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Research on Optimization of Construction Project Investment Evaluation Based on Big Data

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Abstract: *The evaluation and optimization of construction project investment is ultimately to evaluate the risks and benefits of the project, and the evaluation indicators and standards must take into account China's economy and enterprises. The risk factors that affect the investment projects of construction projects come from various aspects. The cost of the project depends on the implementation process and investigation methods in the project operation. In this paper, the optimization research of construction project investment evaluation based on big data is carried out. This paper introduces a risk assessment method based on BPNN (Back propagation neural network). We normalized the attribute values of various indicators used for project risk assessment, and sent them as input samples from the input layer. After being processed layer by layer by hidden layers, they were transmitted to the output layer, and finally the output of the system was taken as the evaluation target. The author verified it with an example, which shows that it is feasible to use BPNN to evaluate and optimize the construction project investment.*

Keywords: *Big data; Construction project; Investment evaluation*

1. Introduction

As a basic resource, big data is often used to define massive data. With the rapid growth of data and information, China has led to the fanatical pursuit of big data in many fields such as economic management, commerce and communication technology [1]. In the process of venture capital operation, project income and project cost are two core issues that need to be considered. The project income depends on the evaluation system, professional ability and market luck of venture capital companies. The cost of the project depends on the implementation process and investigation methods in the project operation.

Construction projects have the characteristics of large investment, complicated construction and many participants [2-3]. At the same time, the objectives of all participants are different, which makes balancing the interests of all parties and reasonably sharing the risks among all participants become the key to controlling the investment risks of construction projects. However, the traditional neural network model has the contradiction between the calculation accuracy and the calculation efficiency. Based on the big data model, this paper puts forward a new idea, and takes the project risk assessment of venture capital as an application example in the reset variable structure classic BPNN (back propagation neural network).

2. Research method

2.1. Design of index system for evaluation of construction investment projects

When investors evaluate construction projects, they often use some variables as evaluation indexes to decide whether to accept a certain investment project. Whether the selection of these indicators can truly and fully reflect the income and risk status of venture projects is one of the keys to the success or failure of venture capital. If the capital market is perfect and venture capital has certain exit and realization channels, the success of venture capital basically depends on the selection and evaluation of the project by the venture capital company after capital raising [4]. The project management plan is the window for venture capital companies to get to know venture enterprises or venture projects for the first time. Therefore, the first step of evaluation is to evaluate the contents of the project management plan.

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At present, there are many models to evaluate the risk value of venture capital. Generally, several types of risk indicators are adopted for the risk of construction investment projects, and statistical data or expert evaluation methods are adopted to obtain the value of each risk indicator, and then AHP evaluation method and fuzzy decision evaluation method are adopted [5-7]. The determination of various weights in the evaluation is subjective, and the complicated and non-linear relationship among various risk indicators is simplified. In addition, some evaluation models lack of information overlapping among risk indicators, which limits the application of this venture capital evaluation model based on traditional statistical models.

The evaluation of construction investment is a complex system. Through comprehensive analysis of various risk indicators that affect the investment of construction projects, qualitative and quantitative methods are adopted, and an overall quantitative indicator is obtained by comprehensive evaluation, and finally a scientific quantitative result is given. The evaluation results are easily influenced by the subjective consciousness and experience of evaluators, limited by their knowledge, and lack of specific data, which makes the traditional methods have great subjective factors.

In the author's opinion, the evaluation and optimization of construction project investment is ultimately to evaluate the risks and benefits of the project, and the evaluation indicators and standards must take into account the economy and enterprises of our country. The risk factors that affect the construction investment projects come from various aspects [8]. There are both subjective and objective factors; There are not only the factors of the project itself, but also the influences of management and funds. There are both social factors and natural factors. To correctly evaluate the overall situation of project benefits, it is necessary to describe and analyze them from different aspects, thus forming a series of single benefit indicators, which respectively represent a part of the economic situation of the whole project. Evaluating the benefit of a project can be seen from its input-output indicators, as shown in Figure 1.

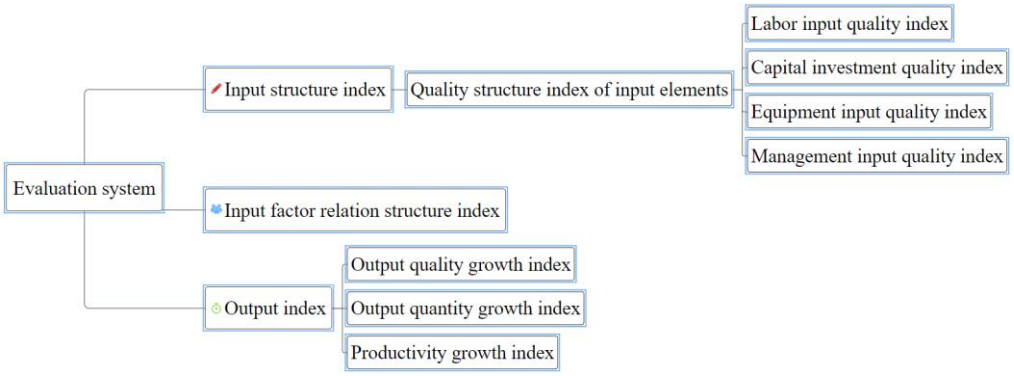

Figure 1: Evaluation system of construction investment

For construction enterprises, the key factors that affect the project cost mainly include policy factors, personnel factors, information factors, market factors and construction factors [9]. Among them, the information factor is particularly important. Through the big data technology, the construction of the information resource sharing platform of project cost can effectively solve the problems of large amount of data, inaccurate data, data lag and complicated data calculation, etc. With the help of the technical advantages of big data, the project cost can be managed in an all-round, whole-process and refined way in terms of data processing, data analysis and data mining, thus effectively improving the management level of project cost.

2.2. Optimization of construction investment evaluation

Construction investment decision-making mechanism refers to the reasonable determination of investment decision-making power through certain methods and procedures, and the formation of scientific investment decision-making procedures and checks and balances mechanism, so as to coordinate the interests and powers of various stakeholders, and ensure the scientific and efficient investment decision-making. Different allocation modes of control rights determine different investment decision-making mechanisms.

In order to improve the investment efficiency, the investment decision-making mechanism of power grid projects should be further improved. For construction projects, the investment amount is huge, the use time is long, and the impact on the economic benefits after the production is long. If the investment

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decision is wrong, no matter how to strengthen the management during the project implementation period, it is difficult to compensate the negative impact caused by the decision. Therefore, it is necessary to improve the organization of investment decision-making, strengthen the concept of investment decision-making based on investment ability, use the pre-evaluation optimization method to make investment plans, and timely adjust investment plans.

Big data is a huge, high-growth and diversified information asset that needs a new processing mode to have stronger decision-making, insight and process optimization capabilities. From the category of data, big data refers to information that cannot be processed or analyzed by traditional processes or tools, which can be said to be the decisive factor to determine whether the final information is valuable or not. By searching, filtering and mining the keywords in the Internet, we can obtain information that could not be collected in the past. By further summarizing and summarizing the collected information, information can be refined into knowledge, and knowledge-based real estate appraisal is the trend and direction of future development [10].

In recent years, the fast-developing neural network technology has been more and more applied to the investment evaluation of large-scale construction projects. It makes full use of experts' knowledge and experience, has strong learning ability, memory ability, calculation ability and intelligence processing function, and overcomes the influence of human subjective factors. This paper will introduce a risk assessment method based on BPNN.

BPNN has the function approximation ability with arbitrary precision. Therefore, the neural network provides a feasible construction and expression for the project risk assessment model. BPNN learning process consists of two processes: forward propagation of signals and backward propagation of errors. Therefore, in the forward propagation, we normalize the attribute values of various indicators used for project risk assessment, and then send them as input samples from the input layer. After being processed layer by layer by hidden layers, they are transmitted to the output layer, and finally the output of the system is taken as the evaluation target. According to the design structure of BPNN, the corresponding evaluation model is established for evaluation, and its network structure is shown in Figure 2.

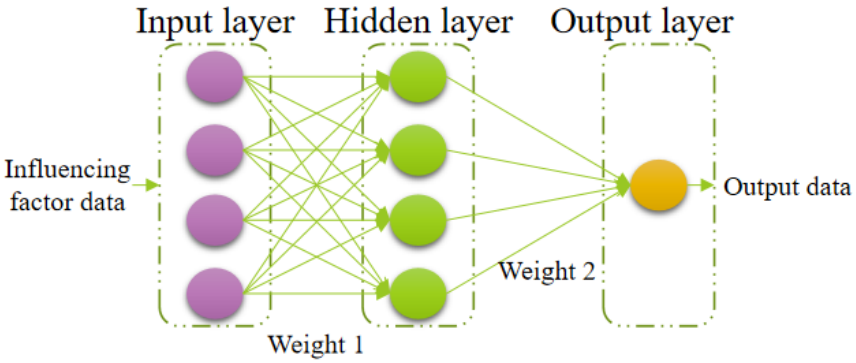

Figure 2: BPNN structure

In this paper, from the perspective of structure optimization, the random reconnection process of input layer neurons to hidden layer neurons and hidden layer neurons to output layer neurons is proposed for quasi-three-layer BPNN, and the random reconnection learning algorithm is adopted to improve the accuracy of BPNN operation.

The weight of each activated hidden layer neuron connected to it is updated as follows:

$$W_{kj}=(n+1)=w_{kj}(n)+\eta\sum_{p=1}^{p}\delta_{kp}O_{jp} \tag{1}$$

$$\delta_{kp}=(d_k-O_{kp})O_{kp}(1-O_{kp}) \tag{2}$$

The algorithm is guided learning, and the essence of learning is to constantly modify the weights so that the error function tends to zero. According to the principle of decreasing the error gradient, the adjustment of W_{kj},V_{kj} can be expressed as:

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$$\Delta W_{kj} = -\eta \frac{\partial E}{\partial W_{kj}} \quad (3)$$

$$\Delta V_{kj} = -\eta' \frac{\partial E}{\partial V_{kj}} \quad (4)$$

η is the step size or learning rate.

3. Applied analysis

This paper analyzes and explains how to use the BPNN-based construction investment project evaluation model to evaluate the project. To evaluate different construction investment projects, we must first train the invested project samples and get the network model matrix. Only by checking the items to be evaluated through the network model can the evaluation value be obtained; Finally, the project evaluation decision is made according to the evaluation value.

A large enterprise group company plans to evaluate the investment risks of 10 investment projects, and apply the neural network model method to evaluate them. Matlab software is used to realize programming, and the neural network structure of investment projects is established. Seven groups of data are used as training sets to train the network, and the other three groups are used as test sets to simulate the objects to be evaluated.

After the training is completed, the risk evaluation value of the whole system can be obtained according to the risk level evaluation of each risk factor by existing experts as input. The output values of 10 test samples are basically consistent with the actual evaluation values, and the error analysis is shown in Figure 3.

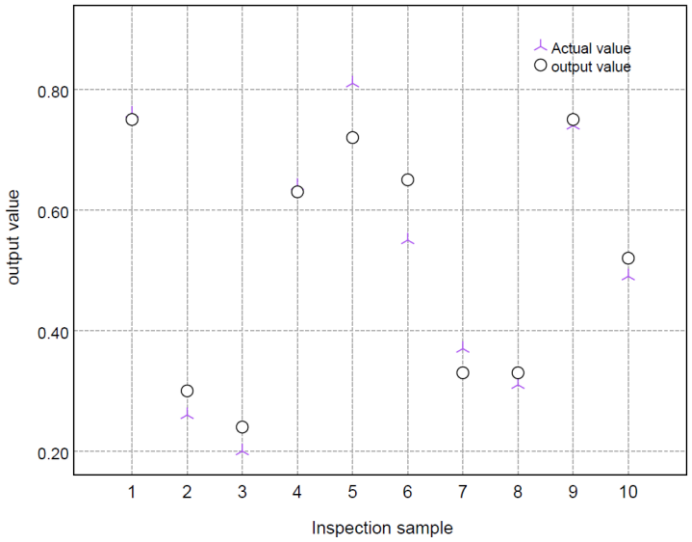

Figure 3: Test sample error

Evaluation of environment, policy, market and other aspects is the main content of investment evaluation and optimization of construction projects. These aspects cannot be quantitatively described by formulas, and the variables are large. Therefore, BPNN can just make up for these defects. The author verified it with an example, which shows that it is feasible to use BPNN to evaluate and optimize the construction project investment.

4. Conclusions

Construction projects have the characteristics of large investment, complicated construction and many participants. At the same time, the objectives of all participants are different, which makes balancing the interests of all parties and reasonably sharing the risks among all participants become the key to controlling the investment risks of construction projects. According to the neural network model

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in artificial intelligence and pattern recognition, this paper puts forward a new idea, and takes the project risk assessment of venture capital as an application example in resetting the classic BPNN with variable structure. The application results show that the output values of 10 test samples are basically consistent with the actual evaluation values, which indicates that it is feasible to optimize the investment evaluation of construction projects with BPNN.

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