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The Influence of Network Structure in Fund Competition on Fund Performance

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Abstract: The number of public offering funds in China has increased year by year. Through the study of Chinese public offering funds in 2011-2020, we find that: (1) the information barrier density of the fund has a significant inhibitory effect on the fund performance, that is, the greater the information barrier density of the fund, the worse its performance. (2) The information barrier strength of the fund has a significant inhibitory effect on the fund performance, that is, the greater the competitive information barrier strength, the worse its performance.

Keywords: Securities investment funds; Network structure; Crash.

1. Introduction

Since 2010, the number and scale of China's public offering funds have been increasing, and they have played a pivotal role in China's securities investment market. As institutional investors, the research on the behavior and performance of public offering funds has also been a hot issue in the financial industry and academia. However, the increasing number of fund institutions has made their connections more complex and the competition more intense, and formed a complex institutional investor relationship network [1]. From the perspective of the competition network, how will the information barrier generated by fund competition affect the fund performance? What is the influence mechanism between them? We analyze the relationship between fund competition network structure and fund performance.

2. Theoretical analysis and research hypothesis

In the previous elaboration of the efficient market theory, whether the information can be fully and timely integrated into the price is one of the criteria to measure the efficiency of market information.

In the study of information diffusion and asset price fluctuation, it is found that the faster the information dissemination, the higher the market efficiency, and the improvement of the information sharing degree will increase the competitive informed transactions, and integrate more information into the price, accompanied by less excess returns[3]. In the competitive network formed by fund institutions, due to the existence of information barrier, the transmission of private information between them will inevitably be restricted, resulting in the denser connection nodes with limited information, which means that the greater the density of information barrier, the worse the information circulation will also be. The spread of information is closely related to the index of network density, while the transmission of information between funds with competitive relationship will be blocked, The higher the network density is, the greater the information barrier density between institutional investors is. At the same time, the higher the information barrier density is, the more restrictions will be imposed on the transmission path of information on the network, and the speed of transmission will be greatly reduced, resulting in poor performance.

Hypothesis 1: The greater the density of fund information barrier, the worse the fund performance.

Build a fund manager network based on social networks, and study the impact of information dissemination on traders' financial decisions[4]. The greater the centrality of the fund's eigenvector, the closer it is to important nodes in the network[5]. In the competitive network, if a node is in a very important competitive position, the greater the degree of its competition barrier, the more barriers it will encounter in the information exchange, which will lead it to fall into an information disadvantage position and eventually lead to a decline in performance.

Hypothesis 2: The greater the barrier of fund information, the worse the fund performance.

3. Research design and model building

3.1. Data sources and sample selection

This paper selects the stocks of listed companies in China's A-share market and the open-end equity funds and open-end hybrid funds in the public securities investment funds as the research samples, excluding the index, bond, currency and other passive investment funds, and the fund sample range is 2011-2011. Both the stock data and the weekly return data of the fund are from the RESSET database, and the fund position data are from the CSMAR database. According to the usual practice of relevant documents, this paper also deals with the following documents: (1) excluding financial listed companies; (2) Eliminate the samples in the absence of data and extreme market conditions; (3) The stock samples with annual trading weeks less than 30 weeks are excluded; (4) Handle the sample outliers, and use Winsorize to shrink the tail by 1% up and down.

3.2. Explanatory variables

(1) Information barrier strength (eigen). Network centrality reflects the centrality and importance of the fund in the network, and represents the advantages of information transmission. The centrality of the network is an index reflecting the network location of nodes in the network. The higher the centrality of nodes in the network, the better their network position in the network, and the more advantages

they have in the acquisition, dissemination and control of information. Because the eigenvector degree centrality of nodes not only considers the number of adjacent nodes directly connected to it, but also considers the centrality of adjacent nodes. The centrality of each node is related to the eigenvector degree of its neighboring nodes. This indicator can best reflect the degree of the node's core advantage in the overall structure of the network, but it is the opposite in the competitive network. Therefore, this paper chooses to use the eigenvector degree centrality to measure the information barrier strength. The calculation formula of the eigenvector degree centrality is as follows:

$$\text{Eigen} = \lambda \sum_j x_{ij} e_j \quad (1)$$

λ is proportional constant; Xij equals 1, which means there is a connection between fund i and fund j; Ej represents the importance of fund j.

(2) Information barrier density(densi). Network density is an important indicator of complex network structure, which describes the density level of the network. The higher the density of the network, the closer its overall structure, the more information is blocked between nodes in the competitive network, and the slower the diffusion speed. The calculation is generally expressed by the ratio of the actual connections between all nodes in the network to the maximum possible number of connections. In this paper, the network density is used to measure the information barrier density, and the calculation formula is:

$$Densi_i = \frac{2E_i}{n_i(n_i-1)} \quad (2)$$

Ni represents the number of all nodes in the individual network of fund i; Ei represents the actual number of connection edges between nodes in the individual network of fund i.

3.3. Interpreted variable

The three-factor model of Fama and French (1989)[6]. The model believes that the performance of investment funds is related to three factors, namely market factor, scale factor and book value factor. Carhart (1997) proposed a four-factor model on the basis of the three-factor model[7]. He believed that the return of the fund was related to the implementation of the one-year momentum strategy by the fund manager.

$$R_{it} = \alpha_{it} + \beta_1 RMRF + \beta_2 SMB_t + \beta_3 HML_t + \beta_{4i} UMD_t + \varepsilon_{it} \quad (3)$$

Rit represents the difference between the net value return of fund i in the period t and the risk-free interest rate of the market; RMRF represents the difference between the average rate of return of the market in the t period and the risk-free interest rate of the market; SMBt, HMLt and UMDt respectively simulated the scale factor of the current period; The difference in the rate of return generated by the book-to-market ratio and performance momentum. With α It is the alpha of the performance measurement index of fund i in the t period.

3.4. Control variables

The control variables selected in this article are shown in Table 1.

3.5. Research model

To test hypothesis 1: this paper constructs the following model to examine the relationship between fund information barrier density and fund performance.

$$Alpha_{it} = \beta_0 + \beta_1 \text{density}_{i,t} + \beta_2 \text{Control}_{i,t} + \text{Year Fixed Effect} + \text{Fund Fixed Effect} + \varepsilon \quad (4)$$

To test hypothesis 2: This paper constructs the following model to examine the relationship between fund information barrier and fund performance.

$$Alpha_{it} = \beta_0 + \beta_1 \text{eigen}_{i,t} + \beta_2 \text{Control}_{i,t} + \text{Year Fixed Effect} + \text{Fund Fixed Effect} + \varepsilon \quad (5)$$

This paper sets the annual fixed effect and the fund fixed effect.

Table 1. Description and definition of related variables

Variable	Metrics
Navol	(Return on the Fund's net value at the end of the current period - Return on the net value at the end of the previous period) / Return on the net value at the end of the previous period
Size	The natural logarithm of the fund's net value at the end of the current period
Age	The natural logarithm of the number of days the Fund was established at the end of the current period
Sum_flow	Current subscription fee minus redemption fee
F_stotal	The natural logarithm of the total net value of the fund under the company in which the fund is located in the current period
F_qtotal	The sum of the number of funds under the current period of the company in which the fund is located

4. Data description and empirical results

All data in this study are panel data. The regression model adopts the two-way solid effect of panel data for regression, controls the individual and annual solid effect of the fund, and takes into account the influence of heteroscedasticity and sequence correlation. The regression results of the fund information barrier density and fund performance are shown in Table 5-3.

In Table 2, the regression result in column (1) is the result of univariate least squares OLS regression. The regression coefficient between the information barrier density and the fund performance is -0.137, and the t value is -4.65. The regression coefficient shows a negative correlation at the statistical level of 1%. The result shows that the greater the information barrier density of the fund, the worse the fund performance. The regression result in column (1) is the result of univariate least squares OLS regression. The regression coefficient between the strength of information barrier and the fund performance is -0.104, and the t value is -4.15. The regression coefficient shows a negative correlation at the statistical level of 1%. The result shows that the greater the strength of information barrier, the worse the fund performance. The regression result in column (1) is the result of univariate least squares OLS regression. The regression coefficient between the strength of information barrier and the fund performance is -0.104, and the t value is -4.15. The regression coefficient shows a negative correlation at the statistical level of 1%. The result shows that the greater the strength of information barrier, the worse the fund performance. The regression coefficient shows a negative correlation at the statistical level of 1%, indicating that the fund performance will slow down as the fund information

barrier density increases, and the fund performance will gradually deteriorate. Hypothesis 1 and Hypothesis2 are verified.

Table 2. Information barrier and fund performance

variable	(1) Alpha	(2) Alpha	(3) Alpha
Density	-0.137***	-0.086***	-0.027***
	(-4.65)	(-2.97)	(-5.46)
Eigen	-0.104***	-0.077***	-0.044***
	(-4.15)	(-2.77)	(-4.85)
Navol			-0.004**
			(-2.45)
Size			0.019*
			(1.93)
Age			0.022**
			(2.53)
Sum_flow			-0.139***
			(-4.01)
F_stotal			-0.009*
			(-1.79)
Fee			-0.362*
			(-1.84)
Constant	-0.844***	-0.754***	-0.213***
	(-2.84)	(-4.01)	(-3.01)
Fund FE	No	Yes	Yes
Year FE	No	Yes	Yes
N	15099	15099	15099
Adj.R^2	0.441	0.440	0.344
Prob>F	0.000	0.000	0.000

Note:***、** 、* The regression coefficients are significant at the 1%, 5%, and 10% levels, respectively, the same below.

5. Conclusions and Implications

The results show that: (1) The information barrier density of the fund has a significant inhibitory effect on the fund performance, that is, the greater the information barrier density of the fund, the worse the fund performance. The possible impact mechanism is that the fund information barrier density reduces the fund performance by reducing the fund's timing ability to a certain extent. (2) The information barrier of the fund has a significant inhibitory effect on the performance of the fund, that is, the greater the information barrier of the fund, the worse the performance of the fund. The possible impact mechanism is that the degree of fund information barrier reduces the fund performance by reducing the fund's stock selection ability to a certain extent.

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