

# Research on Portfolio Disposal Effect Based on Reversal Strategy

Xijin Zhou<sup>1</sup>

<sup>1</sup> Finance, City University of Macau, Taipa, Macau, China  
Email: zxj1144017357@163.com

## ABSTRACT

By analyzing the data of China's stock return from 2001 to 2021, this paper uses the five factor model to study the impact of disposal effect on the excess return of portfolio based on reversal strategy, so as to judge whether the disposal effect is one of the driving factors of reversal effect in China's stock market, and constructs the disposal factor based on the five factor model. Compared with the stock markets of developed countries, the momentum effect in China's stock market is weak and the reversal effect is strong. This paper finds that there is a significant reversal effect in China's stock market in the past two decades. Due to the majority of retail investors in China's stock market, the disposal effect of investors is very common, and it can affect the excess return of portfolio under the reversal strategy.

**Keywords:** *Reversal Effect, Disposal Effect, Factor model.*

## 1. INTRODUCTION

Since the rise of quantitative investment in the 1960s, more and more people began to use this investment tool crossed by finance, mathematics, computer and other disciplines to quantify the return of the portfolio by establishing a model to make the best investment decision. Gradually, people found that a single market risk premium couldn't well explain the excess rate of return in the market. Then there are three-factor, four-factor and five-factor models to explain the "anomalies" in the market. In continuous practice, it is found that investors' emotions will also have an impact on prices. The "efficient market hypothesis" put forward by Eugene Fama has been challenged, and the hypothesis of rational man has been questioned. The word "irrational" appears in finance. Psychology and finance have gradually developed into a new discipline, behavioral finance. Behavioral finance contains many irrational behaviors, which have a great impact on the stock market. Disposal effect and reversal effect are one of the hot topics. Disposal effect refers to that investors tend to sell profitable stocks and continue to hold loss stocks when disposing of their own stocks. That is, when a stock is profitable, it will face greater pressure to be sold, resulting in its price being undervalued. Reversal effect refers to the fact that stocks that have performed well in the past will perform poorly in the future, while stocks that have performed poorly in the past will perform better in the future. Due to the majority of retail investors in

China's stock market, the high turnover rate of individual stocks, the strong hype atmosphere of policies and concepts in the market, and the certain gap between supervision and system and developed countries, the reversal effect in China's market is more significant. Therefore, the investment strategies formulated according to the reversal effect can often obtain excess returns.

## 2. LITERATURE REVIEW

### 2.1. Disposal Effect Theory

Prospect theory was first proposed by Kahneman and Tversky in 1979. They think that the reference value of investors' preference is a function of the change of their preference for wealth, that is, the value of their preference for wealth can't be determined based on a certain point of reference. When the stocks in hand are profitable, investors tend to sell, that is, risk aversion, on the contrary, risk preference. And to the same extent, the negative utility brought by loss is greater than the positive utility brought by income.

Psychological account, Thaler proposed in 1980 that when investors make decisions, they will have two accounts, book account and actual account. When the stock is profitable, investors hope more that the profit can enter the actual account. When the stock loses money,

investors prefer to keep the loss in the book account to get the possibility of rise.

Regret aversion, Kahneman and Tversky found in 1982 that investors will face two choices when disposing of loss making stocks, sell or hold. When disposing of profitable stocks, the regret caused by the decline of stocks is stronger than that caused by the rise of stocks after selling.

## **2.2. Foreign Literature**

The disposal effect was put forward by Shefrin and Statman in 1985. It refers to that investors tend to sell profitable stocks and hold loss stocks when disposing of their own stocks. They believe that the reasons leading to the disposal effect are psychological account, regret aversion and so on. In the same year, De Bondt and Thaler first proposed the reversal effect and found that the stocks with better performance showed poor performance after three to five years, while the stocks with worse performance showed better performance. In 1986, French and Roll found that rising stocks will fall after a few days or weeks, while falling stocks will reverse after a few days or weeks. Then Jegadeesh and Titman's research in 1993 showed that stocks with good performance will continue to perform better in three months to one year, and vice versa. That is, the stock price presents a reversal effect in the short term, a momentum effect in the medium term and a reversal effect in the long term. In 2005, Mark Grinblatt and Bing Han proposed capital gain overhang (Capital Gain Overhang referred to as CGO) to detect whether there is a disposal effect in the market. In 2004, Hartzmark believes that investors will rank the stocks they hold according to the rate of return, and the more likely they are to sell the stocks with the highest or lowest rate of return.

## **2.3. Domestic Literature**

Domestic scholars believe that the momentum effect is not obvious in the Chinese market, and the reversal effect is more common. Zhao Xuejun and Wang Yonghong used the PGR-PLR index proposed by Odean (1998) in 2001. Using the data of China's stock market from 1993 to 2000, they found for the first time that both inertia strategy and reversal strategy showed reversal characteristics in China's stock market, which may be related to the high turnover rate of China's stock market. In 2007, Liu Bo and PI Tianlei found that there is only reversal effect but no momentum effect in the Chinese market. Tian Lihui, Wang Guanying and Tan Dekai found that the momentum effect in the Chinese market is not obvious, and actually shows a significant reversal effect. Different from developed countries, the momentum effect represented by "the strong is always strong" hardly exists in China.

Domestic scholars also believe that Chinese investors generally have disposal effects. Zhou Yuegang's 2011 study found that in the A-share market, stocks with higher earnings in the current period will have a higher rate of return in the next period. This is because stocks with high earnings in the current period are easier to be sold due to the disposal effect of investors, which makes the stock price undervalued. Ren Deping found a positive correlation between the capital gains of Chinese stocks and the turnover rate in 2013, and believed that there was a disposal effect for Chinese investors. The 2017 survey report released by Shenzhen Stock Exchange wrote that the probability of disposal effect of investors is 40.8%. In 2018, Xiao Lin and others found that there was a disposal effect for Chinese financing investors by studying the data of margin trading business of a securities firm from 2014 to 2016. Chen Chen's research in 2021 shows that there is a disposal effect in China's A-share market, and the Capital Gains Overhang (CGO) can predict the return of stocks to a certain extent.

## **3. RESEARCH METHOD**

### **3.1. Data Selecting**

This paper selects the data of A-share, gem and scientific innovation board in China's stock market from 2001 to 2021 as samples, excluding ST shares and financial shares. Considering that investors may calculate the gains and losses based on the nominal stock price without considering the stock division and dividend, the ex-right and ex-dividend treatment is not carried out for the stock price, and the return rate considering the reinvestment of cash dividend is used.

### **3.2. Reversal Strategy Return**

According to Tian Lihui's research in 2014, this paper ranks individual stocks according to the rate of return of individual stocks in the previous period, and records the top 30% of the maximum rate of return of individual stocks as the winner portfolio and the minimum 30% as the loser portfolio. The current yield of winner's portfolio and loser's portfolio calculated according to the equivalent weighting method is recorded as the portfolio yield under the reversal strategy. Take the return rate of reversal strategy as the dependent variable and the factor value of five factors as the independent variable for OLS regression. Align the data according to the stock code and date in advance, and eliminate the data with zero value to reduce the interference to the model regression.

$$R_t = \alpha + \beta_1 MKT_t + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 RMW_t + \beta_5 CMA_t \quad (1)$$

In which  $R_t$  is the return rate when reverse strategy portfolio is  $t$ ,  $\alpha$  is the excess return under the reversal strategy,  $MKT_t$ ,  $SMB_t$ ,  $HML_t$ ,  $RMW_t$ ,  $CMA_t$  are the market risk premium factor, market value factor, book to

market ratio factor, profitability factor and investment mode factor according to the circulating market value weighting method at t,  $\beta_i$  is factor sensitivity coefficient.

**Table 1.** Five Factor Regression Results

	coef	std err	t	p	0.025	0.975
Intercept	-0.0113	0.003	-4.264	0.000	-0.016	-0.006
MKT	-0.0043	0.034	-0.128	0.898	-0.071	0.063
SMB	-0.2031	0.108	-1.875	0.062	-0.417	0.010
HML	0.1076	0.164	0.658	0.512	-0.215	0.430
RMW	0.1228	0.181	0.677	0.499	-0.235	0.480
CMA	-0.2154	0.233	-0.925	0.356	-0.675	0.244

The results show that the reversal strategy can bring significant excess return and can't be explained by five factors. It shows that there is indeed a reversal effect in China's stock market from 2001 to 2021. It is effective to formulate the investment portfolio according to the reversal effect, that is, buying the past loser portfolio and selling the winner portfolio can obtain excess returns.

### 3.3. Construction of Disposal Effect Index

This paper uses the Capital Gain Overhang(CGO) proposed by Mark Grinblatt and Bing Han in 2005 to measure the disposal effect of investors.

$$RP_t = \frac{1}{k} \sum_{n=1}^{100} (V_{t-n} \prod_{s=1}^{n-1} (1-V_{t-n+s})) P_{t-n} \quad (2)$$

$RP_t$  is the reference price, k is the weight normalization coefficient,  $P_{t-n}$  is the average transaction price in the past t-n month,  $V_{t-n}$  is the turnover rate. In this paper, the reference price is calculated according to the average transaction price in the past 12 months and the attenuation weighted form of turnover rate.

$$CGO_t = \frac{P_{close, t-1} - RP_t}{RP_t} \quad (3)$$

$P_{close, t-1}$  is the closing price of a stock last month.

### 3.4. Return Rate Regression of Reversal Strategy under CGO Grouping

According to the obtained CGO data, this paper sorts the stocks of each month from high to low. After sorting, the first 25% is recorded as CGO high group and the last 25% as CGO low group. According to the above method, we can get the portfolio return under the high CGO group and the low CGO group. OLS regression analysis was carried out with the five-factor model.

$$R_{CGO_{h,t}} = \alpha_{CGO_{h,t}} + \beta_6 MKT_t + \beta_7 SMB_t + \beta_8 HML_t + \beta_9 RMW_t + \beta_{10} CMA_t \quad (4)$$

$$R_{CGO_{l,t}} = \alpha_{CGO_{l,t}} + \beta_{11} MKT_t + \beta_{12} SMB_t + \beta_{13} HML_t + \beta_{14} RMW_t + \beta_{15} CMA_t \quad (5)$$

$R_{CGO_{h,t}}$ ,  $R_{CGO_{l,t}}$  is the return rate of CGO high and CGO low portfolio at t,  $\alpha_{CGO_{h,t}}$ ,  $\alpha_{CGO_{l,t}}$  is the excess return under the reversal strategy,  $\beta_i$  is factor sensitivity coefficient.

**Table 2.** Reverse Strategy Return under CGO High Group

	coef	std err	t	p	0.025	0.975
Intercept	-0.0117	0.003	-4.316	0.000	-0.017	-0.006
MKT	0.0330	0.035	0.934	0.351	-0.037	0.103
SMB	-0.2084	0.110	-1.889	0.060	-0.426	0.009
HML	0.2458	0.168	1.464	0.145	-0.085	0.577
RMW	-0.2029	0.188	-1.077	0.283	-0.574	0.168
CMA	-0.1529	0.242	-0.631	0.529	-0.631	0.325

**Table 3.** Reverse Strategy Return under CGO Low Group

	coef	std err	t	p	0.025	0.975
Intercept	-0.0091	0.003	-3.360	0.001	-0.014	-0.004
MKT	-0.0840	0.035	-2.397	0.017	-0.153	-0.015
SMB	-0.1486	0.110	-1.349	0.179	-0.366	0.069
HML	0.1623	0.166	0.976	0.330	-0.165	0.490
RMW	-0.1606	0.187	-0.859	0.391	-0.529	0.208
CMA	-0.2260	0.240	-0.941	0.348	-0.700	0.248

As shown in Table 2 and table 3, the excess return under the reversal strategy portfolio with high CGO is more significant than that under the reversal strategy portfolio with low CGO. Therefore, it can be found that the degree of disposal effect does affect the return of the portfolio under the reversal strategy. And when the CGO index is higher, the portfolio constructed by executing the reversal strategy can obtain higher excess return.

### 3.5. Model Building

In this paper, the CGO of each stock in each period is added with equal weight, and the CGO index of each period is added to the Fama-French five factor model as the disposal factor. Besides, it will also build a six factor model and regress with the portfolio return under the reversal strategy on the basis of its model.

**Table 4.** Six Factor Regression Results

	coef	std err	t	p	0.025	0.975
Intercept	-0.0107	0.003	-3.899	0.000	-0.016	-0.005
MKT	-0.0084	0.034	-0.245	0.807	-0.076	0.059
SMB	-0.2032	0.108	-1.874	0.062	-0.417	0.011
HML	0.1168	0.164	0.711	0.478	-0.207	0.440
RMW	0.1086	0.182	0.596	0.552	-0.251	0.468
CMA	-0.2386	0.235	-1.016	0.311	-0.701	0.224
CGO	0.0085	0.010	0.838	0.403	-0.011	0.028

According to the results in Table 4, the disposal factor explains the excess return of the reversal strategy portfolio to a certain extent. Therefore, this paper makes Fama-Macbeth regression on the six-factor model.

$$R_i = \alpha + \beta_{16}MKT_t + \beta_{17}SMB_t + \beta_{18}HML_t + \beta_{19}RMW_t + \beta_{20}CMA_t + \beta_{21}CGO_t \quad (6)$$

$R_i = r_i - r_f$ ,  $r_i$  is the return rate of stock  $I$ ,  $r_f$  is the risk free return, the disposal factor when  $CGO_t$  is  $t$ .

**Table 5.** Fama-MacBeth Regression results

	coef	t	tnw	p
Risk Premium	0.008116	1.624486	1.402446	0.105724
SMB	0.000586	0.223413	0.275954	0.823425
HML	0.000159	0.119269	0.154760	0.905173
RMW	0.000052	0.035935	0.048544	0.971367
CMA	-0.000182	-0.224892	-0.285134	0.822275
CGO	0.012256	0.756075	0.801109	0.450424
const	0.005386	2.154743	0.903809	0.032283

According to the regression results, table 5 shows that the addition of disposal factors explains the excess return of stocks to a certain extent, indicating that the disposal effect caused by a large number of retail investors in China's stock market does have a certain impact on the stock price.

**4. CONCLUSION**

This paper makes an empirical study on the stock data of the final stock market from 2001 to 2021. Firstly, by constructing the reversal strategy portfolio, it is found that there is a reversal effect in 20 years. Secondly, by constructing the CGO to classify the stocks and then constructing the reversal strategy portfolio, it is found that the disposal effect is one of the driving factors of the reversal effect in China's stock market. Finally, CGO is added to Fama-French five factor model as a disposal factor for Fama-Macbeth regression, which further confirms that the disposal effect has a certain impact on China's stock market. However, the data used in this paper spans a long time and is not classified according to the major events that have occurred in the stock market in the past 20 years. It is a study based on the Chinese stock market in the past 20 years. The follow-up study can be classified in time according to different market conditions.

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