Research on the Effect of Fund Corporate Governance on Fund Performance Based on BP Neural Network

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Abstract. With the continuous improvement of China's capital market, the fund industry has developed rapidly. However, behind its development, fund management companies also have some problems, such as principal-agent problems caused by principals, agents and custodians. By summarizing the existing research, starting from the ownership structure and board structure, this paper introduces BP neural network to establish a regression fitting model on the impact of fund management corporate governance on fund performance, and selects the data for training and testing. The results show that BP neural network has certain accuracy on the impact of fund management corporate governance on fund performance, which enriches the relevant research.

Keywords: Fund Management Company · Shareholding Structure · Board Structure · BP Neural Network · Fund Performance

1 Introduction

Funds are mainly contract type, with the characteristics of collective investment and professional management in China. They mainly involve three aspects: principal, agent and custodian. Therefore, there will be a double principal-agent problem. Fund management companies employ professional fund managers to be responsible for fund operation in order to maximize the interests of fund holders, while fund managers aim to maximize the interests of shareholders. This dual principal-agent relationship makes the governance objectives of fund management companies more complex and intensifies the difficulty of investors in fund investment decision-making. Therefore, fund performance plays an important role in investors' investment decision-making.

The existing fund evaluation system focuses on evaluating the performance of fund managers from the perspective of stock selection and risk. However, according to the research of Chen Siru, the fund corporate governance structure is also one of the important factors affecting the fund performance. Therefore, this paper studies its relationship with fund performance from the perspective of fund corporate governance structure, and introduces BP neural network regression fitting model, which is conducive to the majority of investors to make more rational investment decisions and fundamentally protect the

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interests of investors. At the same time, fund management companies can more deeply understand the advantages and disadvantages of their own governance mechanism, so as to improve the management level and decision-making efficiency.

2 Literature Review

Gilson (1990) and others earlier conducted research on the impact of corporate governance structure on fund performance, designed independent director indicators and analyzed their impact on fund performance, and believed that the establishment of independent directors would help to improve fund performance. On this basis, through the study of American open-end funds, Tufano and Sevick (1997) further found that the higher the proportion of the number of independent directors in the number of the board of directors of the fund, the lower the fund fee rate, and the smaller the size of the board of directors, the lower the fund fee rate. When studying the impact of American fund governance structure on fund performance, Zhang Guoqing (2004) found that the independent director system is in the core position in the governance structure. This system is mainly established to supervise the investment company, so as to prevent the investment consultant from abusing his power to seek illegal interests and better protect the interests of shareholders, i.e. fund holders. Du Xiaoyan (2016).

Liu Shuting (2017) and Deng Qiaolu et al. (2019) studied the impact of equity institutions on fund performance, and believed that equity concentration was significantly positively correlated with fund performance. The higher the equity concentration, the better the fund performance of fund management companies; The higher the degree of equity check and balance, the worse the fund performance of the fund management company; The shareholding ratio of state-owned enterprises has a significant positive impact on fund performance, but there is no significant relationship between the two after the shareholding ratio of state-owned enterprises reaches the holding level.

Therefore, the research on fund corporate governance structure and fund performance at home and abroad focuses on whether the ownership structure and board structure can bring excess returns to active funds. Among them, the ownership structure plays a decisive role in the corporate governance structure, which affects the behavior and performance of the company. The structure of the board of directors not only affects the governance efficiency of the company, but also has an important impact on the performance of the fund. According to the principal-agent problem, analyzing the relationship between the principal-agent problem and the fund performance from these two dimensions is helpful for investors to choose the appropriate fund for investment decision-making according to the corporate governance structure. Most studies mainly focus on one dimension. This paper analyzes the impact of corporate governance structure on fund performance from two dimensions, and constructs a public fund performance evaluation system based on fund corporate governance structure.

3 Research Design

This paper introduces two dimensions of evaluation indicators to measure the ability of corporate governance structure to obtain excess returns for active funds, including the

index of corporate control - ownership structure and the index of corporate governance efficiency - board structure.

3.1 Influence of Ownership Structure on Fund Performance

3.1.1 Equity Concentration and Fund Performance of Fund Management Companies

The concentration of equity will promote the governance mechanism of fund management companies, and then improve the level of fund assets management and operation, which will affect the performance of funds. Gqjz is used to represent the equity concentration, and the following assumptions are put forward:

Hypothesis 1: the ownership concentration of fund management companies is positively correlated with fund performance.

3.1.2 Equity Checks and Balances of Fund Management Companies and Fund Performance

Equity balance = shareholding ratio of the first largest shareholder/(shareholding ratio of the second largest shareholder + shareholding ratio of the third largest shareholder), and equity concentration is expressed in gqzh. The degree of equity check and balance refers to the restraint ability of other shareholders of the company to the largest shareholder. The larger the index, the stronger the control ability of the largest shareholder and the weaker the degree of check and balance of other shareholders to the largest shareholder. Make assumptions:

Hypothesis 2: the equity balance of fund management companies has a negative relationship with fund performance.

3.2 Impact of Board Structure on Fund Performance

3.2.1 Board Size and Fund Performance of Fund Management Companies

China's funds started late and are still in the development stage. More board members are conducive to the complementarity of professional knowledge and the improvement of decision-making. The size of the board of directors is measured by the number of board of directors of fund management companies, which is expressed by DSS. The following assumptions are made:

Hypothesis 3: there is a positive correlation between the performance of the board of directors and the size of the fund management.

3.2.2 Proportion of Independent Directors of Fund Management Companies and Fund Performance

In the long run, the existence of independent directors has improved the internal governance level of the management company to a certain extent, so as to improve the fund performance. The proportion of independent directors is measured by the proportion of the number of independent directors in the total number of directors of the fund management company, which is expressed by dlzb. The following assumptions are made:

Hypothesis 4: the proportion of independent directors in fund management companies is positively correlated with fund performance.

4 Empirical Analysis

Neural network model is a commonly used causality model in the economic field. The main idea is: first, use the model to regress the data from 2015 to 2020 to obtain its causality, and then use the data from 2021 to further verify the relevant causality.

4.1 BP Neural Network

The learning process of BP neural network includes two processes: the forward propagation of input data and the reverse propagation of error. The input data is transmitted to the next layer neuron through a specific transmission function, and then transmitted to the output layer in turn. The calculated output data is compared with the preset output data, and the error signal is transmitted back to change the input function until the error of the output data is minimized. The specific calculation is as follows:

Input layer neurons are independent variables that have an important impact on the output value. Set the number of input neurons as j, which are and respectively $X_1, X_2, \cdots, X_n$. Input neurons affect the output of hidden layer neurons through the connection weight. Set q each hidden layer neuron, and the connection weight between each input neuron and hidden layer neuron is v_{ki}, then the neurons in the hidden layer are z_k=$f_1\left(\sum_{i=1}^{n} x_i \times v_{ki}\right)$, $\mathrm{k} = 1, 2, \cdots \mathrm{q}$.

Similarly, let the weight between the hidden layer and the output layer be w_{jk}, the transfer function from hidden layer to output layer is f_2 (), then the output of the hidden layer node is y_j=f $\left(\sum_{k=0}^{q} w_{jk} \times z_k\right)$.

The simulation output value is compared with the preset output value to obtain the error of each output. By setting the minimum error, the error signal is back propagated, and the weight from the input layer to the hidden layer and the weight from the hidden layer to the output layer are continuously adjusted to minimize the error. The neural network formed and tested by repeated training of a large amount of data can be used for the prediction of similar output values.

4.2 Sample Selection and Data Source

Select the data from 2014 to 2021 to calculate relevant indicators, and select the data from 2015 to 2021 for analysis. A total of 73 fund companies were selected as research samples, and the relevant data of fund management companies and funds were from wind financial database.

4.3 Variable Setting

Sharp ratio is used to measure the fund performance. Sharp ratio is equal to the difference between the expected return of the fund and the market return, that is, the ratio of excess return to the standard deviation of fund return. The higher the sharp ratio, the better the performance. Specific variables are shown in Table 1:

Table 1. variable setting

	Variable
Explanatory Variable	Equity checks and balances
	Board size
	Proportion of independent directors
	Ownership concentration
Control Variable	Duration of fund management company
	Size of fund management companies
Explained Variable	Sharpe

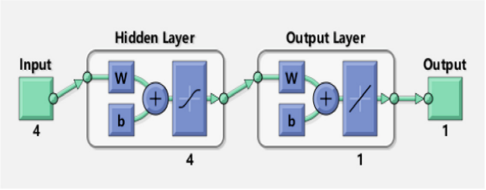

Fig. 1. Topology of BP neural network

4.4 Establishment of Neural Network Model

The BP neural network used by Zhou Yang (2019) has a three-layer structure, including input layer, hidden layer and output layer. As shown in Fig. 1, the hidden layer is 4. Algorithm description

(1) Select the input data and determine the output data according to the selected input data.
(2) The actual output of the network calculated by processing the input data through the nodes of the hidden layer and the output layer is further compared with the expected output, and the error between the actual output and the expected output is calculated.
(3) The error is used as the basis for modifying the weight, back propagated to the input layer, and then the weight coefficients of each layer are corrected, and the process is repeated.
(4) Until the error between the actual output and the expected output reaches the preset error convergence standard, the final network weight is obtained.
(5) Using Huang Guiyi's (2010) fund forecasting method, we take the data from 2015 to 2020 as input, and calculate the weight of the whole neural network according to the calculated weight, so as to obtain the prediction results of 2021.

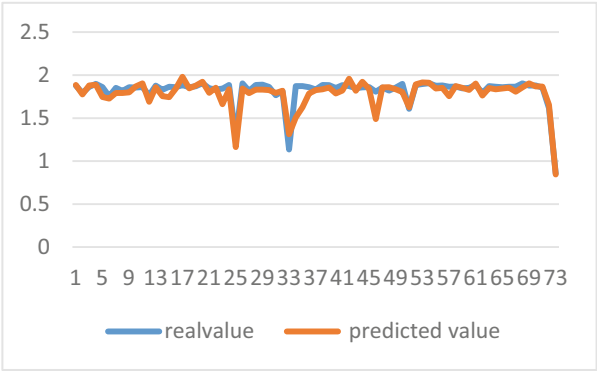

Fig. 2. Fitting results of predicted value and real value

4.5 Impact on Fund Performance

First select the relevant data from 2015 to 2020 for regression to obtain the relevant net, and then input the equity concentration, equity checks and balances, the size of the board of directors and the proportion of independent directors in 2021 to obtain the output prediction results. Compared with the real results in 2021, as shown in Fig. 2, it is found that the predicted values of net fitted by BP neural network based on the data from 2015 to 2020 are basically consistent with the real values. It further shows that the equity concentration, equity checks and balances, the size of the board of directors and the proportion of independent directors have an important impact on the fund performance.

5 Conclusion

The empirical results of this paper show that the regression fitting effect of BP neural network is better than that of pure traditional regression, and can better get the research results of the impact of fund management corporate governance structure on fund performance. The relatively high proportion of independent directors in the board of directors is conducive to improving the fund performance. The proportion of senior executives in the board of directors has a positive effect on the company's operating performance, and is conducive to balancing the interests of all parties and preventing interest transmission and unfair transactions. Therefore, we should further improve the independent director system, give better play to the role of the independent director system and enhance the company's performance. At the same time, the positive effect of equity concentration on fund performance and the negative effect of equity checks and balances on fund performance suggest further optimizing the equity structure. The concentration of equity of fund management companies will provide benefit transmission for major shareholders to some extent. We should appropriately adjust the control ability of the first largest shareholder over other shareholders in order to realize the effective check and balance of the first largest shareholder. Enhance the voice of other minority shareholders, avoid the over concentration of the rights of the largest shareholder and moderate decentralization. So as to give full play to the role of large and small shareholders in corporate

decision-making, improve the governance level of fund management companies, and improve the performance of fund management companies.

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