

# An Empirical Study of Fund Performance Ranking on Fund Manager's Risk Adjustment Behavior

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## Abstract

Performance ranking is a key factor for investors to make investment decisions such as redemption. Numerous studies have shown that in order to improve and secure the year-end relative performance ranking, mid-year performance rankings have prompted fund managers ranked at different mid-year levels to adjust the risk levels of their portfolios to varying degrees in the second half of the year. This study is of great significance to improve the incentive mechanism of fund companies, investor investment activities and the performance of regulatory responsibilities by state institutions. First of all, this paper makes a full sample study of the risk adjustment behavior of fund manager based on the fund's first-half performance by using the combination table analysis method and regression analysis method, and further studies the relationship between market state and fund manager's risk adjustment behavior. **Result:** Fund managers (losers) with lower mid-year performance increase portfolio risk more than fund managers (winners) who are at the top of the mid-year performance list. Finally, pay incentives dominate in a bull market, prompting fund managers to increase the risk of their portfolios in the second half of the year in the event of a lower first-half performance ranking, while career worries can have the opposite effect of performance rankings in a bear market.

## Keywords

Fund Manager Performance Ranking Risk Adjusting Behavior

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## 1. Introduction

The tournament mechanism is an incentive mechanism for the fund industry. Brown *et al.* (1996) [1] argues that even without a management fee contract, the

competitive nature of the mutual fund environment alone can provide incentives for fund managers. Fund managers strive to increase their relative performance rankings in order to expand their size, and thus engage in a fierce performance competition. According to competition theory, relative performance rankings motivate managers to work harder (Lazear and Rosen (1981)) [2]. However, such incentives may also lead to excessive risk of increasing performance rankings (Taylor (2003)) [3].

Why does a fund manager's relative performance ranking affect its risk adjustment for the subsequent period? Existing research provides two explanations for the motivation of fund managers' risk adjustment: salary incentives and career considerations. Gorjaev (2005) [4] demonstrates that performance rankings have a greater impact on fund liquidity than yields. In addition, Capon, Fitzsimons, and Prince (1996) [5] found that the past performance levels were key factors in investors' decisions to buy the fund. Mutual funds that received the highest returns during the assessment period received the most re-increase in new investments in the Fund. Fund managers tend to maximize short-term performance rankings in order to get more money inflows creating a competitive performance ranking tournament. The study of the dual incentive problem of fund manager sits on the issue of principal-agent between investors and fund managers, which needs further study. Firstly, this paper makes a full sample study of the risk adjustment behavior of fund manager based on the fund's first-half performance by using the combination table analysis method and regression analysis method, and further studies the effect of performance ranking on adjusting behavior in the bull and bear market states.

This paper proceeds as follows. In the next section we review the economic tournament literature, especially focusing on the impact of performance ranking on risk adjusting behavior, and then motivate our testable hypotheses. Section 3 describes the data and methodology we employ in our empirical investigation, while Sections 4 details the findings of the classification and regression tests we use to support our conclusions. The final section concludes the paper.

## 2. Literature Review

### 2.1. Foreign Studies

A great deal of literature suggests that fund managers' risk-choice behavior is influenced by past performance rankings, but the findings are not consistent.

Some studies support the competition hypothesis (e.g. Brown *et al.*; Chevalier and Ellison, 1997; Koski and Pontiff, 1999). These studies found that the worse the medium-term performance, the greater the fund's increased portfolio risk in the second half of the year. Brown *et al.* (1996) [1] first proposed the fund competition hypothesis that fund managers who had a relatively good or poor mid-year return had the incentive to change their portfolios; By the median annual cumulative rate of return, the losers and winners were found to be more likely to increase portfolio risk in the post-year performance competition than

the top fund managers (winners) in the mid-year performance competition. Chevalier and Ellison (1997) [6] looked at the fund's holding characteristics at the end of September and December, and found that the fund did change the level of risk based on past performance rankings to increase expected capital inflows. For example, foundations that underperformed from January to September increased the standard deviation in tracking errors between October and December. Koski and Pontiff (1999) [7] used regression analysis to find that the fund's risk changes were negatively correlated with the fund's performance in the first half of the year.

There are also studies that do not support this hypothesis (e.g. Busse, 2001; Gorjaev, etc., 2005). Busse (2001) [8] used daily earnings data rather than monthly data to estimate the risk of fund returns, using the same approach from Brown *et al.* (1996) to study the risk-taking behavior of 230 equity funds in 1985-1995, and did not find that Brown did not find that after adjusting for the correlation, Brown was not found to have risk adjustment phenomena found in (1996). Kempf (2008) [9] looked at the performance tournaments within the fund family and found that managers with lower first-half results chose high risk in large families, while in small families, fund managers who had been ranked at the top of the list chose high risk. Cullen (2012) [10] and others, after distinguishing between the average regression of the fund manager's active adjustment risk level and risk level, found that the fund manager's behavior of actively adjusting risk level is not related to historical performance.

## 2.2. Research in China

In China, there is less literature on the impact of relative performance on fund managers' investment behavior (such as risk-taking behavior). Shi Chenxuan and Liu Xia (2005) [11], Sun Jing and Qiu Wanhua (2005) [12], studied that fund managers who ranked lower in the previous performance were more likely to choose high risk, and that new funds were more likely to be risky than older funds. Zhou Yongfeng (2008) [13] changed to the standard deviation of daily yield, replacing the previous one commonly measured by month, and the results also support this conclusion.

There are also studies that have come to different conclusions. Han Dezong and Song Hongyu (2002) [14] used the joint table study to draw the opposite conclusion, the mid-year performance of the top fund managers tend to invest in high risk. Ding Zhenhua (2006) [15] empirical study of the risk-taking behaviour of 55 open-end equity funds listed prior to December 30, 2004 found that the impact of the fund's past performance rankings on the fund's future risk options was uncertain, *i.e.* some funds increased the risk of portfolios when performance was poor. Another part of the foundation reduces the risk of portfolios when performance is poor. Using the two-dimensional grouping list method of Brown *et al.* (1996), a study of the risk-taking behaviour of closed-end funds between 1998 and 2008 found that fund managers did not increase the risk level of their portfolios after becoming losers. The winners also did not reduce the

risk level of the portfolio to maintain its performance ranking; Gong Hong (2010) [16] argued that closed-end funds' closed-end operations and "drought and flood protection" had left closed-end fund managers lacking the incentive to improve their performance rankings. Cai Qingfeng and Liu Jin (2012) [17] for the first time combined compensation incentives and career considerations to find that compensation incentives dominate in a bull market, prompting fund managers to increase the risk of increasing their portfolios in the second half of the year in the face of lower first-half results to maximize compensation. Career considerations can have the opposite effect of performance rankings in a bear market.

By combing the research of scholars in China and abroad, it is found that the number of research on the "tournament" effect of the fund market in China is relatively small, and there is no consistent conclusion. Some scholars believe that the early winners in order to seek further increase in earnings, more inclined to increase risk. Some scholars have come to the opposite conclusion. In addition, some scholars believe that the fund manager's risk adjustment behavior is also influenced by objective factors of personal characteristics (such as personal risk preference, gender, etc.).

To sum up, there are some common problems in the relevant research in our country at this stage:

- Due to the late start of China's fund, the relevant research only began to appear in 2004, mainly concentrated in 2008-2012, most of the study used a smaller number of samples, and the interval is earlier.
- The previous research is mainly aimed at whether there is a "tournament effect" in China's fund market and less research are made on the extent to which the winner's fund increases the risk of the portfolio compared to the winner's fund.

### **3. Data and Methodology**

#### **3.1. Data**

In this paper, open-end stock fund as the research object, open-end stock fund manager's performance ranking competition is more intense, facing employment risk and compensation incentive than other types of fund managers, and the proportion of stocks in the portfolio is large, the expected adjustment risk range is also greater. This article selects all open-end equity funds for the period 2010-2018. We've eliminated the new fund every year. After screening, this paper finally obtained a total of 1364 fund samples over 9 years. The net growth rate of the fund and data of control variables (family, lnage, lnsize, year) are derived from the CSMAR database. By analyzing China's A-share market index since 2003, we find that the mid-year market index yield is a good indicator of the market's state of the year. Market index is measured by Shanghai Securities Composite Index. About data processing, we mainly use Excel and STATA12.0 two metering tools.

### 3.2. Methodology

In order to compare whether the risk adjustment ratio of the loser fund is greater than the risk adjustment ratio of the winning fund, according to Brown *et al.* (1996) [1], two variables are established. The first is that each fund's prior net worth growth rate (RTN) is calculated as:

$$RTN_{imy} = \prod_{m=1}^m (1 + Ret_{imy}) - 1 \quad (1)$$

$Ret_{imy}$  is the net growth rate of the fund  $i$  on the month  $m$  of the year  $y$ , calculated as:

$$Ret_{imy} = \left( Nav_{imy} / Nav_{i(m-1)y} \right) - 1$$

$Nav_{imy}$  and  $Nav_{i(m-1)y}$  represent the net value of the re-equity units of the fund  $i$  on the month  $m$  and  $m - 1$  in the year  $y$ , respectively, *i.e.* the net value of the unit that takes into account the dividend reinvestment and the split.

The second one is the Fund's risk adjustment ratio for the year (RAR), calculated as follows:

$$SD = \sqrt{\frac{\sum_m^1 (Ret_{imy} - \overline{Ret})}{M - 1}}$$

In this paper, the risk choice of the fund manager in the first half of the year is defined as the  $SD_{iy}^1$ , and the risk choice in the second half of the year is defined as the  $SD_{iy}^2$ .

Then, calculate the fund's risk adjustment ratio for the year (RAR):

$$RAR_{iy} = SD_{iy}^2 / SD_{iy}^1 \quad (2)$$

The standard deviation of the net worth growth rate in the second half of the year and the first half of the year, RAR, reflects the degree of adjustment of fund risk. The methods for measuring whether portfolio risk increases:

The risk adjustment level at a later stage of the fund greater than the median of all samples is considered to be a relative increase in the fund's portfolio risk, while the lower-than-median sample is considered to be relatively less risk-reduced.

## 4. Empirical Results

### 4.1. Descriptive Statistical Analysis

**Table 1** is a description statistic of the sample. RTN is the fund's net worth growth rate in the first half of the year, the losers and winners are divided according to the median growth rate of the first six months of the net worth, Age is the age of the fund at the end of the year, Tna is the total net worth of the fund at the end of the year. The mean of RTN, Age and Tna is reported in the table. Overall, the average age of funds in the sample is increasing year by year, at 4.93 years at the end of 2018, while the average net value of the fund is decreasing year by year, at 1 billion RMB by the end of 2018.

**Table 1.** Sample description statistics.

Year	Number of Funds	RTN	Age	Loser		Winner		Tna	Market
				RTN	Age	RTN	Age		
2010	24	22.66	3.08	24.42	3.58	20.9	2.58	137.56	Bear
2011	36	18.69	3.5	-21.78	3.44	-15.6	3.56	69.04	Bear
2012	60	1.72	3.5	3.07	3.97	0.37	3.03	43.67	Bull
2013	78	20.23	3.92	10.43	3.9	10.02	3.95	34.32	Bear
2014	91	23.88	4.45	28.51	4.85	19.14	4.04	27.89	Bull
2015	98	-4.62	5.16	-3.52	5.19	-5.67	5.14	19.64	Bull
2016	139	0.2	4.93	-3.1	4.84	3.56	5.01	15.23	Bear
2017	229	7.61	4.46	3.74	4.57	11.52	4.36	14.67	Bull
2018	258	-17.72	4.93	-17.42	4.77	-18.03	5.1	10	Bear

a. RTN is shown as a percentage; the unit of measurement of Tna is RMB 100 million.

## 4.2. Effect of Performance Ranking on Fund Risk Adjustment Behavior

### 1) T-test of Average Variance and Wilcoxon Test for Median Variance

**Table 2** shows the results of the grouping by the growth rate of the net worth of the first 6 months (*i.e.* M-6). The average and median value of the loser and winner's risk adjustment ratio RAR are reported in the table. The T-test for the difference in the mean and the Z-value of the Wilcoxon test for the difference in the median are also reported in the table. Panel A defines winners and losers by median, *i.e.* performance ranked before the median as a winner, after the median righteously, the loser. Panel B defines winners and losers by four points, *i.e.* funds with the top 25% of the performance are the winners, and the bottom 25% are the losers. Consistent with the assumptions in this paper, no matter which method is used to define the loser and the winner, the risk adjustment ratio of the loser fund is greater than the risk adjustment ratio of the winning fund, and the difference between the average and median is significant at the 1% significant level. The results show that funds (losers) that rank edge in the prior year increase the risk of their portfolios to a greater extent than funds (winners) that have the highest performance in the previous year.

### 2) Contingency Table Analysis

According to Brown *et al.* (1996) [1], this paper uses a two-dimensional grouping list method to test the extent to which the investment risk of losers and winners changes at a later stage.

As Panel A in **Table 3** shows, the percentage of funds with the loser's performance ranking in the first six months of the year was 27.20%, significantly larger than the 22.95% choice of low risk. In contrast, fund managers who scored the winner in the first six months chose a low-risk adjustment percentage of 27.20 per cent, greater than the 22.65 per cent who chose a high-risk adjustment. Panel B shows that the difference in risk adjustment for losers based on the quart

**Table 2.** Risk-adjusted ratio.

Panel A		Divide Losers and Winners by Median			
		Loser	Winner	M1-M2	T-value
RAR	Average	0.54	0.45	0.1	3.26***
	Median	1	0	1	3.25***
Panel B		Divide Losers and Winners by Quartile			
		Loser	Winner	M1-M2	P-value
RAR	Average	0.57	0.43	0.14	3.74***
	Median	1	0	1	3.71***

**Table 3.** Two-dimensional group analysis.

Panel A		Ranked by Median		$\chi^2$	Observations
		Loser	Winner		
Risk Adjustment	Increase	27.20	22.65	10.56	1364
	Decrease	22.95	27.20	***	
Panel B		Ranked by Quartile		$\chi^2$	Observations
		Loser	Winner		
Risk Adjustment	Increase	28.99	21.38	13.76	683
	Decrease	21.52	28.11	***	

ranking is even more pronounced. **Table 3** shows that losers in the performance ranking tend to try to improve performance in the second half of the year by increasing investment risk, leading to the choice of losers to increase investment risk. In contrast, the top funds managers (winners) are under less pressure and therefore do not choose to increase investment risk. Moreover, the greater the difference in performance rankings, the more likely the losers is to increase risk.

### 3) Regression Analysis

The two-dimensional grouping method adopted by Brown *et al.* (1996) [1] does not take into account the impact of other characteristics of the fund on the risk-taking behavior of the fund manager, so in order to control other factors that may affect the risk-taking behavior of fund managers, this paper uses regression analysis to study the impact of fund managers' performance ranking on fund managers' risk-taking behavior. In our regression analysis, we look at the impact of first-half earnings rankings on fund managers' risk-taking behavior in the second half of the year. The regression model is as follows:

$$RAR = \alpha + \beta_1 RANK_{it} + \beta_2 SD_{iy}^1 + Company_{control} + Fund_{control} + Year + \varepsilon \quad (1)$$

The explanatory variable  $RANK_{it}$  in model (1) is the relative performance ranking of fund  $i$  in the first half of  $t$ . Consistent with Kempf *et al.* (2009) [9], we rank all funds according to their first-half performance from small to large, the worst performing funds take 0, the best performing funds value 1, and the other

values are evenly distributed (0, 1). The higher the value of the variable indicates that the performance of the fund *i* relative to other funds is better, on the contrary, the worse the performance of the fund.

**Table 4** shows Rank's coefficient of beta 1 is significantly negative at 1%, indicating that the worse the performance of the Fund relative to other funds of its kind, the greater the risk adjustment of the Fund. In an economic sense, after controlling for other factors, the funds that ranked the worst in the previous performance (*i.e.*, Rank-0) were 15.4% higher than the funds that ranked the best in the previous performance (Rank?-1), and the risk of the assets they held in the latter period was 15.4%.

### 4.3. Market Status and Fund Manager Risk Adjustment

Due to the limitations of the amount of fund data and data structure available for study in China, the empirical results of cross-form classification have some limitations. The following will use market status as a relevant variable to measure the professional pressure faced by fund managers, by applying regression model more reliably to analyze the impact of performance ranking on fund managers' risk adjustment behavior.

Based on the measure of market status above, we divided the five years 2010/2011/2013/2016/2018 into a bear market, divided the four years 2012/2014/2015/2017 into a bull market, and established the following regression model:

$$\begin{aligned} \text{RAR} = & \alpha + \beta_1 \text{RANK}_{it} * M_1 + \beta_2 \text{RANK}_{it} * M_2 + \beta_3 \text{SD}_{it}^1 \\ & + \text{Company}_{control} + \text{Fund}_{control} + \text{Year} + \varepsilon \end{aligned} \quad (2)$$

**Table 4.** Regression analysis.

	Model (1)
RANK	-0.154 (0.001)***
SD	-2.402 (0.000)***
Family	-0.000 (0.593)
lnage	-0.012 (0.026)**
lnsize	0.007 (0.430)
year	Yes
N	1364
Prob > F	0.000
Adj R-square	0.061



Among them,  $M_1$  and  $M_2$  are virtual variables: when  $t$  equals to 2010/ 2011/ 2013/ 2016/ 2018,  $M_1$  is 1,  $M_2$  is 0; and when  $t$  equals to 2012/ 2014/ 2015/ 2017,  $M_2$  is 1,  $M_1$  is 0. After passing the F-test and Hausman test, we used the time-fixed effect to estimate the model. The results are as follows:

**Table 5** shows that the coefficients in the bear market are significantly negative at the level of 1% and 5%, respectively, and the fund managers who are lagging behind choose a more prudent investment strategy, with positive correlation between performance ranking and risk adjustment. Based on the results of the regression, we can infer that compensation incentives dominate in bull markets and reputational incentives dominate in bear markets.

## 5. Robustness Test

For reasons of robustness, other variables are also used in this paper to replace RANK1it's relative performance ranking of fund managers. This paper designs the following virtual variable regression model:

$$RAR = \alpha + \beta_1 RANK\_F_{it} + \beta_2 SD_{iy}^1 + Company_{control} + Fund_{control} + Year + \varepsilon \quad (3)$$

$$RAR = \alpha + \beta_1 RANK\_0F_{it} + \beta_2 SD_{iy}^1 + Company_{control} + Fund_{control} + Year + \varepsilon \quad (4)$$

The  $RANK\_F_{it}$  in model (3) is a virtual variable, and if the performance of the fund  $i$  in the first half of  $t$  is less than the median performance of similar funds, *i.e.* the performance of the fund  $i$  in the first half of  $t$  is ranked as the winner, and then  $RANK\_F_{it}$  is 1, otherwise it is 0. The  $RANK\_0F_{it}$  in model (4) is a virtual variable, and we divide all the funds in each year's sample into two groups based on the quartile of first-half performance, the best 1/4 and the worst-performing one-fourth.  $RANK\_0F_{it}$  is 1 when ranked as the winner.

In **Table 6**, model (3) and model (4) can be seen the regression coefficient of

**Table 5.** Differences in bull and bear market.

	Model (2)
RANK*M1	0.162 (0.002)***
RANK*M2	-0.146 (0.004)***
SD	-2.416 (0.000)***
Family	-0.000 (0.577)
lnage	-0.012 (0.026)**
lnsize	0.007 (0.426)
year	Yes
N	1364
Prob > F	0.000
Adj R-square	0.060

**Table 6.** Robustness test.

	Model (3)	Model (4)
RANK_F	-0.075 (0.004)***	
RANK0_F		-0.121 (0.001)***
SD	-2.421 (0.000)***	-2.231 (0.000)***
Family	-0.000 (0.578)	-0.000 (0.552)
lnage	-0.013 (0.019)**	-0.013 (0.089)*
lnsize	0.007 (0.412)	0.014 (0.242)
year	Yes	Yes
N	1364	683
Prob > F	0.000	0.000
Adj R-square	0.058	0.064

RANK\_F and RANK0\_F is significantly negative, indicating that the risk adjustment of the loser fund is greater than the risk adjustment degree of the winner. The results are robust.

## 6. Conclusions

Based on the annual performance ranking, this paper analyzes and studies the risk-taking behavior of funds (managers) from the incentive mechanism faced by fund managers. Fund managers (losers) with lower mid-year results increase portfolio risk more than fund managers (winners) who are at the top of the mid-year performance list. For example, the funds with the worst previous performance were 15.4 per cent higher than those with the best performance in the previous period. Pay incentives dominate in a bull market, prompting fund managers to increase the risk of their portfolios in the second half of the year in the event of a lower first-half performance ranking, while career worries can have the opposite effect on performance rankings in a bear market.

This paper enriches and perfects the literature on fund competition and the risk-taking behavior of fund managers in China. Annual Performance Rankings will trigger the risk-taking behavior of fund managers. It means a lot to fund investors, fund managers and regulators. The fund's performance ranking must take into account the fund's risks and be more concerned with the fund's long performance, not short-term performance.

## Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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