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The Influence Mechanism of Investor Behavior Deviation on Beta Anomalies in the Perspective of Behavioral Finance

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Abstract: There are many interference factors in the real capital market, such as the ineffectiveness of the capital asset pricing model, and even the negative correlation between the systematic risk and return. Based on the basic theory of behavioral finance, this paper empirically tests the influence mechanism of investors' behavior deviation on a beta anomaly by taking China's A-share listed companies as samples from 2017 to 2020. It is found that both the strategy of buying the winner and the strategy of contrarian investment are positively related to the beta anomaly, that is, the higher the probability of irrational investors adopting these two strategies, the higher the probability of beta anomaly in the A-share market. The research conclusion provides new empirical evidence for understanding the relationship between investor behavior deviation and beta anomaly and also provides a certain reference for relevant departments to monitor market risk.

Keywords: behavioral finance, contrarian investment, the strategy of buying the winner, beta anomaly, empirical test

1. Introduction

The research on the beta phenomenon originated from the validity test of the capital asset pricing model. Fama and French [1] constructed Fama French multi-factor model by introducing company individual characteristics based on the CAPM model. However, the beta anomaly still existed significantly [2]. Some studies have pointed out that the beta anomaly coefficient lies in the trading strategy of investors. For example, Liu Shengyao and Li Yizong [3], Zhou Aimin and Yuanyuan [4] all believe that investors' subjective choice deviation, such as strong gambling psychology, buying the winner and other investment strategies, gave birth to the emergence of the beta anomaly.

Traditional finance is based on the assumption of "rational person". And behavioral finance, as one of the emerging disciplines, is an independent scientific system that integrates psychology, sociology, finance and other disciplines to analyze the investment behavior and investment psychology of securities investors in the financial market [5]. With the development of the financial market, we increasingly find that there is a huge gap between investors' assumptions and reality. Thus, by introducing the basic theory of behavioral finance, various existing financial phenomena can be explained by rational ways and methods. At the same time, because different types of investors make different judgments and decisions in the face of changes in the financial market environment, it is necessary to study the comprehensive effect of irrational strategies on the stock market caused by

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investors' different psychology. The above research not only helps to understand the different mechanism of the two irrational transaction decisions on the formation of beta anomalies [6] but also can effectively expand the application of the basic theory of behavioral finance in the field of investment practice, which has certain practical significance.

Based on the analysis of investors' psychological behavior from the perspective of behavioral finance, this paper discusses the influence mechanism of two irrational strategies on the beta anomaly of the stock market. Overconfidence tends to overestimate one's understanding of things, underestimate risks and exaggerate their ability to control things, thus increasing the probability of failure [7]. In addition, investors adopt the investment strategy of buying the winner and blindly follow other investors to buy or sell the same stocks at the same time, which will lead to the rapid rise or fall of stock prices in a short period of time, and also increase the systemic risk of the financial market.

This paper is divided into five parts. The second part reviews the classic literature and discuss the investor behavior deviation and beta anomaly. The third and fourth parts design relevant models and make an empirical analysis of the results. Finally, the fifth part summarizes and discusses the limitations of the research.

2. Literature review and research hypothesis

2.1 beta anomaly related research

Scholars generally call the phenomenon that "the higher the risk exposure, the lower the return", which is different from the capital asset pricing model, "beta anomaly".Early scholars mainly studied the beta anomaly from the two perspectives of verifying its existence or improving the capital asset pricing model and increased the explanatory power of the model in empirical research by introducing a variety of factors such as scale factor, value factor, and momentum factor. In recent years, most domestic scholars have studied the beta anomaly of the A-share market mainly from the perspective of investor sentiment [8].

In order to find out the causes of beta anomalies, many scholars have carried out research, which can be summarized as follows. The restrictions of financing constraints will make the price of high beta assets higher than the intrinsic value, resulting in the mismatch of income and risk [9]. From the perspective of investor behavior, including heterogeneity, preference for gambling stock and investor sentiment, the causes of beta abnormality can basically be explained. From the perspective of heterogeneity, optimists and pessimists have different prospects for high beta assets, and this deviation leads to high beta assets often being speculatively overestimated, reducing their future earnings and producing downward-inclined securities market line [10]. From the perspective of gambling preference, the researchers found that after controlling gambling preference, the excess return of beta anomaly decreased significantly. From the perspective of investor sentiment, antoniou et al. [11] found that the period of optimistic investor sentiment will increase the speculative trading of high beta stocks, making the slope of the securities market line negative [12]. Studying the return phenomenon and operation law of China's stock market is conducive to all kinds of investors to reasonably build their investment portfolio and obtain stable returns at the micro-level. Macroscopically, it is helpful for the country to improve the stock market mechanism and related laws and regulations [13].

2.2 researcresearch on investor behavior deviation

With the overconfidence and the characteristics of herd behavior being excavated, behavioral factors become an important part of capital market research.

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In the process of trading decision-making, investors will be overconfident, which will lead to behavioral deviation of "contrarian investment".Overconfidence stems from investors' belief that they have more information access and stronger information processing ability than others. Contrarian investment is a common way of financial investment, that is, selling stocks during the rise of stocks and buying them on the contrary. This financial behavior is a test of investors' own ability and mentality. Investors conduct all-around analysis and judgment on the market situation based on their overconfident investment psychology [5].

In the process of trading decision-making, investors will also cause the behavior deviation of buying the winner due to the herd effect. Herd behavior in the capital market refers to a group psychological phenomenon in which market participants blindly follow the trend [14]. Due to the lack of professional knowledge and information disadvantage, individual investors often trade according to the price trend, characterized by buying the winner [5]. In order to maximize subjective value, investors buy high-risk stocks when chasing up and sell low-risk stocks when killing down, resulting in asymmetric risk return [13]. Huang Shizhong, Li Shi, and others also found that herding will break the balance of long and short forces offsetting each other during the normal operation of the capital market, make the actions of many investors tend to be consistent and induce the sharp rise and fall of stock prices, resulting in systemic financial risks [15].

Based on the above two viewpoints, the two irrational strategies of investors, namely, the strategy of buying the winner and the strategy of contrarian investment, may be positively or negatively correlated with the beta anomaly. Therefore, the research hypothesis of this paper is put forward.

H1: the strategy of buying the winner is positively related to the beta anomaly of listed companies in the A-share market.

H2: the contrarian investment strategy is positively correlated with the beta anomaly of listed companies in the A-share market.

3. Research design

3.1 Sample selection and data source

The sample data selects the monthly trading data of China. A-share listed companies from January 1, 2017, to December 31, 2020, explores the impact mechanism of investor behavior deviation on the beta anomaly, and screens the samples as follows. (1) Eliminate the samples of financial industry and real estate industry to avoid the deviation of results caused by the particularity of financial industry. (2) Eliminate the research samples of ST and st * to minimize the impact of garbage stocks on the results.(3) Propose research samples with missing data to ensure the consistency of data.

Finally, the annual observation of more than 10000 companies are obtained, and the first 2400 samples are grouped according by date. Since the data of phase J depends on the portfolio of phase J-1, a total of 46 effective samples were obtained. The sample data of this paper mainly comes from reset, and the data used for some variables comes from an economic and financial research database (CSMAR). Excel and Stata 13 software are used for data processing and analysis.

3.2 Description and measurement of variables

3.2.1 Explained variable.

The beta coefficient of a stock is the ratio of the covariance of a single stock and the market portfolio to the variance of the market portfolio, which measures the common change degree of the return of a single stock and the market return. Using the rolling regression method, this paper obtains the beta coefficient by rolling regression between the monthly excess return of stocks and the excess return of the market portfolio in the past year [16]. Referring to the research of Wang Qingshi and Li Huitong,

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Zhou Aimin and Yuanyuan, Baker et al., and Bali et al., this paper adopts the following methods to deal with the beta anomaly. First, all sample stocks are divided into five groups from large to small according to the beta level of month T-1 and ensure that each group has the same number of individual stocks. Secondly, the process simulates the hedging transaction of zero cost portfolio, that is, in each t period, buys the stock assets of the lowest group of beta and shorts the stock assets of the highest group of beta. Finally, the equal weight excess return realized under this hedging strategy is calculated, and this is taken as the actual return of the t-period portfolio, which is taken as a measure of beta anomaly [4,6,17,18]. This method makes up for the defects that it is difficult to effectively control the influence of individual stock characteristics such as asset size and book-to-market ratio on the yield, and makes it possible to control individual stock characteristics [17].

3.2.2 Explanatory variable.

Contrarian investment strategy arbitrage by buying stocks with poor performance in the past and selling stocks with good performance in the past. The strategy of buying the winner takes advantage of the sticky arbitrage of stock price caused by people's insufficient response to information [7]. Referring to the research of Zhong Chen and Wu Xiong, this paper adopts the following treatment methods for the independent variables: rank the sample stocks from high to low according to the excess return rate of the J-1 period, and the top ten combinations are winners and the last ten combinations are losers. If irrational stock investors buy past winners and sell past losers, they will adopt the investment strategy of buying the winner. If irrational investors buy past losers and sell past winners, they will adopt a contrarian investment strategy. At the same time, the equal weight rate of return is used to quantify the two investment methods [19].

3.2.3 Control variable

Referring to the research of Zhou Aimin and Yuanyuan, this paper selects Fama French's three factors, momentum effect, economic growth rate, and inflation rate as control variables, which may predict the switching of market style [4].

Note: data sources are from the CSMAR database and RESET database

3.3 Model design

To test the relationship between investor behavior strategy and beta anomaly of listed companies in the A-share market, this paper establishes a multiple linear regression model as follows.

$$Ewer\ (j) = \beta_0 + \beta_1 * MIS\ (j) + Controls + \varepsilon \quad (1)$$

$$Ewer\ (j) = \beta_2 + \beta_3 * CIS\ (j) + Controls + \varepsilon \quad (2)$$

Among them, $Ewer(j)$ indicates the degree of a beta anomaly in phase J. If $Ewer(j)$ is negative, it indicates the existence of a beta anomaly, and the greater the value, the deeper the degree of an anomaly in this phase. $MIS\ (j)$ represents the return rate of the portfolio adopting the strategy of buying the winner in phase J, $CIS(j)$ represents the return rate of the portfolio adopting the strategy of contrarian investment in phase J, and controls represent the control variables mentioned in Table 1.

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Table 1: variable definition and calculation method.

Variable type	Variable symbol	Variable name	Variable calculation method
Explained variable	Ewer	Beta vision	Equal weight excess return
Explanatory variable	MIS	The strategy of buying the winner	Portfolio yield
	CIS	The strategy of Contrarian investment	Portfolio yield
Control variable	Momentum	Momentum effect	Defined as the weighted rate of return of the whole market circulation market value last month
	FF3_market	Market factor	Calculated concerning Fama French three-factor model
	FF3_size	Scale factor	Calculated regarding Fama French three-factor model
	FF3_bm	Valuation factor	Calculated regarding Fama French three-factor model
	Output	Economic growth	Defined as the growth rate of the added value of industries above Designated Size in the current month
	Inflation	Inflation	It is defined as the logarithm of the CPI index of the current month

4. Empirical analysis and result discussion

4.1 Descriptive statistics

Table 2 makes a descriptive statistical analysis of the research variables. Among them, the mean value of beta anomaly is -0.013 and the standard deviation is 0.998, which can verify the existence of beta anomaly of listed companies in the A-share market, with a small fluctuation range. However, the beta anomaly in some periods is -2.111, which means that the systemic risk is high. In addition, under the strategy of buying the winner, the average value of portfolio yield is 0.057 and the standard deviation is 3.454, which indicates that the return rate will greatly increase (decrease) when investors adopt the same investment decision.

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Table 2: Descriptive statistics of research variables.

Variable	Mean	Std. Dev.	Min	Max
Ewer	-.013	.998	-2.111	3.463
MIS	.057	3.454	-5.767	12.143
CIS	.057	.936	-2.535	2.72
Momentum	.026	.085	-.126	.257
FF3 size	-.009	.031	-.083	.064
FF3 bm	-.005	.029	-.066	.06
Output	-.015	.636	-2	2.462
Inflation	4.629	.009	4.619	4.657

4.2 Descriptive statistics

Table 3: Empirical test results (1).

Linear regression

Ewer	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]
MIS	.234	.047	5.02	.002	.14	.329
Momentum	-.481	1.913	-0.25	.803	-4.35	3.388
FF3_size	-.119	3.613	-0.03	.974	-7.426	7.188
FF3_bm	2.564	3.725	0.69	.495	-4.971	10.099
Output	-.219	.132	-1.66	.106	-.487	.049
Inflation	7.461	13.394	0.56	.581	-19.631	34.553
Constant	-34.529	62.027	-0.56	.581	-159.991	90.932
Mean dependent var		0.005	SD dependent var		1.001	
R-squared		0.646	Number of obs		46	
F-test		9.748	Prob > F		0.000	
Akaike crit. (AIC)		95.937	Bayesian crit. (BIC)		108.738	

As can be seen from Table 3, there is a positive correlation between the strategy of buying the winner and the beta anomaly of listed companies in the A-share market, which supports hypothesis H1. The results show that when investors adopt the strategy of buying the winner, the balance of long and

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short forces in the normal operation of the capital market will be broken, and the stock price will rise and fall sharply, which will lead to systemic financial risks.

As can be seen from Table 4, there is a positive correlation between contrarian investment strategy and beta anomaly of listed companies in the A-share market, which supports hypothesis H2. The results show that investors seek to maximize subjective value too much, which will lead to asymmetric risk.

4.3 Descriptive statistics

The data selected in this paper are only those of 50 listed companies in the A-share market. Due to the limited number of samples, in order to ensure the effectiveness of the empirical results, this paper tests the robustness by increasing the volatility of control variables. The test results are shown in Table 5-6. From the data in the table, it can be seen that the t-statistic of MIS of portfolio return of the strategy of buying the winner is 4.66, which is significantly positively correlated, and the t-statistic of CIS of portfolio return of contrarian investment strategy is 6.09, which is significantly positively correlated.

Table 4: empirical test results (2).

Linear regression

Ewer	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]
CIS	.812	.146	5.55	.004	.516	1.108
Momentum	.596	1.023	0.58	.563	-1.473	2.665
FF3_size	2.435	3.278	0.74	.462	-4.195	9.066
FF3_bm	-5.237	5.287	-0.99	.328	-15.931	5.457
Output	.173	.149	1.16	.251	-.128	.473
Inflation	2.202	11.827	0.19	.853	-21.72	26.123
Constant	-10.264	54.703	-0.19	.852	-120.911	100.384
Mean dependent var		0.005		SD dependent var		1.001
R-squared		0.632		Number of obs		46
F-test		7.790		Prob > F		0.000
Akaike crit. (AIC)		97.620		Bayesian crit. (BIC)		110.421

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Table 5: robustness test results (model 1).

Linear regression

Ewer	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]
MIS	.201	.043	4.66	.002	.114	.288
Momentum	-1.251	1.232	-1.02	.316	-3.744	1.241
FF3_size	-1.529	2.986	-0.51	.611	-7.569	4.51
FF3_bm	.429	3.449	0.12	.902	-6.546	7.405
Output	-.21	.114	-1.84	.073	-.441	.021
vol	0	0	3.14	.003	0	.001
Constant	-.681	.267	-2.55	.015	-1.221	-.142
Mean dependent var		0.005		SD dependent var		1.001
R-squared		0.705		Number of obs		46
F-test		17.572		Prob > F		0.000
Akaike crit. (AIC)		87.530		Bayesian crit. (BIC)		100.330

Table 6: robustness test results (model 2).

Linear regression

Ewer	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]
CIS	.7	.115	6.09	.022	.468	.933
Momentum	-.174	1.021	-0.17	.865	-2.24	1.891
FF3_size	1.059	3.286	0.32	.749	-5.588	7.705
FF3_bm	-5.835	4.583	-1.27	.21	-15.105	3.435
Output	.119	.128	0.93	.359	-.14	.379
vol	0	0	1.65	.107	0	.001
Constant	-.596	.311	-1.92	.062	-1.224	.032
Mean dependent var		0.005		SD dependent var		1.001
R-squared		0.667		Number of obs		46
F-test		11.205		Prob > F		0.000
Akaike crit. (AIC)		93.082		Bayesian crit. (BIC)		105.882

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5. Summary and reflection

Due to the large number of investors and diverse behaviors in the secondary market, it is reasonable to explain the beta anomaly in A-share market with behavioral finance theory.Many scholars have carried out research based on investor behavior, including heterogeneity, gambling stock preference and investor sentiment, but these theories have limited ability to explain beta intention.

Based on the basic theory of behavioral finance, taking China's A-share listed companies from 2017 to 2020 as samples, this paper empirically tests the impact mechanism of two common irrational investment behaviors, namely "contrarian investment" and "buying the winner", on beta anomalies. It is found that the relationship between market risk and excess return is not stable, and there is a market risk anomaly in the Chinese market. Both the strategy of buying the winner and the strategy of contrarian investment are positively correlated with the beta anomaly, that is, the higher the probability of irrational investors adopting the two strategies, the higher the probability of beta anomaly in the A-share market. The research conclusion provides new empirical evidence for understanding the relationship between investor behavior deviation and beta anomaly. Inhibiting investors to adopt the strategy of buying the winner and contrarian investment strategy is helpful to straighten out the relationship between risk and return and weaken the beta anomaly in China's A-share market.

Due to the different internal reasons for the formation of the two strategies, the former is due to investors' insufficient reaction and the latter is due to investors' overreaction. In view of this, the following suggestions are put forward. First, improve the information disclosure mechanism of listed companies, enhance the quality of stock price information, and improve market effectiveness, thus weakening the impact of psychological factors on beta anomalies. Second, strengthen the supervision of listed companies, standardize the order of market transactions and guide the value trading of stocks. There are still the following shortcomings in this paper. Only linear model for regression is relatively simple and needs optimization. In addition, there may be a lag effect on the influence of investor behavior deviation on beta anomaly.

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