

2. Hypotheses and Data Description

2.1 Hypotheses

Assuming the existence of both PT/MA and rational investors in market, Grinblatt and Han (2005) propose a model of equilibrium asset prices which describes how the fully rational price path is altered by the PT/MA-inspired demand function. According to their model, a stock's expected return depends on the size of the unrealized capital gain and the fraction of shares traded as determined by

$$E\left[\frac{P_{t+1}-P_t}{P_t}\right]=(1-w)V_t\frac{P_t-R_t}{P_t} \quad (1)$$

where P_t, V_t and R_t are the stock price, turnover ratio and reference price on date t respectively. $g_t \equiv \frac{P_t-R_t}{P_t}$ is defined as the aggregate unrealized capital overhang for the stock on date t. The parameter *w* is the weight that accounts for the representation of the PT/MA investors in the economy. In particular, $w=\frac{1}{1+\mu\lambda}$, $0<w<1$, where μ is the proportion of PT/MA investors and λ is a positive constant measuring the relative intensity of the demand perturbation induced by the PA/MA investors. Eq. (1) shows that a stock's expected return monotonically increases in the marginal PA/MA investor's unrealized capital gain g_t. This implies that the unrealized capital overhang and future returns are positively correlated.

Furthermore, according to the PT/MA framework of Grinblatt and Han (2005), the disposition effect trading by PT/MA investors is able to lead to the momentum effect. Particularly, their model suggests that the effect of intermediate horizon momentum is likely to be much stronger. Conditionally, past returns have no predictive power for future returns as past returns are noisy proxies of the unrealized capital gains. Empirically, Grinblatt and Han (2005) confirm that the intermediate horizon momentum effect disappears when the unrealized capital gains is controlled for in the US stock market.

Therefore, we examine whether their model is applicable to the Chinese stock market by testing the following hypotheses:

Hypothesis 1: The variable measuring the stock's unrealized capital gains is positively related to past returns.

Hypothesis 2: A stock's expected return is monotonically increasing in the variable measuring the stock's unrealized capital gains.

Hypothesis 3: An intermediate horizon momentum effect disappears when the variable measuring the stock's unrealized capital gains is controlled for, given the existence of momentum in stock returns.

2.2 Data Description

Our data sample includes all stocks are listed in both the Shanghai Stock Exchange (SHSE) and the Shenzhen Stock Exchange (SZSE). Daily closing price, market value, trading volume, numbers of shares outstanding are retrieved from DataStream. We use the daily stock price to calculate the weekly stock return (r), the past cumulative return over the short horizon of the last four weeks ($r_{-4:-1}$), the intermediate horizon between the last 5 weeks and 52 weeks ($r_{-52:-5}$), and the long horizon between the last 53 weeks and 156 weeks ($r_{-156:-53}$). We also use the daily share trading volume and the total number of tradable shares to calculate the average weekly turnovers over the short horizon ($V_{-4:-1}$), the intermediate horizon ($V_{-52:-5}$) and the long horizon ($V_{-156:-53}$) respectively, as well as the average weekly turnover ratio over the prior 52 weeks ($\overline{V}$). The control variable of firm size is the natural logarithm of stock market capitalization observed at the beginning of a week.

Following Grinblatt and Han (2005), we estimate the reference stock price at the beginning of week t with the five years data prior to week t as follows:

$$R_t = \frac{1}{k}\sum_{n=1}^{260}\left(V_{t-n}\prod_{t=1}^{n-1}\left(1-V_{t-n+t}\right)\right)P_{t-n}$$

where V_t is a stock's turnover ratio on date t and k is a constant that constraints the weights of past prices to one, which is equal to

$$k = \sum_{n=1}^{260} \left(V_{t-n} \prod_{t=1}^{n-1} (1 - V_{t-n+t}) \right)$$

The weight on P_{t-n} reflects the probability of the shares purchased on date t-n which have not been traded since then. Moreover, since this weight declines geometrically with the time, more recent trading prices have more weight on the reference price, given other things constant. Brown et al. (2006) report that assigning more weight to the more recent prices could capture the homoscedasticity induced by Odean (1998)'s approach for the analysis of the disposition effect.

Following Grinblatt and Han (2005), we compute the variable measuring the unrealized capital gains at the beginning of week t as

$$g_t = \frac{P_{t-2} - R_{t-1}}{P_{t-2}}$$

Note that the stock price lagged by one week P_{t-2} is used in this calculation to avoid confounding market microstructure effect such as bid-ask bounce. Frazzini (2006) suggests that this proxy is expected to provide a more efficient estimator of the aggregate unrealized capital gains or losses.

Finally, we require all stocks must have at least five years historical data as required by the calculation of the unrealized capital gains. This leads to our sample has 1,550 stocks consisting of 793 weeks from January 1998 to June 2013.

[INSERT TABLE 1 HERE]

Table 1 provides summary statistics of the key variables in our study. It reports the time-series averages of the cross-sectional means, medians, standard deviations,

and 10th, 50th, 90th percentiles of these variables. As shown in Table 1, there are wide cross-sectional variation and time-variation in the unrealized capital gains.

[INSERT FIGURE 1 HERE]

Figure 1 presents the 10th, 50th, 90th percentiles of cross-sectional unrealized capital gains respectively. The changes in the unrealized capital gains coincide with the ups and downs in the Chinese stock market. For example, it can be observed that from 2001, the value of the unrealized capital gains decreases and the difference between the 10^{th} and 90^{th} percentiles gradually increases over time. This period corresponds to a four-year market slump of Chinese stock market from 2001 to 2005. Indeed, after reaching its record-high of 2,245.44 points on June 14, 2001, the Shanghai Composite Index plunged to 998.23 points on June 6, 2005. This was partly due to a ban on new initial public offerings (IPOs) started in April 2005 to curb the slump and allow more than US$200 billion of state-owned equity to be converted to tradable shares. Another big fall in the unrealized capital gains coincides with the global financial crisis in 2008.

3. Empirical Results and Analysis

3.1 Determinants of the Unrealized Capital Gains

We first analyse the association between the unrealized capital gains and past returns by examining the cross-sectional determinants of the unrealized capital gains. As in Grinblatt and Han (2005), we regress the weekly unrealized capital gains on the past stock returns, firm size and turnover ratios by applying the cross-sectional Fama-MacBeth (1973) regression approach to the following specification:

$$g = a_0 + a_1 r_{-4:-1} + a_2 r_{-52:5} + a_3 r_{-156:-53} + a_4 V_{-4:-1} + a_5 V_{-52:-5} + a_6 V_{-156:53} + a_7 s. \qquad (2)$$

[INSERT TABLE 2 HERE]

Panel A in Table 2 shows that the unrealized capital gains are positively related to past returns are the coefficients are 0.4063 for short-horizon, 0.5820 for intermediate horizon and 0.3104 for long horizon, respectively, and all of them are significant. Particularly the effect of intermediate horizon is stronger than the effects of other two horizons. These results provide strong evidence to support the first hypothesis, which is consistent with the findings of Grinblatt and Han (2005). In addition, the unrealized capital gains are significantly positively associated with not only firm size but also the past turnover ratio from short and long horizons, and negatively related to the past turnover ratio from intermediate horizon.

3.2 Expected Returns, Past Returns and Unrealized Capital Gains

To test the other two hypotheses, we analyze the relationship between the expected stock return and the explanatory variables of past returns, firm size, past turnover ratios and unrealized capital gains by applying the cross-sectional Fama-MacBeth (1973) regression approach to the following two specifications with and without the unrealized capital gains:

$$r = a_0 + a_1 r_{-4:-1} + a_2 r_{-52:-5} + a_3 r_{-156:-53} + a_4 \overline{V} + a_5 s, \quad (3)$$

$$r = a_0 + a_1 r_{-4:-1} + a_2 r_{-52:-5} + a_3 r_{-156:-53} + a_4 \overline{V} + a_5 s + a_6 g. \quad (4)$$

Based on Grinblatt and Han (2005), the dependant variable (r) in the regression is weekly stock return for week t. We use the cumulative returns over the short, intermediate and long horizons ($r_{-4:-1}$, $r_{-52:-5}$,$r_{-156:-53}$) in the regression to control the past return effects as illustrated in Jegadeesh and Titman (1993). We use the weekly turnover ratio over the 52 weeks prior to week t-1 ($\overline{V}$) and the firm size to control the past turnover ratio and size effect, respectively. And, the unrealized capital gains (g) are

calculated at the end of week t-1. We fit either of the two models with the whole sample or three subsamples containing observations of January, February to November, and December separately. The results are reported in Panels B and C of Table 2.

Panel B of Table 2 shows that there is no evidence for an intermediate horizon momentum effect in the Chinese stock market because of a negative coefficient of the past intermediate horizon returns ($r_{-52:-5}$) for all the samples. On the contrary, there is evidence supporting a reversal effect of the past returns over all the three horizons based on the whole sample period and the February to November subsample period, when the unrealized capital gains are excluded from the regression. These results are consistent with the findings of many earlier studies on the Chinese stock market. For example, Wang (2004) documents no intermediate-horizon momentum returns but contrarian profits in the Chinese stock market. Shumway and Wu (2006) find that there is no apparent momentum in the Chinese stock market as there is no significant forecasting ability of past stock returns on future returns. The study on momentum and mean reversal in the Chinese stock market by Wu (2011) also finds that the momentum strategy is not profitable, and there is a strong mean reversion in the Chinese stock market. Unlike the free short-selling setting in the US stock market, the strictly short-selling restrictions in the Chinese stock market may lead to the insignificant predictability of past returns on future returns. Investors are unable to short those loser stocks, thus resulting in a no-momentum phenomenon (Bai and Li, 2013). In addition, our findings of the mean reversion over long horizon are consistent with that of De Bondt and Thaler (1985) that stock price trends reverse over the following three to five years.

Furthermore, Panel C of Table 2 indicates that the expected returns are negatively related to the unrealized capital gains as the coefficient of g is significantly negative for the whole sample period and the February to December subsample period. This presents evidence against the second hypothesis that the expected returns are monotonically increasing in the unrealized capital gains. Our findings show that stocks with unrealized capital gains have lower expected returns than stocks with unrealized capital losses, given all other explanatory variables constant. This is consistent with the studies by Barberis, Huang, and Santos (2001), Barberis and Huang (2001), and Barberis and Xiong (2009), which show contrarian expectations on disposition-prone investors. When stocks have unrealized capital gains and disposition-prone investors are less risk-averse because future losses will be cushioned by the unrealized capital gains, the stock prices are usually high. Consequently, the disposition-prone investors expect lower returns. On the other hand, when stocks have unrealized capital losses and disposition-prone investors are more risk-averse, the disposition-prone investors expect higher returns. Hence our findings suggest that Grinblatt and Han's model may not be applicable to the Chinese stock market[2].

In addition, when the unrealized capital gains are controlled for, the effect of the mean reversal over the intermediate horizon becomes insignificant for all the samples. This result also presents evidence against the third hypothesis. It suggests that there

[2] Note that we did not look into alternative unrealized capital gains regressors because Grinblatt and Han (2005) show that their results should be independent of the choice of unrealized capital gains regressor..

may be some alternative explanations for the strength of the unrealized capital gains as a predictor of future returns in the Chinese stock market.

Due to the strictly short-selling restrictions, investors in the Chinese stock market may respond to unrealized capital losses differently from investors in the US stock market. This may affect the association between expected returns and unrealized capital losses. Thus we examine the possible different effects of positive and negative values of the unrealized capital gains on the expected stock returns by applying the cross-sectional Fama-MacBeth (1973) regression approach to the following specification:

$$r = a_0 + a_1 r_{-4:-1} + a_2 r_{-52:-5} + a_3 r_{-156:-53} + a_4 \overline{V} + a_5 s + a_6 g^+ + a_7 g^- \qquad (5)$$

where the unrealized capital gains $g^+ = g$ if $g \geq 0$, and 0 otherwise, and the unrealized capital losses $g^- = g$ if $g < 0$, and 0 otherwise. We fit the model with the whole sample and the three subsamples separately, and report the results in Panel D of Table 2.

In Panel D of Table 2, as the coefficient of $g^+ (g^-)$ is significantly positive (negative) for both the whole sample and the February to November subsample, it appears that the expected returns monotonically increase in the unrealized capital gains when the variable is positive, while it is negatively related to the unrealized capital gains when this variable is negative. Note that the results of the reversal effect of the past returns are similar to those in Panel C.

A possible explanation for this inconsistent evidence with the US stock market is short-selling restriction. In an efficient market, like the US market, without any frictions and, in particular, investors can take short position in any stock; all investors' opinions about the value of the stock will be reflected in the price. If, however, short

sale is not allowed in a market (non-shortable market), like the Chinese stock market, investors may show asymmetric reaction to good news versus bad news. This is because, when good news is released to the public, any investor can react to this information by buying the stock. When investors have heterogeneous beliefs about the value of the stock, the most optimistic ones will tend to buy at higher prices. The more divergent the opinions are among investors, the more likely these investors will overreact to good news and push the price above its fundamental value. When short selling is not allowed, some informed traders, such as arbitrageurs, will be kept away from such mispricing, which will cause overvaluation (Miller, 1977). On the other hand, when bad news is released to the public, only investors who currently have a long position in the stock can sell the stock and, thus, have their opinion reflected in the price. When investors differ in their evaluation of a stock, some pessimistic investors who do not own the stock are not able to have their opinions reflected in the stock price. Therefore, compared with stocks that can be freely short sold (shortable stocks) in the US stock market, the price of non-sharable stocks in the Chinese stock market might be less efficient in reacting to public information, especially bad news. The huge difference in short-selling regulations in the US and Chinese stock markets lead to inconsistent pattern. Therefore, if an investor has bearish belief on a security, however, he/she is not able to short sell it due to the shorting constraints or high shorting cost, such investor cannot realize the unrealized capital gains to make profit in the next stage. The negative relation between the unrealized capital gains and the expected returns shows that the short-selling constraints not only lead to stock overvaluation but also prevent investors from realizing unrealized profit from previous period by shorting stocks in current period.

3.3 Robustness Check

For the purpose of robustness check on our results, we repeated the analysis in the previous section with the subsample from January 1998 to December 2007, excluding the period of the global financial crisis. The regression results are similar to those for the data from January 1998 to June 2013, and the conclusions for all the three hypothesis tests remain the same[3]. This confirms that our findings are robust and unaffected by the global financial crisis.

In order to make our study consistent with Grinblatt and Han (2005) study and comparable with the US market, we include US data as well, we replicated the work of Grinblatt and Han (2005) by fitting the three models defined in Equations (2), (3), and (4) with the US stock data for the same sample period from January 1998 to June 2013. As in Grinblatt and Han (2005), all US data are sourced from the CRSP database, which includes 3,124 firms traded on the NYSE/AMEX exchanges with at least 5-year observations. The summary statistics are reported in Table 5.

[INSERT TABLE 5 and FIGURE 2 HERE]

Figure 2 plots the unrealized capital gains in the same way as the Chinese stocks. The dispersion of the variable of the unrealized capital gains changes widely over time, particularly during the period of the global financial crisis. Like the Chinese stock market, the unrealized capital gains had a huge drop around the global financial crisis.

[3] The detailed results are available upon request.

Table 6 reports the regression results for the US stocks. Panel A confirms the first hypothesis, while Panel C provides strong evidence to support the second hypothesis.

However, neither the Panel B nor the Panel C in Table 6 supports the third hypothesis as the coefficient of the intermediate horizon return is not significantly positive in the non-January samples. This result may be due to the global financial crisis, which might diminish the profitability of momentum strategies. In fact, when we refit the models of Equations (3) and (4) with the subsample period from January 1998 to December 2007, the intermediate horizon momentum effect is significant. Furthermore, this momentum effect disappears when the unrealized capital gains are included in the regression, supporting the third hypothesis, as shown in Table 7 of the details. Clearly, the discrepancies in the results of the application of Grinblatt and Han's (2005) model between the Chinese and US stock markets are not due to different sample periods.

4. Conclusion

This study empirically examines the applicability of Grinblatt and Han (2005) model for analyzing the relationship between the disposition effect and momentum in the Chinese stock market by testing the three hypotheses implied by their model. Our results show that the unrealized capital gains are positively associated with past returns, which provides evidence supporting the first hypothesis. However, our findings also show that the unrealized capital gains are negatively related to the expected returns, which contradicts the second hypothesis. Furthermore, as there is no evidence for an intermediate horizon momentum effect in the Chinese stock market, we have found no evidence to support the third hypothesis. Finally, our findings are robust for different sample periods and the discrepancies in the findings between the

Chinese and US stock markets are not due to different sample periods. Therefore, our findings imply that the relationship between the disposition effect and momentum in the Chinese stock market may not be exactly described by the model of Grinblatt and Han (2005).

One possible explanation for the discrepancy in findings between our study and Grinblatt and Han (2005)'s study could be the short-selling constraints in the Chinese stock market but not in the US stock market. As indicated by Miller (1977), short-selling constraints can prevent negative information or opinions from being incorporated into stock prices. Rational investors are prevented form shorting overpriced stocks; consequently these stocks may experience a higher return than it should be because the prices would not go down further due to the short-selling constraints. In the bull market, both shortabe and non-shortable stocks can reflect investors' opinion immediately; however, in the bear market, stocks cannot reflect some investors' bearish beliefs unless the market is shortable. Therefore, the short-selling constraints strength the disposition effect in the bull market but weaken the effect in the bear market if short sales are prohibited in the market. For example, investors are more likely to buy shares when the prices go down than when the prices go up if the investor initially has a short position in the stock. Therefore, the short-selling restriction in the Chinese stock market is a very plausible reason why the disposition effect is opposite to that in the US stock market when both markets are bearish.

We find that the unrealized capital gains are positively related to the expected returns, while the unrealized capital losses are negatively related to expected returns. This suggests that the future directions of the research should include the study on the

relationship between the disposition effect and momentum under short-selling constraints.

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Table 1

Summary statistics for the Chinese stock data from January 1998 to June 2013

	$r_{-4:-1}$	$r_{-52:-5}$	$r_{-156:-53}$	$\bar{V}$	s	G
Mean	0.0099	0.2021	0.4836	0.0844	3.5085	-0.0678
Median	0.0000	-0.0433	0.0375	0.0604	3.4542	0.0762
Std.Dev	0.1308	0.8061	1.3044	0.0823	0.4488	0.6010
10^{th} percentile	-0.1241	-0.4057	-0.4798	0.0152	2.9965	-0.8706
90^{th} percentile	0.1498	1.1096	1.9956	0.1792	4.0952	0.5393

Figure 1

Time series of cross-sectional percentiles of the capital gains overhang for the Chinese stock data from January 1998 to June 2013

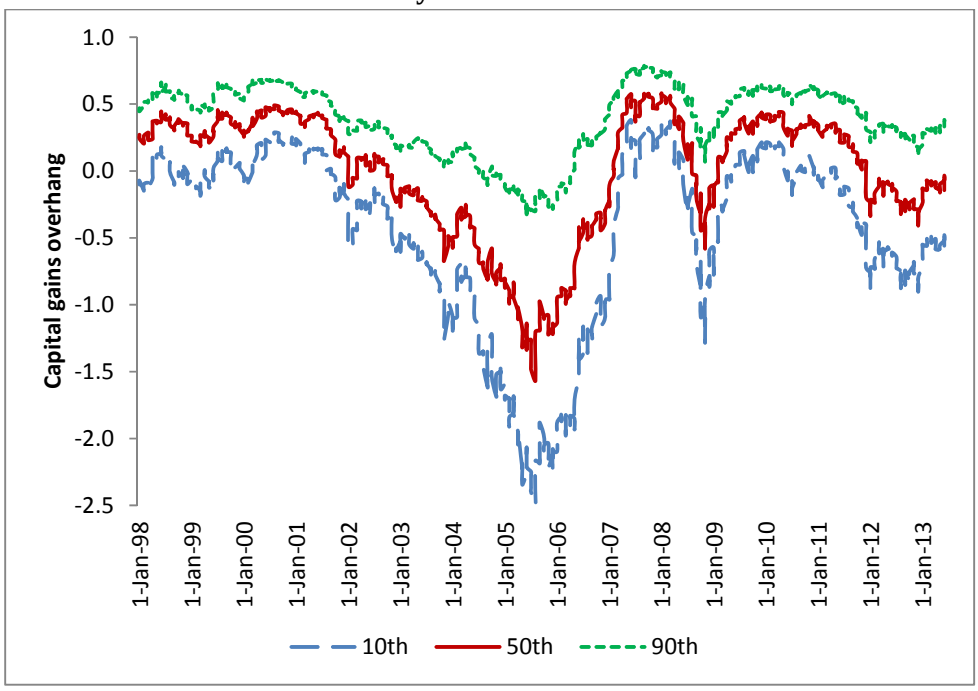

Table 2

Average coefficients and t-statistics (in parentheses) for the following cross-sectional Fama-MacBeth (1973) regressions with the Chinese stock data from January 1998 to June 2013:

Panel A: $g = a_0 + a_1 r_{-4,-1} + a_2 r_{-52,-5} + a_3 r_{-156,-53} + a_4 v_{-4,-1} + a_5 v_{-52,-5} + a_6 v_{-156,-53} + a_7 s$

a_0	a_1	a_2	a_3	a_4	a_5	a_6	a_7
-0.4155	0.4063	0.5820	0.3104	0.3312	-0.3180	0.1885	0.1191
-17.84	27.50	33.19	26.49	20.76	-11.19	6.82	21.80

R^2_{adj} =0.5926

Panel B: $r = a_0 + a_1 r_{-4,-1} + a_2 r_{-52,-5} + a_3 r_{-156,-53} + a_4 \bar{V} + a_5 s$

Period	a_0	a_1	a_2	a_3	a_4	a_5
All months	-0.0223	-0.0133	-0.0031	-0.0040	0.0173	0.0073
	(-6.77)	(-4.20)	(-4.07)	(-9.80)	(7.38)	(9.44)
January	-0.0319	-0.0055	-0.0024	-0.0041	0.0396	0.0109
	(-2.83)	(-0.45)	(-0.97)	(-2.54)	(4.22)	(3.95)
February-November	-0.0201	-0.0143	-0.0034	-0.0042	0.0148	0.0066
	(-5.48)	(-4.07)	(-4.03)	(-9.51)	(5.85)	(7.82)
December	-0.0344	-0.0118	-0.0006	-0.0015	0.0196	0.0096
	(-3.54)	(-1.46)	(-0.24)	(-1.28)	(2.55)	(4.21)

Panel C: $r = a_0 + a_1 r_{-4,-1} + a_2 r_{-52,-5} + a_3 r_{-156,-53} + a_4 \bar{V} + a_5 s + a_6 g$

Period	a_0	a_1	a_2	a_3	a_4	a_5	a_6
All months	-0.0264	-0.0114	-0.0004	-0.0019	0.0204	0.0088	-0.0097
	(-8.05)	(-3.65)	(-0.57)	(-4.47)	(8.62)	(10.87)	(-4.68)
January	-0.0348	-0.0056	-0.0009	-0.0031	0.0407	0.0116	-0.0024
	(-3.10)	(-0.47)	(-0.41)	(-1.88)	(4.34)	(4.24)	(-0.70)
February-November	-0.0246	-0.0121	-0.0005	-0.0019	0.0182	0.0084	-0.0113
	(-6.72)	(-3.48)	(-0.61)	(-4.01)	(7.14)	(9.27)	(-4.57)
December	-0.0361	-0.0105	0.0009	-0.0009	0.0209	0.0099	-0.0019
	(-3.77)	(-1.35)	(0.49)	(-0.76)	(2.72)	(4.49)	(-0.95)

Panel D: $r = a_0 + a_1 r_{-4,-1} + a_2 r_{-52,-5} + a_3 r_{-156,-53} + a_4 \bar{V} + a_5 s + a_6 g^+ + a_7 g^-$

Period	a_0	a_1	a_2	a_3	a_4	a_5	a_6	a_7
All months	-0.0266	-0.0121	-0.0006	-0.0023	0.0202	0.0087	0.0070	-0.0186
	(-8.10)	(-3.90)	(-0.79)	(-5.42)	(8.61)	(11.23)	(3.80)	(-2.03)
January	-0.0351	-0.0055	0.0002	-0.0022	0.0405	0.0119	0.0081	-0.0079
	(-3.18)	(-0.47)	(0.08)	(-1.34)	(4.35)	(4.36)	(1.17)	(-0.50)
February-November	-0.0248	-0.0129	-0.0008	-0.0024	0.0181	0.0082	0.0076	-0.0187
	(-6.76)	(-3.73)	(-0.92)	(-5.21)	(7.16)	(9.59)	(3.69)	(-1.82)
December	-0.0359	-0.0111	0.0004	-0.0011	0.0203	0.0097	0.0002	-0.0283
	(-3.80)	(-1.42)	(0.22)	(-0.91)	(2.62)	(4.42)	(0.05)	(-0.77)

Table 5

Summary statistics for the US stock data from January 1998 to June 2013

	$r_{-4:-1}$	$r_{-52:-5}$	$r_{-156:-53}$	$\bar{v}$	s	g
Mean	0.0071	0.1144	0.2825	0.0393	15.7047	-0.0581
Median	0.0049	0.0490	0.0907	0.0210	15.5969	0.0689
Std.Dev	0.0998	0.5628	1.3137	0.0706	4.9460	0.6184
10^{th} percentile	-0.0875	-0.3050	-0.4098	0.0038	9.4467	-0.6051
90^{th} percentile	0.0981	0.5109	0.9742	0.0845	22.2993	0.4309

Figure 2

Time series of cross-sectional percentiles of the capital gains overhang for the US stock data from January 1998 to June 2013

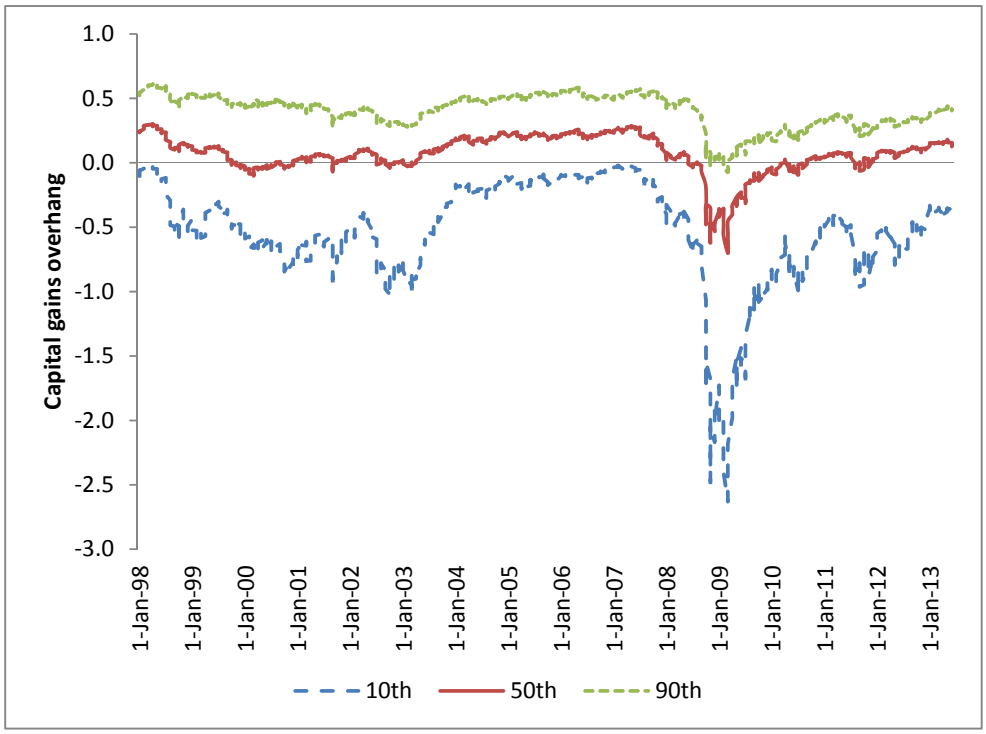

Table 6

Average coefficients and t-statistics (in parentheses) for the following cross-sectional Fama-MacBeth (1973) regressions with the US stock data from January 1998 to June 2013:

Panel A: $g = a_0 + a_1 r_{-4,-1} + a_2 r_{-52,-5} + a_3 r_{-156,-53} + a_4 v_{-4,-1} + a_5 v_{-52,-5} + a_6 v_{-156,-53} + a_7 s$

a_0	a_1	a_2	a_3	a_4	a_5	a_6	a_7
-0.3968	0.7389	0.5419	0.2183	0.0258	-0.1606	-0.0558	0.0235
(-52.05)	(26.76)	(33.98)	(28.52)	(0.95)	(-4.87)	(-3.01)	(67.82)

R^2_{adj} = 0.3199

Panel B: $r = a_0 + a_1 r_{-4,-1} + a_2 r_{-52,-5} + a_3 r_{-156,-53} + a_4 \overline{V} + a_5 s$

Period	a_0	a_1	a_2	a_3	a_4	a_5
All months	0.0001	-0.0238	-0.0008	-0.0008	0.0101	0.0000
	(0.21)	(-8.71)	(-0.99)	(-3.66)	(4.30)	(0.98)
January	0.0136	-0.0244	-0.0062	-0.0012	0.0087	-0.0007
	(6.15)	(-2.70)	(-2.05)	(-1.55)	(1.08)	(-4.69)
February-November	-0.0012	-0.0233	-0.0005	-0.0007	0.0095	0.0001
	(-1.60)	(-7.64)	(-0.55)	(-2.71)	(3.71)	(2.25)
December	-0.0001	-0.0288	0.0019	-0.0020	0.0172	0.0002
	(-0.05)	(-3.45)	(0.82)	(-2.53)	(2.09)	(1.80)

Panel C: $r = a_0 + a_1 r_{-4,-1} + a_2 r_{-52,-5} + a_3 r_{-156,-53} + a_4 \overline{V} + a_5 s + a_6 g$

Period	a_0	a_1	a_2	a_3	a_4	a_5	a_6
All months	0.0041	-0.0338	-0.0063	-0.0027	0.0122	-0.0002	0.0094
	(6.92)	(-12.32)	(-8.79)	(-11.69)	(5.26)	(-4.70)	(21.01)
January	0.0159	-0.0282	-0.0111	-0.0021	0.0101	-0.0008	0.0058
	(7.47)	(-3.17)	(-3.67)	(-3.22)	(1.30)	(-5.11)	(3.22)
February-November	0.0029	-0.0342	-0.0060	-0.0026	0.0117	-0.0002	0.0099
	(4.60)	(-11.18)	(-7.85)	(-10.44)	(4.58)	(-3.38)	(20.45)
December	0.0038	-0.0357	-0.0040	-0.0034	0.0196	0.0000	0.0080
	(1.99)	(-4.19)	(-1.73)	(-4.28)	(2.38)	(0.08)	(5.86)

Table 7

Average coefficients and t-statistics (in parentheses) for the following cross-sectional Fama-MacBeth (1973) regressions with the US stock data from January 1998 to December 2007:

Panel A: $r = a_0 + a_1 r_{-4,-1} + a_2 r_{-52,-5} + a_3 r_{-156,-53} + a_4 \overline{V} + a_5 s$

Period	a_0	a_1	a_2	a_3	a_4	a_5
All months	0.0002	-0.0236	0.0013	-0.0006	0.0170	0.0000
	(0.28)	(-8.76)	(2.11)	(-3.44)	(5.68)	(1.86)
January	0.0138	-0.0377	-0.0016	-0.0011	0.0211	-0.0003
	(4.86)	(-3.77)	(-0.53)	(-1.98)	(1.79)	(-3.64)
February-November	-0.0012	-0.0215	0.0010	-0.0005	0.0163	0.0001
	(-1.44)	(-7.19)	(1.68)	(-2.68)	(5.05)	(3.07)
December	0.0003	-0.0303	0.0063	-0.0011	0.0205	0.0001
	(0.13)	(-4.17)	(3.13)	(-1.45)	(1.85)	(1.02)

Panel B: $r = a_0 + a_1 r_{-4,-1} + a_2 r_{-52,-5} + a_3 r_{-156,-53} + a_4 \overline{V} + a_5 s + a_6 g$

Period	a_0	a_1	a_2	a_3	a_4	a_5	a_6
All months	0.0040	-0.0323	-0.0029	-0.0020	0.0184	-0.0001	0.0099
	(6.18)	(-12.02)	(-4.65)	(-9.00)	(6.10)	(-3.16)	(19.60)
January	0.0152	-0.0389	-0.0041	-0.0018	0.0239	-0.0003	0.0053
	(5.90)	(-3.82)	(-1.48)	(-2.64)	(2.12)	(-4.10)	(2.32)
February-November	0.0028	-0.0309	-0.0032	-0.0019	0.0173	0.0000	0.0103
	(4.13)	(-10.40)	(-4.69)	(-7.99)	(5.30)	(-1.87)	(19.51)
December	0.0049	-0.0386	0.0009	-0.0028	0.0235	0.0000	0.0104
	(2.23)	(-5.29)	(0.62)	(-3.21)	(2.13)	(-0.56)	(5.70)