

Simulation analysis on evaluation model for the rationality of college budget expenditure performance

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Abstract: During rationality evaluation process for college budget expenditure performance, when traditional algorithm is adopted to evaluate, the accuracy and practicability of expenditure cannot be considered at the same time, thus, assessment results have poor accuracy. For this, a rationality evaluation method for college budget expenditure performance based on improved genetic algorithm is put forward. The difficulty of rationality evaluation for the current budget expenditure performance of college is analyzed, to obtain quantified expressions of rationality evaluation factors effecting college budget expenditure performance, quantified results regarded as input, the rationality evaluation results of expenditure performance as output, weights and threshold of neural network are optimized with genetic algorithm, nonlinear relationship of rationality assessment model of neural network is built as well, so as to achieve the establishment of rationality evaluation model of college budget expenditure performance. Simulation results show that the rationality evaluation method of college budget expenditure performance based on improved genetic algorithm, have high accuracy and strong adaptability.

1 Introduction

In terms of performance management combining assets management and budget management, the reform of domestic college has obvious achievement (1.2.3). But rationality evaluation of expenditure performance is not fully integrated into the whole process of efficient budget management, so the management environment for reasonable expenditure performance (4.5.6) is unable to be formed. How to build up the rationality evaluation model of colleges budget expenditure performance, allocate financial resources scientifically, improve fund use efficiency and effect rapidly, worthy of further research, at the same time, has attracted many experts and scholars attention (7.8.9). The rationality evaluation method of college budget expenditure performance has far-reaching significance, therefore, has become the focus of the research, and has been widespread concerned, also a lot of good methods 10.

2 Principle of rationality evaluation optimization method for College Budget Expenditure Performance

The current algorithm for evaluation, the accuracy and practicability of expenditure cannot be considered at the same time, thus, assessment results have poor accuracy. For this, a rationality evaluation method for college budget expenditure performance based on improved genetic algorithm is put forward.

2.1 Analysis of difficulties in evaluation for college budget expenditure performance

At present, many difficulties exist in the rationality evaluation process of college budget expenditure performance, a detailed analysis for these difficulties is the primary condition to establish reasonable evaluation model.

(1) Theoretical level, the rationality evaluation of budget expenditure performance are lack of theoretical research.

Theoretical study on the college budget expenditure performance evaluation aspect is not perfect, the basic theory cognition about the evaluation of budget expenditure performance is lack of consensus, and some people think that college budget expenditure performance evaluation is on the expenditure content, scope, from the performance angle of expenditure, by the corresponding

methods to implement prior consideration, real-time monitoring, and inspection afterwards, and strive to achieve "doing more with less expense".

(2) System level, expenditure performance evaluation system of college budget regulations is incomplete.

At present, at the aspect of college budget performance evaluation subject, organization and implementation, work plans, budget, using effect, responsibility investigation and tracking query have no corresponding legal constraints, which makes evaluation work are lack of corresponding legal protection.

(3) Operational level, the college budget expenditure performance evaluation criteria is not clear.

The college budget expenditure performance evaluation is a means for college expenditure performance supervision. In order to establish a college budget expenditure performance evaluation model, the current system is lack of a unified, complete index system on the basis of precise data analysis.

2.2 The design of rationality evaluation optimization model of the college budget expenditure performance

First of all, the project budget expenditure performance is classified into application development, engineering, invention, innovation, international cooperation. The genetic algorithm fused in neural network to build the corresponding genetic neural network evaluation model for different types of college budget items, input and output are processed, and the training is carried on the genetic neural network, finally realize the rational optimization of college budget expenditure performance evaluation.

Assuming the vector index of original sample in the process of establishing the rationality evaluation model of college budget expenditure performance are not identical, and data level have large difference, in order to calculate over-saturated state of some neurons, for time (T) , staff number (C) , item number (K) , the number of the output results (O) and other quantitative indexes, normalization is performed with the following formula:

$$X' = \frac{X - X_{\min}}{X_{\max} - X_{\min}} \quad (1)$$

In the formula: X' represents the input data, X stands for an arbitrary value among T , C , K , O , X_{\max} and X_{\min} expressed as maximum value and minimum value of budget expenditure evaluation index in historical data.

In the process of establishing evaluation model, since the neural network evaluation precision is sensitive to the initial weights, will cause the network cannot be timely converged. The connection weights and threshold of the neural network obtained with genetic algorithm can effectively compensate for these problems.

The basic steps of modelling for rationality evaluation of college budget expenditure performance based on improved genetic algorithm are as follows:

(1) Coding

In the process of rationality evaluation of college budget expenditure performance based on improved genetic algorithm, weight learning of the neural network is tedious parameters continuity optimization problem, because the binary code has large error in the continuity problem, in order to get the weights and thresholds of high precision, by using real number coding method to form a real number vector, which regarded as a chromosome of modified genetic algorithm.

(2) The population initialization

In the process of rationality evaluation of college budget expenditure performance based on improved genetic algorithm, the value of initial weights and thresholds of neural network are real numbers in the $(-1,1)$ range, so the value of all the genes of initial population are arbitrary

number in $(-1,1)$, the number of initial population is 50.

(3) Objective function and fitness function.

In the process of rationality evaluation of college budget expenditure performance, neural network training is aimed to promote predictive value close to the actual value in rationality evaluation of budget expenditures, thus, error square of actual output value and the expected value of neural network is chosen as the optimization target. Expressed by the following formula

$$\min E(S): E(S) = \sum_{s=1} \sum_{t=1} (z_{st} - T_{st})^2 \quad (2)$$

In the formula, $E(S)$ represents the objective function value of t -th individuals in S generation, z_{st} represent the actual output value of the network, T_{st} represents the fitness function of the expected value, f_{st} represents the reciprocal of the target function, which can be used to get the following formula:

$$f_{st} = \frac{1}{E_{st}} \quad (3)$$

Adjustment formula of adaptive crossover probability P as follows:

$$P = \begin{cases} K_1(f_{\max} - f') / (f_{\max} - \bar{f}) & f' \geq \bar{f} \\ K_2 & f' < \bar{f} \end{cases} \quad (4)$$

$$\begin{cases} f' \geq \bar{f} \\ f' < \bar{f} \end{cases}$$

Wherein: f_{\max} represents the maximum fitness value of the population, f' represents the fitness value of larger individual among 2 crossover objects, \bar{f} represents the average fitness value of population.

(4) During the process of rationality evaluation of college budget expenditure performance, the best individual obtained after 100 generations of genetic operation is differentiated into the connection weights and thresholds of neural network, and regarded as the initial weights and thresholds of neural network rationality evaluation model.

(5) The input layer and output layer design.

During the rationality evaluation process of college budget expenditure performance based on improved genetic algorithm, the number of nodes in input layer of the neural network is equal to the influence factors of the college project budget expenditure performance evaluation, the number of nodes in output layer depends on the desired output results.

(6) The hidden layer structure design.

Based on the improved genetic algorithm to process rationality evaluation of college budget expenditure performance, if hidden nodes weren't constrained, network containing one hidden layer can accomplish arbitrary nonlinear mapping, so the neural networks with one hidden layer of N_2 hidden nodes is selected, and N_0 is utilized to represent the number of neuron in neural network input layer, the corresponding input are T', C', K', O', P', Q' . N_1 is the neuron number of output layer, the reasonable evaluation value of corresponding efficient project budget

expenditure performance i is W . The formula is obtained:

$$N_2 = \sqrt{N_1 + N_0} + \alpha \quad (5)$$

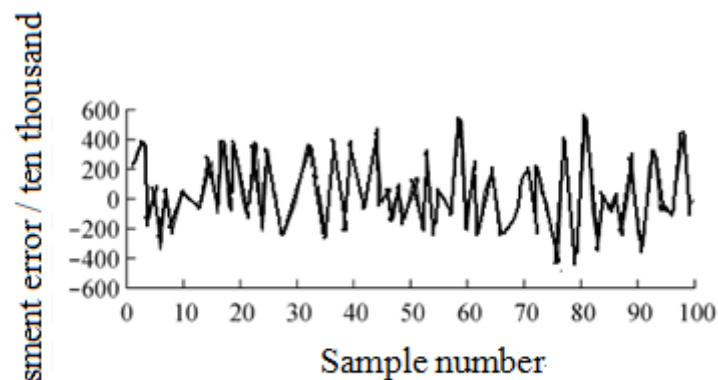
In the formula, the value of α in the range (1~10). After repeated test indicates that, when the value of α is 6, rationality evaluation model of college budget expenditure performance based on improved genetic algorithm have higher accuracy and fast stable speed. Thus, $N_2 = 9$.

In conclusion, rationality evaluation model of college budget expenditure performance based on improved genetic algorithm have high accuracy and strong applicability.

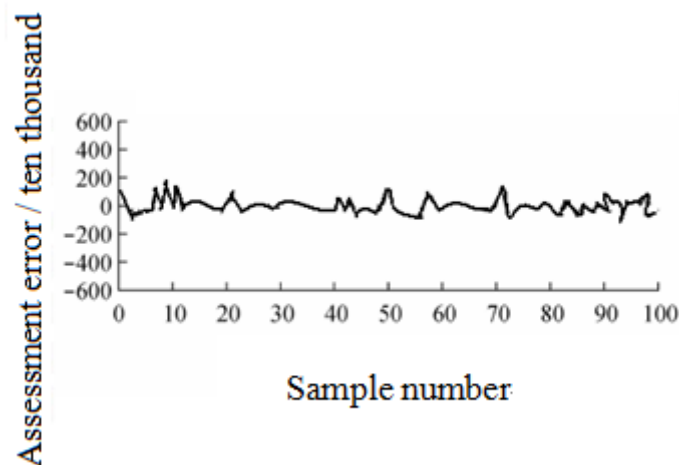
3 simulation results

In order to verify the rationality evaluation model for college budget expenditure performance proposed in the paper of real effectiveness, there is the need for an experiment, virtual experiment platform is built in MATLAB software, with 299 historical rationality evaluation data of college budget expenditure performance to test the performance of traditional and improved model.

The experimental results shown in Figure 2, 3. Figure 2 and figure 3 illustrates that during the process of rationality evaluation for college budget expenditure performance with the improved algorithm, since the optimal individual obtained by using the genetic algorithm for assignment to the initial neural network weights and threshold, and then neural network evaluation model is utilized for local optimization, finally college budget expenditure performance evaluation value of global optimum solution is acquired, has obvious advantage compared to the traditional algorithm.



a traditional algorithm



b the proposed algorithm

Fig. 1 evaluation error curve of different algorithm

Through the experiment results can illustrate that the optimized model for rationality evaluation

of college budget expenditure performance have lower error rate is lower than the traditional algorithm, can meet the application requirements of rationality evaluation of college budget expenditure performance.

4 Conclusion

For the poor accuracy problem when the current algorithm is adopted to evaluate, a rationality evaluation method for college budget expenditure performance based on improved genetic algorithm is put forward. The difficulty of rationality evaluation for the current budget expenditure performance of college is analyzed, to obtain quantified expressions of rationality evaluation factors effecting college budget expenditure performance, quantified results regarded as input, the rationality evaluation results of expenditure performance as output, weights and threshold of neural network are optimized with genetic algorithm, nonlinear relationship of rationality assessment model of neural network is built as well, so as to achieve the establishment of rationality evaluation model of college budget expenditure performance. Simulation results show that the rationality evaluation method of college budget expenditure performance based on improved genetic algorithm, have high accuracy and strong adaptability.

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