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EMPIRICAL STUDY ON STOCK'S CAPITAL RETURNS DISTRIBUTION AND FUTURE PERFORMANCE

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EMPIRICAL STUDY ON A STOCK'S CAPITAL RETURNS DISTRIBUTION AND FUTURE PERFORMANCE

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ABSTRACT

Investors subject to reference dependence and mental accounting tend to make decisions based on the unrealized losses and gains relative to a reference point, and behave consistently with the disposition effect. In this paper, I focus my study on stocks' capital returns distribution, which is a distribution of each stock that represents the relative capital gains/losses of all shareholders during a target time period. Empirical evidences show the mean value and the skewness of stock's capital returns distribution play significant roles in forecasting future performance. For stocks with a negative mean value of the distribution, the only significant parameter is the skewness, while for stocks with positive mean, that parameter is the mean. This finding suggests an investment strategy taking advantage of the capital returns distribution may generate significant capital returns. I name stocks with lowest skewness among those having negative mean as losing stocks and name stocks with the largest positive mean values as winners. Running horse-race of buy-winner portfolio and short-loser portfolio after a holding period varying from one month to two years gives us a total of twelve investment strategies examined in this paper. There is an inverted U shape in the cumulative portfolio returns. Both the short-loser and buy-winner strategy beat the market in short- and medium-term, and generate significant abnormal returns for investors. But after two years of the portfolio formation, the profitability of strategies tested in this paper dissipates.

TABLE OF CONTENTS

LIST OF FIGURES AND TABLES

1. INTRODUCTION

Shefrin and Statman (1985) pointed out that in the stock market there exists the disposition effect, i.e. investors tend to sell their winning shares too soon and hold their losing shares for too long. The previous literature has investigations on how the disposition effect helps to predict expected stock return. In Grinblatt and Han (2005), they documented that a stock's capital gains overhang, which is the difference between the stock's market price and its aggregate cost basis of all shares, "dominates as a forecasting variable" when studying the relationship between stocks' past performance and future returns.

Their findings inspired me to explore more information about the relationship between a stock's capital return and its future performance. In contrast to their analysis on a stock's aggregate capital gain/loss, I generated a distribution for each stock representing the relative capital returns of all its shares during certain time period. In this paper, I use the cost of purchase as the reference price to which an investor measures his relative capital profit of his stock share. Specifically speaking, at any given market price, different shareholders of the same stock face different unrealized capital returns, because of the difference in purchase cost of the stock share(s). Hence, the capital returns distribution of all shareholders could be generated to provide us information about the shareholders' capital gains/losses.

To study the relation between the shape of stocks' capital returns distribution and stocks' future performance, I generated four moment variables to describe the distribution, i.e., the mean value, variance, skewness, and kurtosis. Empirical regressions of future stock return on the four proxy variables show that expected stock return is positively related with the first and the third moment variables of the capital returns distribution. A larger mean value represents that the majority of shareholders earns higher unrealized capital gains in this period. Because the expected stock return increases monotonically with the mean, such stocks would continue their winning performance in next period, reflecting price momentum. For stocks with negative mean value of the capital returns distribution, the skewness is the only significant parameter forecasting future stock returns; while for stocks with positive mean value, only the mean plays significant role in predicting. The asymmetry may be explained by the idea of reference dependence and mental accounting.

According to Kahneman and Tversky (1979)'s Prospect Theory, people make decisions based on the value of potential losses and gains to a reference point rather than the final outcome. In this paper, I use the cost of purchase as the reference price of a stock share. A reference-dependent investor is more likely to be risk seeking when facing a loss, and risk averse when facing a gain. Thus, the utility function of such an investor is concave on the positive domain and convex on the negative domain of investment returns. Subject to mental accounting, if an investor holds several stock shares, he may divide his investments into separate mental accounts based on his unrealized capital returns. The shareholder is more willing to sell the shares that have unrealized capital gains, while is more reluctant to sell the shares with unrealized capital losses, because he is risk averse over the former accounts but is risk-seeking over the later accounts. For investors subject to reference dependence and mental accounting, their demands are distortions to the demands of rational investors, and such distortions are inversely related to the unrealized capital return of their stock investments. As shown by the model of Grinblatt and Han (2005), the demand distortion of investors subject to reference dependence and mental accounting (RD/MA investors for short) is inclined to cause price under-reaction to public information. Thus, winning stocks probably still win in the next period, and losing stocks probably still lose. The RD/MA investors' trading behavior is in accordance with the disposition effect; hence momentum in stock returns can be expected.

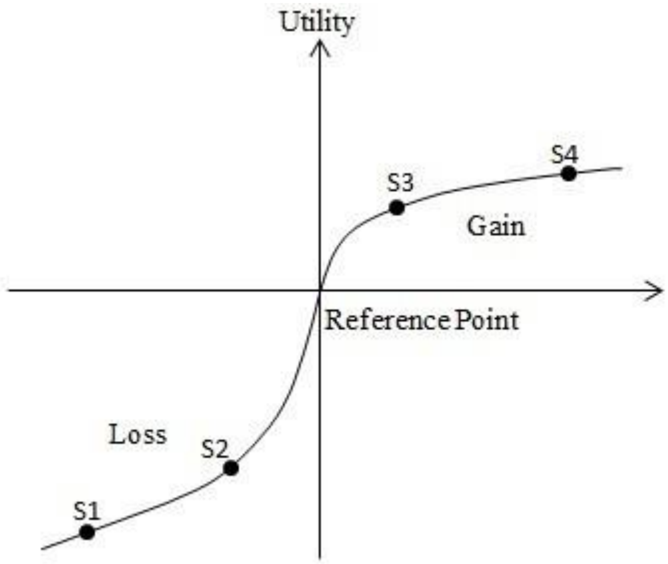

Figure 1: Reference Dependence Value Function

This figure plots an example of the S-shaped reference dependence value function. Supposing there are four shareholders, they face different unrealized capital returns. Shareholders S1 and S2 own stock shares with unrealized capital losses, and S1 is an extreme loser. Whereas shareholders S3 and S4 have unrealized capital gains, and S4 is extreme winner. Subject to reference dependence and mental accounting, shareholders with capital gains (S3 and S4) are risk averse, and have less demand for the stock than shareholders with losses (S1 and S2), who are risk seeking. And extreme loser (S1)'s demand is even greater than that of a loser with relatively small loss (S2).

According to the above analysis we can see the reference point to which investors measure their relative capital returns plays an important role in deciding their trading behaviors. In this paper, I use the purchase cost of a stock share as the shareholder's reference price. Every time a share is traded, there would be a new reference price for this share's new holder, which is the real-time market price. Thus, the relative capital return represents how much an investor has earned compared to his cost. And all the following calculations and analysis are based on this idea. The previous literature has conducted some studies on the relative capital returns referenced to the current market stock price, such as Zhou and Lei (2010). In my opinion, choosing the purchase cost as the reference point is more similar to the realistic situation. In this paper, the empirical regression part has a similar framework with Zhou and Lei (2010), but the model used is built under a different idea.

The empirical implications in previous part suggest that an investment strategy taking advantage of the capital returns distribution may generate significant returns for investors. Selecting stocks based on the mean and the skewness of their capital returns distribution gives us two groups of portfolios. I name stocks with lowest skewness among those having negative mean as losing stocks and name stocks with the largest positive mean values as winners. In this paper, I ran horse-race of two portfolios, i.e. buy-winner portfolio and short-loser portfolio, for a holding period varying from one month to two years, hence there is a total of twelve investment strategies examined in this paper. All of them could generate significant returns for investors, and the buy-winner strategies generate higher stock returns than the short-loser strategies for most of the cases.

The rest parts of this paper is organized as follows: Section 2 is about the model and my hypothesis; Section 3 describes the variables and data; Section 4 documents the empirical results; Section 5 illustrates the investment strategies I examined; Section 6 is a comparison and contrast between US stock market and Chinese stock market; and Section 7 is a discussion part.

2. THE MODEL AND HYPOTHESES

2.1 THE MODEL

Before illustrating the model, I first make two assumptions of the stock market: a). The fundamental value of stocks moves in a random walk, $\mathrm{F}_{t+1} = \mathrm{F}_t + \varepsilon_{t+1}$; b). The total supply of stock is fixed and normalized to one unit.

In Grinblatt and Han (2005), the authors proposed the following demand functions of rational investors and PT/MA investors at date t:

Rational Investors: $\mathrm{D}_t^r = 1 + \mathrm{b}_t(\mathrm{F}_t - \mathrm{P}_t)$ (1)

PT/MA Investors: $\mathrm{D}_t^{PT/MA} = 1 + \mathrm{b}_t[(\mathrm{F}_t - \mathrm{P}_t) + \lambda(\mathrm{R}_t - \mathrm{P}_t)]$ (2)

where F_t is the stock's fundamental value, P_t is the stock's market price, R_t is the reference price chosen by the investor to measure his relative capital return, λ is a positive constant measuring the relative strength of the capital gain part for PT/MA investors' demand, and b_t is the slope of rational investors' demand function. The slope, b_t, is irrelevant to the model, excerpt for the rational investors' equilibrium demand. Grinblatt and Han (2005) defined b_t as "the solution to the equilibrium demand of rational investors that have full knowledge of the existence of PT/MA disposition investors".

In this paper, I basically follow Zhou and Lei(2010)'s idea of differentiating different reference prices for a given stock's all RD/MA shareholders. However, in contrast to their idea of using the current market price as the reference point, the following model aims at studying the unrealized capital returns relative to investors' cost of purchase. Supposing a RD/MA investor owns the n^{th} share of a given stock and that there is a total of N shares outstanding. So, at date t, when faced with the stock's market price P_t, the shareholder would have the reference price $R_{t,n}$. Then the demand function of RD/MA investors is rewritten as:

RD/MA Investors: $D_{t,n}^{RD/MA} = 1 + b_t\left[(F_t - P_t) + \lambda\left(R_{t,n} - P_t\right)\right]$ (2')

Assuming that the probability of a shareholder being a RD/MA investor is μ, then we can get:

Total market demand: $D_t = \sum_{n=1}^{N}[\mu D_{t,n}^{RD/MA} + (1-\mu)D_t^r]$ (3)

Since the supply of stock is normalized to one unit, we have $\frac{D_t}{N} = 1$, according to the market clear condition. After rearranging, we get the equation of equilibrium price:

$P_t = \omega F_t + (1-\omega)\frac{1}{N}\sum_{n=1}^{N} R_{t,n}\,, where\ \omega = \frac{1}{1+\lambda\mu}$ (4)

From the above equation, we find that the equilibrium price is a weighted average of the stock's fundamental value and the reference prices. The greater the proportion of RD/MA investors is (larger μ) and the stronger the distortion effect of RD/MA is (larger λ), then stock price's deviation is worse.

RD/MA investors are supposed to have separate mental accounts for each share of a stock. Defining the reference price as the purchase cost for the share of a given stock a RD/MA investor holds. Every time a share is traded, there would be a new reference price for this share's new holder, which is the real-time market price. Supposing, at time t, the n^{th} share is traded, then the new reference price equals to P_t; otherwise, the reference price keeps unchanged at $R_{t,n}$. Thus, new reference prices of a stock are weighted average of old ones and new market prices.

$$R_{t+1,n} = (1 - \upsilon_t)R_{t,n} + \upsilon_t P_t \tag{5}$$

As documented in Grinblatt and Han (2005), υ_t is an evolving weight that is related with turnover rate or selling frequency, "since the cost basis is the reference price that motivates the mental account." Whereas, in this paper, I would denote υ_t as a function of the share's selling probability. How probably a share is traded is related to its achieved relative capital gain. The previous literature has statements about their relationship: "the selling probability of a share is a non-decreasing function of the relative capital gains/losses (Zhou and Lei, 2010)". Different from Zhou and Lei (2010), I define υ_t as a function of relative capital return $(\frac{P_t - R_{n,t}}{R_{n,t}})$: $\upsilon_t = \upsilon(\frac{P_t - R_{n,t}}{R_{n,t}})$. And $\upsilon(x)$ is a non-decreasing function of x.

Rearranging above functions, we can get:

$$E\left[\frac{P_{t+1}-P_t}{P_t}\right] = (1-\omega)\frac{1}{N}\sum_{n=1}^{N}\left\{\upsilon\left(\frac{P_t-R_{n,t}}{R_{n,t}}\right)\left[\left(\frac{P_t-R_{n,t}}{R_{n,t}}\right)\left(\frac{P_t-R_{n,t}}{R_{n,t}}+1\right)^{-1}\right]\right\} \tag{6}$$

Comparing with the function of expected return given by Grinblatt and Han (2005), the above function includes various reference prices of a given stock. In Zhou and Lei (2010), they use the market price P_t as investors' reference price, while in this paper I use the reference price as the denominator. My idea is more similar to the realistic situation. In practical stock market, different shareholders of the same stock may have different unrealized capital gains/losses referenced to their purchase cost, thus they tend to differ in the demand for this stock at the same market price. Equation (6) also includes a factor measuring the selling probability of various shares. The function implies that a stock's expected return is strongly related with the relative capital returns $(\frac{P_t-R_{n,t}}{R_{n,t}})$ of its shares.

2.2 REGRESSION FUNCTION AND HYPOTHESES

One of this paper's interests is to explore how the shape of relative unrealized capital returns distribution determines stock's performance in the future, in other words, whether various shapes of the distributions can predict expected stock returns. To study the comprehensive effect of capital returns on stock's future performance, we may first examine the effect of a particular share with certain capital return on the stock, and then examine that of all shares'. For a stock, when some of its shares are traded, the new reference price of shareholders is updated to the real-time market price, and the capital returns distribution of the stock is changed correspondingly. Therefore, in order to explore the relation between stocks' past and future performance, we need to generate proxy variables for describe the shape of stocks' relative capital returns distribution,. Typically, a distribution is characterized by its moment variables, such as mean, variance, skewness, and kurtosis. So the linear regression function used in later empirical study is

$$E\left[\frac{P_{t+1}-P_t}{P_t}\right] = h_0 + h_1 ARC_t + h_2 VRC_t + h_3 SRC_t + h_4 KRC_t \tag{7}$$

where ARC_t, VRC_t, SRC_t and KRC_t are respectively the mean, the variance, the skewness and the kurtosis of a stock's relative capital returns distribution at date t. The intercept h_0 can be viewed as a factor measuring the effect of higher moment variables.

I propose the following hypotheses of the empirical regression results:

a. The coefficient for the mean value is positive. ($h_1 > 0$)

One of the main findings in Grinblatt and Han (2005) is that the capital gains overhang, which is the difference between stock market price and its aggregate cost basis, "is a critical variable in any study of the relation between past returns and future returns." In their calculation of capital gains overhang, they simply use stock's aggregate cost. While in this paper, I have a new definition of reference price and differentiate all shareholders' different reference prices to calculate the stock's average aggregate capital return. I believe this method better represents all shareholders unrealized relative capital returns, and hence the predictability of average capital profit on future stock performance shouldn't fail. My hypothesis is that expected stock return is positively related with the mean value of capital returns distribution. Zhou and Lei (2010) confirmed what Grinblatt and Han (2005) found, claiming that future stock return is a non-decreasing function of average capital gains in Chinese stock market. I expect to see that expected stock return increases with ARC in my study on US stock market.

Suppose there are two stocks, H, and L. They have different mean values but are the same in other moment variables. Stock H has a positive mean, while stock L's mean is zero. This means the majority of shareholders of H obtain relative higher capital gains. So the selling probability of H's shares should be no lower than that of L's. According to previous functions and analysis, the expected return of stock H will be higher than that of stock L. Take a numerical example. Suppose both Stock L and Stock H are equally held by four shareholders. Stock L has a relative capital returns distribution of (-0.2, -0.1, 0, 0.1), and Stock H has a relative capital returns distribution of (-0.1, 0, 0.1, 0.2). Based on equation (6), $r_L - r_H = \frac{(1-\omega)}{4}[-0.2\upsilon(-0.2) - 0.2\upsilon(0.2)] < 0$, which is consistent with our intuition.

b. For stocks that have a majority of shareholders facing unrealized capital losses, stock return in next period is positively related with the skewness. ($\mathrm{h}_3 > 0$ $when$ $\mathrm{ARC}_\mathrm{t} < 0$)

If a stock has a negative mean value, it means the majority of shareholders has relative capital losses. As the skewness of a distribution increases, its left tail gets shorter and its right tail gets longer. If there are two stocks with the same negative ARC value, the one with larger skewness has fewer shares generating large capital losses than the one with smaller skewness. As a result of fewer shares with relatively large losses, investors may be not that prone to hold their losing shares, thus less stock loss in next period. Let's take a numerical example again. Suppose both Stock A and Stock B are equally held by four shareholders. Stock A has a relative capital returns distribution of (-0.3, -0.2, -0.2, 0.1), and Stock B has the distribution of (-0.4, -0.1, -0.1, 0). Now,

$r_A - r_B = \frac{(1-\omega)}{4}[-0.3\upsilon(-0.3) + 0.4\upsilon(-0.2) + 0.1\upsilon(0.1) + 0.4\upsilon(-0.4) + 0.2\upsilon(-0.1)] > 0$, showing that, for stocks with capital losses, the skewness is positively related with future stock return.

The effect of SRC on stocks with positive ARC may be less significant than its effect on loser stocks. When the majority of the shareholders have capital gains, an increase in SRC would result in fewer shares with relatively small gains and more shares with relatively large gains. But the decrease in small-gain shares is larger than the increase in large-gain shares. Thus the total change of investors' selling probability may be ambiguous. Zhou and Lei (2010) made the conjecture that future stock return is a non-decreasing function of the skewness, but their result shows that the skewness is insignificant and negative for winning stocks. So I propose the ARC may act as a dominant variable for winning stocks, and the effect of skewness is stronger for loser stocks.

3. VARIABLES AND DATA

This section demonstrates the procedure to find the target time interval and calculation of proxy variables. I take advantage of the flexible time interval of Zhou and Lei (2010) to define the distribution at a target date. For a given stock, the following steps are used to construct proxy variables tested in later empirical study:

a. Choose an arbitrary date t;

b. Sum up daily turnover rates backwards till the cumulated turnover rate is 100%. Denote the starting date of this target time interval by t_0, then the length of this target time interval: N = t-t_0+1;

c. I assume that the capital returns distribution at date t is about the daily stock prices and daily trading volumes during the target time interval [t_0, t]. For a share purchased at date s, t_0 < s < t, we use the following equations to calculate the moment variables of relative capital returns distribution:

$$\text{Relative capital return at date s: } \mathrm{RC_s} = \frac{\mathrm{P_t - P_s}}{\mathrm{P_s}} \tag{8}$$

$$\text{Mean at date t: } \mathrm{ARC_t} = \frac{\sum_{s=t_0}^{t} \mathrm{vol_s RC_s}}{\sum_{s=t_0}^{t} \mathrm{vol_s}} \tag{9}$$

$$\text{Variance at date t: } \mathrm{VRC_t} = \frac{\sum_{s=t_0}^{t} \mathrm{vol_s (RC_s - ARC_t)^2}}{\sum_{s=t_0}^{t} \mathrm{vol_s}} \tag{10}$$

$$\text{Skewness at date t: } \mathrm{SRC_t} = \frac{\sum_{s=t_0}^{t} \mathrm{vol_s (RC_s - ARC_t)^3}}{\sum_{s=t_0}^{t} \mathrm{vol_s}} * \mathrm{VRC_t^{-(3/2)}} \tag{11}$$

$$\text{Kurtosis at date t: } \mathrm{KRC_t} = \frac{\sum_{s=t_0}^{t} \mathrm{vol_s (RC_s - ARC_t)^4}}{\sum_{s=t_0}^{t} \mathrm{vol_s}} * \mathrm{VRC_t^{-2}} \tag{12}$$

where P_s is the average stock price at date s, P_t is the average stock price at date t, and vol_s is the trading volume at date s.

Thus we have the following empirical regression equation for stock i at date t:

$$\mathrm{RC}_{i,t+1} = \mathrm{h}_0 + \mathrm{h}_1\mathrm{ARC}_{\mathrm{i,t}} + \mathrm{h}_2\mathrm{VRC}_{\mathrm{i,t}} + \mathrm{h}_3\mathrm{SRC}_{\mathrm{i,t}} + \mathrm{h}_4\mathrm{KRC}_{\mathrm{i,t}} \tag{13}$$

where $\mathrm{RC}_{i,t+1} = \frac{P_{i,t+1}-P_{i,t}}{P_{i,t}}$ is the stock's relative capital return at date t+1.

In this paper, I collect daily stock data from CRSP and Wind Information. The sample data include all ordinary common shares traded on NYSE and AMEX, S&P 500 Index, as well as all shares publicly traded in Chinese A-share stock market and SSE Composite Index. The sample period is from January 1996 to December 2011.

4. EMPIRICAL ANALYSIS

This section documents the estimation results of the cross-sectional regression illustrated by equation (13). Proxy variables of a stock's reference price distribution should provide information about each shareholder's change of demand on the share they traded. When there are irrational investors subject to reference dependence and mental accounting, the demand of such investors is a distortion to that of rational investors. Such PT/MA investors' trading behavior is consistent with the disposition effect, and hence momentum in stock returns can be expected. So proxy variables describing the shape of the reference distribution are critical indicators of stock performance in the future.

Table 1 reports the coefficients and t-statistics for the regression. Panel 1 represents for all data in the sample. Panel 2 represents for data with negative mean value of the capital returns distribution. And Panel 3 represents for data with positive mean.

Regression:	$\mathrm{RC}_{i,t+1} = \mathrm{h}_0 + \mathrm{h}_1\mathrm{ARC}_{\mathrm{i,t}} + \mathrm{h}_2\mathrm{VRC}_{\mathrm{i,t}} + \mathrm{h}_3\mathrm{SRC}_{\mathrm{i,t}} +$			
	ARC	VRC	SRC	KRC
Panel 1: Full Data				
	3.3714	1.0628	**0.4009**	-0.1173
	[1.9928]	[1.0058]	[2.8830]	[-1.2092]
Panel 2: Losing Stocks (Negative ARC)				
	0.5009	14.5716	**0.5288**	-0.0860
	[0.0986]	[1.3687]	[3.3844]	[-0.9271]
Panel 3: Winning Stocks (Positive ARC)				
	8.9172	-18.4427	-0.5610	0.4836
	[2.9634]	[-0.5971]	[-0.4282]	[1.5373]

Table 1: Coefficients and t-statistics for cross-sectional regressions

This table reports the Fama-MacBeth (1973) cross-sectional regression results. Data used in the regressions are daily trading records of stocks in NYSE and AMEX from January 1996 to December 2011. Data are collected from CRSP. The coefficients and t-statistics (in brackets) presented in Panel 1, Panel 2 and Panel 3 are draw respectively from regressions on full data, stocks with negative ARC and stocks with positive ARC. Figures in bold indicate that the estimates are significant at 95% confidence interval.

Panel 1 shows that the coefficients for ARC and SRC are significant and positive, which is consistent with our hypothesis. A stock with higher average capital return, i.e. a larger number of

ARC, tends to perform better in next month than stocks with lower average capital returns. As has analyzed in previous part, when a stock's average capital gain of all its shareholders is higher, this stock faces higher aggregate probability of selling, hence continuing to win in future period. Also skewness of the relative capital returns distribution plays significant role in predicting future stock returns. This result implies that a stock with longer right tail and shorter left tail of its capital returns distribution will have higher returns in the next period. If a stock has a relatively larger positive skewness of its capital returns distribution, then it is likely that this stock has a larger proportion of extreme winning shares and a smaller proportion of extreme losing shares. Thus this stock has higher aggregate probability of selling, hence continuing to win in future period. The results in Panel 1 shows that studying the shape of relative capital returns distribution could help to predict expected stock returns.

After running the regression on the full data, I divided the sample into two subsamples, losing stocks and winning stocks, based on the sign of ARC. Negative ARC means the majority of the stock's shareholders have capital losses, and this group of investors tends to be risk seeking, according to the reference dependence theory. Positive ARC represents that the majority of shareholders have capital gains, and they tend to be risk averse. I expected to see different forecasting effect of the capital returns distributions of losing stocks and winning stocks.

In both Panel 2 and Panel 3, the coefficients for ARC are positive (though only in Panel 3 it is significant), and this is consistent with our hypothesis. In Panel 2, the coefficient for skewness is significant and positive. When a stock has negative mean value of its capital returns distribution, then it means there are more shares with relatively lager losses than shares with relatively large gains. As its skewness becomes larger, the stock's expected return in the next month gets higher.

Panel 3 reports that only the coefficient for ARC is significant for winning stocks. Though the coefficient for KRC is not significant, it is positive, which matches with our hypothesis. In all of the three panels, the coefficients for variance and kurtosis are not significant. Grinblatt and Han (2005) documents that a stock's capital gains overhang, "dominates as a forecasting variable" when studying the relationship between stocks' past performance and future returns. My empirical result is consistent with their findings. What's more, my result also shows that the shape of the relative capital returns distribution, described by its moment variables, plays significant role in predicting expected stock returns.

5. INVESTMENT STRATEGIES

5.1 CONSTRUCTION OF PORTFOLIOS

Finding an investment strategy that could generate substantial abnormal profit is always a big concern for researchers and investors. A popular view held by the early literature is that relative strength strategies that buy stocks with consecutive price increases in past periods and sell stocks with consecutive price decreases could generate abnormal returns. Levy (1967) suggested that such trading rule performs well when investors base their stock selections on price movements over past 3 months to one year. The recent literature focused more on the contrarian strategy. Individuals often overreact to information, and this translates to stock price overreaction, thus suggesting contrarian strategies that buy stocks with price falling in past periods and sell stock with price rising.

This section provides an analysis of a new investment strategy that bases the stock selections on the relative capital returns distribution. We have learnt that expected stock returns increase monotonically with the mean and the skewness of stock's capital returns distribution. Especially for stocks with negative ARC, the skewness plays a significant role in predicting future stock performance. And for stocks with positive ARC, the mean value matters. These empirical implications on the predictability of stock returns hint us that investors can take advantage of stock's capital returns distribution to earn substantial profits. The investment strategies I construct in this paper select stocks based on the mean and the skewness of the stock's capital returns distribution.

In any given month t during this sample period, I divide the full data into two subsamples. For losing stocks with negative ARC, I sort them on values of SRC in ascending order, and divide them equally into 5 groups: AS0, AS1, AS2, AS3, AS4. Name group AS0, i.e., a group of stocks with the skewness value belonging to the lowest 20%, as loser group. Short-selling this loser group for K months is what I called short-loser strategy. For winning stocks with positive ARC, I sort them on values of ARC in ascending order, and divide them equally into 5 groups: AA0, AA1, AA2, AA3, AA4. Name group AA4, i.e., a group of stocks with a mean value belonging to the highest 20%, as winner group. Buy-winner strategy is to buy and hold this winner group for K months.

In month t, the strategies have a series of portfolios that are chosen in the current month as well as in the previous K-1 months. Portfolios constructed in month t-K will have its position closed out in month t. The holding period, K, lasts for 30 days, 90 days, 180 days, 270 days, 360 days and 720 days respectively. The above procedures give us 12 different investment strategies in total. As done in Jegadeesh and Titman (1993), the portfolios of the above strategies are calculated for a series of buy-and-hold portfolios.

5.2 RETURNS OF PORTFOLIOS

Table 2 reports the average cumulative returns of the S&P 500 index, which represents the performance of stock market, and our portfolios under different holding periods. The cumulative market returns are calculated using the daily S&P 500 index from 1996 to 2011. S&P 500 index one of the most commonly followed equity indices and many consider it the best representation of the market as well as a bellwether for the U.S. economy. The last two columns in Table 2 report the portfolios' abnormal returns, which is the portfolio return minus the market return.

The portfolios constructed using our strategies earn a positive and significant return under all the holding periods, but the cumulative portfolio returns increase first and then decrease. In the near future after the portfolio constructed (K=30 and 90), the returns generated by the short-loser and the buy-winner portfolios are almost triple of the market returns. During a medium-term holding period, the cumulative portfolio returns keep increasing. As the holding period gets longer, the cumulative returns of both buy-winner portfolio and short-loser portfolio decrease. This is consistent with the finding of “the inverted U shape in the cumulative returns” in Jegadeesh and Titman (1993). The previous literature concludes such a stock return pattern as stocks' short-and long-term price momentum and medium-term return reversal.

What matters to investors is the abnormal profit generated by the investment strategies. Our strategies successfully beat the stock market in almost all the cases except when the holding period is as long as nearly two years. Especially after the first month of the portfolio formation, the short-loser strategy earns an abnormal return as high as 3.0045%, considering the market return of 0.696%. From the above table we can see our investment strategy that takes advantage of capital returns distribution could earn substantial abnormal profit after a holding period of short- and medium-term. However, since the cumulative market returns keep increase as the holding period lasts longer, while our portfolios have an inverted U shape in stock returns, such strategy gradually losses its profitability and perform poorly as time passes by.

(%)	Market Returns	Portfolio Returns		Abnormal Returns	
		Short-loser	Buy-winner	Short-loser	Buy-winner
K=30	**0.6960**	**3.7005**	**2.5849**	**3.0045**	**1.8889**
	[7.3362]	[3.2262]	[5.1970]	[3.0118]	[2.8860]
90	**2.0462**	**6.2447**	**5.7704**	**4.1985**	**3.7242**
	[12.2386]	[2.3143]	[5.7122]	[3.3816]	[3.6170]
180	**4.4472**	**9.2706**	**9.5881**	**4.8234**	**5.1409**
	[17.2901]	[6.2845]	[2.7664]	[8.2335]	[4.4445]
270	**6.8180**	13.0113	**12.6566**	**6.1933**	**5.8386**
	[20.2885]	[1.0720]	[7.2771]	[4.3257]	[3.6835]
360	**8.7691**	**11.6782**	**14.0054**	**2.9091**	5.2363
	[21.5690]	[5.8239]	[4.8727]	[3.6227]	[1.3619]
720	**12.495**	**11.9106**	**10.3829**	**-0.5844**	**-2.1121**
	[18.9661]	[2.1135]	[5.7961]	[-2.5363]	[-5.3914]

Table 2: Performance of Capital-Returns-Distribution Portfolios

This table reports the cumulative capital returns of the stock market, various portfolios constructed in last section and the difference between these two. Data used in this empirical study are daily trading records of stocks in NYSE and AMEX and S&P 500 Index from January 1996 to December 2011.Sort stocks with negative ARC on values of SRC in an ascending order, and select those having the lowest 20% value to form the loser portfolio. Also sort stocks with positive ARC on their ARC values in an ascending order, and form the winner portfolio with those having the highest 20% values. Short-loser and buy-winner for a holding period varying from 30 days to 2 years gives us twelve strategies in total. The t-statistics are in brackets, and figures in bold indicate the estimates are significant at 99% confidence interval.

5.3 SUB-PERIOD STUDY ON RETURNS OF PORTFOLIOS

In this part, I divided the whole sample into three sub-periods, January 1996 to December 2000, January 2001 to December 2005, and January 2006 to December 2011. Table 3 represents these portfolios' performance.

During the sub-period of 1996-2000, the cumulative returns of the market, the short-loser portfolio and the buy-winner portfolio are reported in Panel 1. This sub-period is a boom for US stock market. Both the cumulative stock market returns and the cumulative portfolio returns increase as the holding period lasts longer (except for the buy-winner portfolios of K= 270 and K=360). The inverted U shape observed in last table doesn't show here. When the holding period lasts for nearly two years, the market return achieves 76.4103%, which is far higher than the returns of portfolios we constructed based on capital returns distribution. But in short- and medium-term, our strategies perform well. After the first month of portfolio formation to three quarters after the formation, both of the two strategies could generate significant positive capital profits. Especially when K=30, the portfolio returns are almost double of the market return.

In the following sub-period from 2001 to 2005, for both the two groups, the cumulative portfolio returns show an inverted U shape pattern. Portfolios obtain their highest cumulative return when the holding period is around three quarters to a year. The stock market return acts similar to its performance in last sub-period: the cumulative market return keeps increasing as time passes by, and it rises quite sharply from K=360 to K=720. Again, the portfolios we formed have substantial abnormal profits under short- and medium-term holding period, but bear significant abnormal losses under long-term holding period.

Panel 1: 1996 - 2000							
	K=	30	90	180	270	360	720
S&P 500 Index Returns		**2.0050**	**6.4942**	**14.3362**	**23.1759**	**32.5531**	**76.4103**
		[13.5009]	[27.6995]	[50.4874]	[60.7247]	[68.0745]	[86.4366]
Portfolio Returns	Short-loser	**5.8977**	**10.2512**	**17.0133**	**24.3084**	**29.3461**	**33.0721**
		[6.4752]	[8.0409]	[4.3093]	[2.8176]	[7.3685]	[3.8725]
	Buy-winner	**6.6306**	**12.0216**	**20.4004**	**27.6630**	**27.3096**	**32.5245**
		[5.7845]	[4.9085]	[7.2440]	[14.5984]	[20.7617]	[4.5103]
Abnormal Returns	Short-loser	**3.8927**	**3.7570**	**2.6771**	**1.1325**	**-3.2070**	**-43.3382**
		[15.2600]	[5.6973]	[3.1508]	[3.3110]	[-9.6743]	[-15.0833]
	Buy-winner	**4.6256**	**5.5274**	**6.0642**	**4.4871**	**-5.2435**	**-43.8858**
		[3.1109]	[6.7430]	[11.6423]	[9.0995]	[-8.218]	[-9.4087]
Panel 2: 2001 - 2005							
	K=	30	90	180	270	360	720
S&P 500 Index Returns		0.0241	0.2775	**0.8107**	**2.0418**	**2.9225**	**10.5812**
		[0.1474]	[1.0531]	[1.9672]	[3.6387]	[4.2225]	[12.0692]
Portfolio Returns	Short-loser	**1.9220**	**1.2087**	**2.6791**	3.6343	**3.0081**	**2.7072**
		[1.8670]	[5.7079]	[2.8587]	[1.0105]	[2.9134]	[6.2780]
	Buy-winner	1.3459	**1.9675**	**2.2164**	**4.0825**	**4.5603**	**3.8864**
		[1.2917]	[1.9211]	[2.7263]	[9.1087]	[2.0210]	[5.6229]
Abnormal Returns	Short-loser	**1.8979**	**0.9312**	**1.8684**	**1.5925**	0.0856	**-7.8740**
		[3.7084]	[1.9228]	[3.1030]	[1.9031]	[1.5909]	[-2.8125]
	Buy-winner	**1.3218**	**1.6900**	**1.4057**	**2.0407**	**1.6378**	-6.6948
		[4.8881]	[2.8215]	[2.1368]	[3.8712]	[2.3589]	[-1.2203]
Panel 3: 2006 - 2011							
	K=	30	90	180	270	360	720
S&P 500 Index Returns		0.1630	0.4187	**1.6733**	**2.0807**	0.9245	**-13.0889**
		[0.9334]	[1.2791]	[3.1760]	[3.1612]	[1.2135]	[-16.1497]
Portfolio Returns	Short-loser	**1.2923**	**1.3093**	**2.5896**	**2.1413**	**0.8679**	**-1.5658**
		[1.6539]	[1.8863]	[2.8916]	[3.9010]	[1.8268]	[-2.2226]
	Buy-winner	**1.3674**	1.8457	**1.4710**	**2.0677**	-0.1432	**-2.1870**
		[2.3103]	[1.1755]	[2.0914]	[2.3971]	[1.0048]	[-2.1505]
Abnormal Returns	Short-loser	**1.1293**	**0.8906**	**0.9163**	0.0606	-0.0566	**11.5231**
		[2.4669]	[2.4097]	[2.5636]	[1.5732]	[-0.4276]	[5.3082]
	Buy-winner	**1.2044**	**1.4270**	-0.2023	-0.0130	**-1.0677**	**10.9019**
		[2.0947]	[3.1003]	[-0.6133]	[-0.1188]	[-2.8403]	[7.5695]

Table 3: Cumulative Capital Returns of Portfolios in Three five-year Sub-periods

This table reports the cumulative capital returns of the twelve investment strategies in each of the three sub-periods during 1996 to 2011. Data used in this empirical study are daily trading records of stocks in NYSE and AMEX. Market returns are calculated using S&P 500 Index. The process of portfolio formation is the same to that in Table 2. Abnormal return equals to the portfolio return minus the market return. The t-statistics are in brackets, and figures in bold indicate the estimates are significant at 90% confidence interval.

During the sub-period of 2006-2011, the stock market experienced severe depression and crisis. The cumulative stock market return no more shows a great jump when K=720, but a rather severe fall from K=360 to K=720. The cumulative portfolio returns still have an inverted U shape pattern. Thus, when the cumulative market return experiences the big fall when K=720, our portfolios obtain substantial abnormal profits. Compared with the former two sub-periods, our investment strategies fail to perform well under medium-term holding period, but show their good profitability when the holding period is short-term, especially when K=30. In general, the short-loser strategy has better performance than the buy-winner strategy in this sub-period, which is contradict to the case of other time periods. One possible reason may be that when suffering the financial crisis or economic recession, investors may behave differently and be under government interventions. To sum up, our investment strategies that take advantage of capital returns distribution could beat the market and generate significant positive abnormal profits under short- and medium-term holding period, especially after one month of the portfolio formation. But as the holding period lasts longer, the profitability of our strategies gradually dissipates, and tends to perform far worse than the market. So there is an inverted U shape in the cumulative portfolio returns.

6. STUDY ON CHINESE STOCK MARKET

In this section, I focus my study on the Chinese A-share stock market. Although there is a growing literature investigating the predictability of stock returns in emerging stock markets, Chinese stock market remains a most important one deserving such investigations. China is "one of the few countries whose stock markets are negatively correlated with the US stock market" (J Kang et al., 2002). Hu (1999) comments on the difference in Chinese stock market and mature markets from the view of government regulations extent and the investor composition: "In China, financial data on listed companies are not of reliable quality, and the regulatory framework for the stock market is not fully developed. Most of these individual investors possess only rudimentary knowledge on stock investments and trade like noise traders who purely speculate in the stock market." This often leads to excessive speculation where "stock prices are often pushed up several hundred percent and quickly corrected later on" (C. Y. Wang, 2004). To examine if the relation between stocks' future returns and the shape of relative capital returns distribution also fits in Chinese A-share market, I repeated what I have done with U.S. stock market data on this emergent market.

6.1 CROSS-SECTIONAL REGRESSIONS

Table 4 reports the coefficients and t-statistics for regression when running equation (13) using Chinese stock data. ARC and SRC are significantly positively related with the future stock returns. Again, for stocks bearing average capital loss, the coefficient for skewness is significant and positive. As the stock's skewness becomes larger, its expected return in the next month gets higher. While for stocks with average capital gain, the parameter playing a significant role in forecasting future stock returns is ARC. These empirical results are consistent with our hypothesis as well as the results of regressions using U.S. stock data.

Regression: $RC_{t+1} = h_0 + h_1 ARC_t + h_2 VRC_t + h_3 SRC_t + h_4 KRC_t$				
	ARC	VRC	SRC	KRC
Panel 1: Full Data				
	5.4118	-11.3002	**0.1902**	-0.0860
	[2.2029]	[-0.6789]	[1.8511]	[-0.0453]
Panel 2: Losing Stocks (Negative ARC)				
	5.6776	-5.9172	**1.0255**	-0.2935
	[1.4155]	[-0.9413]	[2.4287]	[-0.1931]
Panel 3: Winning Stocks (Positive ARC)				
	2.9083	-6.2997	-0.3013	0.2031
	[2.9667]	[-1.2817]	[-0.1395]	[0.6191]

Table 4: Coefficients and t-statistics for cross-sectional regressions

This table reports the Fama-MacBeth (1973) cross-sectional regression results. Data used in the regressions are daily trading records of stocks in Chinese A-share stock market from January 1996 to December 2011. Data are collected from Wind Information. The coefficients and t-statistics (in brackets) presented in Panel 1, Panel 2 and Panel 3 are draw respectively from regressions on full data, stocks with negative ARC and stocks with positive ARC. Figures in bold indicate that the estimates are significant at 95% confidence interval.

6.2 INVESTMENT STRATEGIES

This sections documents the returns of portfolios constructed using the investment strategies we used in last part. Since we got similar empirical result with Chinese stock market data here to what we got with U.S. stock market, I will use the same stock selection strategy to build our portfolios.

(%)	SSE Composite Index Returns	Portfolio Returns		Abnormal Returns	
		Short-loser	Buy-winner	Short-loser	Buy-winner
K=30	**1.6971**	**3.3799**	**4.0571**	**1.6828**	**2.3600**
	[9.7932]	[4.0848]	[3.9533]	[1.6575]	[4.5183]
90	**5.6704**	**8.0263**	**7.7163**	**2.3559**	**2.0459**
	[15.8077]	[1.9505]	[3.0821]	[2.5534]	[3.5500]
180	**12.6206**	**14.4229**	**13.6288**	**1.8023**	**1.0082**
	[19.9484]	[6.5485]	[1.6944]	[2.0667]	[1.8472]
270	**20.2860**	**20.4055**	**21.5261**	0.1195	1.2401
	[21.4854]	[7.7586]	[7.2949]	[0.8504]	[1.4011]
360	**26.2607**	**24.9686**	**26.6636**	-1.2922	0.4029
	[21.9660]	[9.8751]	[10.2503]	[-1.3978]	[0.7320]
720	**42.2176**	**30.8220**	**34.5433**	**-11.3956**	**-7.6743**
	[30.0976]	[13.2512]	[10.7723]	[-3.2929]	[-4.0795]

Table 5: Cumulative Returns of Portfolios in Chinese Stock Market

This table reports the cumulative capital returns of various portfolios and the stock market. Data used are daily trading records of stocks in Chinese A-share stock market from 1996 to 2011. The market return is calculated using daily SSE Composite Index. Sort stocks with negative ARC on SRC values in an ascending order, and select those with the lowest 20% value to form the loser portfolio. Also sort stocks with positive ARC on ARC values in an ascending order, and form the winner portfolio with those having the highest 20% values. Short-loser and buy-winner for a holding period varying from 30 days to 720 days gives us twelve strategies in total. The t-statistics are in brackets, and figures in bold indicate the estimates are significant at 90% confidence interval.

According to Table 5, the investment strategies taking advantage of the relative capital returns distribution could generate significant abnormal returns compared with the Chinese stock market, especially after short-term holding period. The cumulative portfolio returns didn't show the inverted U shape pattern as we observed in our test on US stock market. Both the portfolio returns and cumulative market returns keep increasing as the length of holding period increases. The abnormal returns generated by our tested strategies fall into negative domain when the holding period extends to around two years. It is similar to the case in the US stock market. So we conclude that the investment strategies base its stock selection on the capital returns distribution have better performance after a short-term holding period. As time passes, its profitability is most significant after one month of portfolio formation, and then gradually dissipates as the holding period becomes as long as two years, both in Chinese stock market and in US stock market.

However, there's one thing deserve our notice that short-selling stocks directly is forbidden in Chinese stock market, even though trading on the stock index futures is allowed. That is to say, it is unrealistic to adopt the short-loser strategies constructed in this paper when trading in Chinese stock market.

7. DISCUSSION

Ever since Shefrin and Statman (1985) pointed out the existence of the disposition effect in stock market, more and more literature believe the most recognized explanation of this regularity are Kahneman and Tversky (1979)'s Prospect Theory, together with Thaler (1980)'s Mental Accounting. According to the prospect theory, people make decisions based on their unrealized losses or gains compared to a reference point. An investor subject to reference dependence and mental accounting is more willing to sell his stocks that have unrealized capital gains, while is more reluctant to sell his stocks with unrealized capital losses, because he is risk averse over the former accounts but is risk-seeking over the later accounts.

For investors subject to reference dependence and mental accounting, their demands can be viewed as the distortions to the demands of rational investors, and such distortions are inversely related to the unrealized capital return of their stock investments. As shown by the model of Grinblatt and Han (2005), PT/MA investors' demand distortion is inclined to cause price under-reaction to public information. If a stock has a price rising to its fundamental value, more and more RD/MA investors tend to sell their winning shares, which would delays stock price's return to its fundamental value, and hence longer rise period. If a stock has price falling to its fundamental value, rational investors sell their shares while RD/MA investors hold on to theirs', which defers stock price's return to its fundamental value. Thus, winning stocks probably still win in the next period, and losing stocks probably still lose. The RD/MA investors' trading behavior is in accordance with the disposition effect; hence momentum in stock returns can be expected. Based on above analysis, with the existence of disposition effect in the stock market, a variable properly generated to represent a stock's aggregate capital return would be sufficient to predict expected stock returns.

In this paper, I generated four moment variables to describe the distribution, i.e., the mean value, variance, skewness, and kurtosis. Cross-sectional regressions of future stock return on the four proxy variables show that expected stock return is positively related with the first and the third moment variables of the capital returns distribution. A larger mean value represents that the majority of shareholders earns higher unrealized capital gains in this period. Because the expected stock return increases monotonically with the mean, such stocks would continue their winning performance in next period, reflecting price momentum. Then I divided the data into two subsamples, losing stocks and winning stocks, based on the sign of ARC, to conduct separate cross-sectional regressions. For stocks bearing average capital loss, the coefficient for SRC is significant and positive. As the stock's skewness becomes larger, its expected return in the next month gets higher. While for stocks with average capital gain, the parameter playing a significant role in forecasting future stock returns is ARC. A winning stock with higher average capital return, i.e. a larger number of ARC, tends to perform better in next month than stocks with lower average capital gains.

The above empirical implications suggest that an investment strategy taking advantage of the capital returns distribution could generate significant returns for investors. I choose stocks with the highest 20% value of positive ARC as winning stocks, and choose stocks with the lowest 20% value of skewness among all stocks with negative ARC as losing stocks. In this paper, I examined 12 different investment strategies, including adopting the buy-winner strategy as well as the short-loser strategy for 1 month, 3 months, 6 months, 9 months, 12 months and 24 months. Portfolios earn positive and significant returns. The changing pattern of cumulative portfolio returns is consistent with an inverted U shape, implying short-term momentum and medium-term return reversal. Through a comparison study on U.S. stock market and Chinese stock market, I found the investment strategies built in this paper have longer duration and better profitability in Chinese stock market, implying stronger short-term momentum effect in this emergent market.

However, the empirical evidences in this paper fail to provide strong supportive explanation of the inverted U shape return pattern observe. Literature tends to view return momentum as evidence of under-reaction and view return reversal as evidence of overreaction. Delong et al. (1990) claims that transactions by “positive feedback traders who buy past winners and sell past losers” move price temporarily away from fundamental values and cause prices overreaction. While Jegadeesh and Titman (1993) proposes the market underreacts to information about a firm’s short-term prospects and overreacts to that about longer-term prospects. A more sophisticated model to distinguish investor behavior would be of interest in further research.

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