Research on Value Assessment of Scientific and Technological Enterprises Based on BP Neural Network

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Abstract. At present, in the research of the value evaluation of science and technology enterprises, most scholars adopt market method, income method, real option method and other basic research methods. These commonly used methods have some limitations in the application of evaluation. Therefore, from the perspective of BP neural network, the author discusses the applicability and validity of BP neural network in evaluating the value of scientific and technological enterprises, and provides a reference for relevant investment decision makers of scientific and technological enterprises.

Keywords: Value assessment, BP neural network, Technological enterprises

1. Introduction
China's science and technology industry is in a period of rapid development, science and technology economy is also in a broad market, science and technology economy is becoming more and more important to the development of the national economy. Science and technology enterprises are different from traditional enterprises in many aspects, such as development stage, value source, evaluation index selection, and so on. They have their own particularities. Therefore, the traditional theory and method of value evaluation are not applicable to the science and technology industry to a certain extent, so a reasonable and effective value evaluation system should be established for the science and technology enterprises [1]. Establishing BP neural network model of value evaluation of scientific and technological enterprises can remedy some limitations of common methods of value evaluation to a certain extent, and provide direction and suggestions for the effective promotion of the value of scientific and technological enterprises through the analysis of the importance of variables in the model, and provide guidance and reference for stakeholders and business decision makers in the decision-making of investment, reorganization, merger and acquisition of scientific and technological enterprises [2].
2. Application Analysis of BP Neural Network in Technology Enterprise Value Evaluation

2.1. Basic principle of BP neural network
In addition to the input layer and the input layer, the BP neural network also includes the implicit layer in the middle. The nonlinear mapping of BP neural network with multi-input to multi-output depends on the above three parts. The basic framework of BP neural network is shown in Figure 1. From the graph, it can be seen intuitively that each layer of neurons in the network is interconnected, and the non-linear mapping of any relationship between the first layer and the final layer can be realized. The learning and training process of the neural network is realized by forward and backward propagation of BP algorithm [3]. During forward propagation, date information is continuously transferred from the input layer to the output layer and must be accomplished through the implied layer. If the output layer of the network cannot reach the output within the error range, the network will automatically reverse-propagate [4]. Thus, through repeated learning, the errors that may arise in the middle are continuously reduced after repeated propagation of forward and reverse, and BP neural networks are building the entire model in such complex training and learning.

![Figure 1. Basic framework of BP neural network](image)

2.2. Applicability of BP neural network in value evaluation of technological enterprises
BP neural network has been applied in real estate evaluation, patent evaluation and other fields. The relationship between the value of technology enterprises and many influencing factors is also very complex, not linear, and the principle of BP neural network is precisely from the study of human brain processing information, which happens to be able to be used to solve the problem of complex multiple factors [5]. It can deal with variables that affect each other, restrict each other and have complex relations, and also can effectively analyze complex multi-dimensional data. On the other hand, it does not need many years' historical data to evaluate the value of scientific and technological enterprises based on BP neural network. The sample data are all from the objective data of enterprises. The whole process of evaluation avoids artificial subjective factors by means of computer software, which ensures the objectivity and authenticity of the evaluation results.

3. Analysis on the influencing factors of the value of science and technology enterprises

3.1. Value Formation Analysis of Technology Enterprises
The value formation of technology companies takes a long process, as shown in Figure 2, which can be divided into three stages. In the first stage, in the early stage of the development of science and technology enterprises, based on the obvious characteristic of technology enterprises, most of the enterprises lose money year by year, but not valueless. In the second stage, with the expansion of the
scale of enterprise users, the "user increment" effect of the network economy is becoming more and more obvious. Income increases rapidly, total cost increases slowly, and profit increases continuously. In the third stage, enterprises begin to appear the break-even point. After that, the effect of "increasing returns" is obvious. Income continues to grow, while cost drops rapidly. The profit model of scientific and technological enterprises continuously gains profits for enterprises and realizes the value increment of enterprises.

![Figure 2. Formation of Internet Enterprise Value](image)

3.2. Analysis on the influencing factors of the business model of technology enterprises

The business model is only a means to create value for the enterprise, and there can be many choices in the way of implementation, but no matter which one to choose, we should first consider the important role of the brand in the enterprise, focus on the brand value of the enterprise and improve the visibility of the enterprise. Secondly, technology enterprises need to formulate the core development strategy to better occupy the market; technology enterprises also need to establish a good network platform, improve website performance and services, and create a better user experience for customers. Finally, it should strengthen the innovation ability of enterprises, so that enterprises can obtain sustainable development ability.

4. Empirical study of BP neural network in value evaluation of technological enterprises

4.1. Structural design of evaluation model

The sequence of BP neural network is very strong, and its information is always transmitted forward and backward. According to this logic, the information flowing into the input layer goes through the hidden layer before flowing out of the output through the hidden layer. When the network structure is designed, not only the number of input variables should be pre-set, but the number of hidden layers should also be determined. At the same time, the number of output nodes in the latter two parts should also be determined at the time of design. Too few hidden layer nodes, training errors may not meet the requirements; too many hidden layer nodes and the network shrinkage is too slow will affect the performance of the network. Therefore, the node with the smallest error is selected. The number of output nodes is determined to be 1 according to the actual situation, because the value of the technology enterprise is the output variable.

4.2. Evaluation model training results

After the above series of steps, we cannot only determine the structure of the neural network, but also confirm its parameters. The optimized six principal components serve as input vectors, which come from the BP neural network model and are substituted into the BP neural network training program for training. Based on the results of the operation, figure 3 shows the error curve and regression curve respectively, and the model of the neural network can be corrected accordingly.
Figure 3. Evaluation model training results

From Figure 3, it can be seen that this BP network model can well simulate the non-linear relationship between the influencing factors of science and technology enterprise value, and it also can be authenticated that the established BP neural network evaluation model is effective and correct. The BP network value evaluation model is constructed, which can predict and judge the new input data.

5. Conclusions

BP neural network has the advantages of strong non-linear mapping ability and self-learning ability, which avoids the limitations of existing valuation methods for science and technology enterprises. Using principal component analysis and BP algorithm with momentum adaptive learning rate can optimize the performance of BP neural network and make the model have better value evaluation and prediction effect.

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