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Financial Accounting Management Framework Based on Neural Network

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Abstract:

The planning, organization, coordination and control of enterprise's daily production and operation activities need to be based on financial management information. The efficiency of traditional financial management system is very low. In this paper, financial accounting management framework based on Neural Network is proposed. This paper constructs a more effective financial risk management prediction model based on BP neural network algorithm. The empirical research results show that the risk prediction model designed in this paper has higher risk prediction accuracy and better practical application effect.

Keywords*:Data analysis, Financial accounting,Neural Network.*

I. INTRODUCTION

The 21st century is an era of highly developed and rapidly spreading information. As the most important main body of micro market, the expansion of its overall scale, the innovation of business management mode and the improvement of social and economic benefits are inseparable from the efficient management of enterprise financial information [1,2]. Enterprise financial information has been recognized as the most important factor of enterprise productivity after raw materials, assets, labor and capital. Most countries, including China, have listed the information industry as the key supporting industry in the future.As an enterprise, the financial information it holds is also a very important strategic resource. It is an important condition and foundation for an enterprise to win the market competition in the future to accurately grasp the complete and effective financial information inside and outside the enterprise [3]. From the management function of enterprises, the planning, organization, coordination and control of daily production and operation activities of enterprises need to be based on financial management information. Therefore, the management activities of enterprise financial information is the core link of enterprise financial management behavior and even the whole enterprise operation.

Under the condition of market economy, financial risk exists objectively and runs through

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the whole process of production and operation. It is unrealistic to completely eliminate risks and their influences [4,5]. It is important to comprehensively analyze financial risks, find early information that may lead to deterioration of financial situation, control the problems that affect the profitability of enterprises and even endanger their survival within a solvable range, and give early warning to various phenomena that may cause crises at any time. Therefore, it is particularly necessary to study and build a risk prediction model for financial information management.

II. RISK FINANCIAL INFORMATION MANAGEMENT MODE AND FUNCTION

There are two main theories about enterprise risk financial information management mode in the world, which are “four stage theory” and “five stage theory”. The “four stage theory” emphasizes the role of technical factors in the promotion of enterprise financial information management, including the physical control stage, automation technology management stage, information resource management stage and knowledge management stage.Although the content of “five stage theory” is not as detailed as “four stage theory”, the discussion of financial information management is closer to the real situation in the actual operation process of enterprises. It clearly shows the financial concept guided by enterprise financial information management, and further integrates financial information, strategic information, management information and administrative information of enterprises. Finally, all financial management information of the enterprise will be centralized and unified management.The main viewpoints of “five stage theory” include data statistics stage, information processing stage, financial information management system stage, end-user management stage and information resource management stage.

Although the details and objects of financial management are different, enterprise financial information management is also included in the scope of modern management, so the mode of enterprise financial information management is the same as that of modern management. From the perspective of management mode classification, enterprise financial information management is the intersection of enterprise financial activities and modern information management behavior. This management mode is mainly through the update and improvement of information technology to continuously optimize the financial governance environment and financial management system. Using the spillover effect of modern information technology, we can improve the efficiency of enterprise financial information management and reduce the risk of financial information management.

From the functional analysis of enterprise financial information management, financial information management is the integration of financial governance activities and financial management activities. Financial governance and financial management are obviously different in subject, function and goal, and can not replace each other. The main body of financial governance includes all stakeholders of the enterprise, and the main body of financial management is the board of directors and the management of the enterprise; the ultimate goal of

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financial governance is to realize the balance among the owners, creditors and other stakeholders of the enterprise, and the ultimate goal of financial management is to maximize the interests of enterprises.

In the process of risk financial management, due to the changes of external market environment and internal management system, enterprises will face multiple risks, so it is necessary to early warning and identify the financial risks faced by enterprises.

III. RISK PREDICTION MODEL OF FINANCIAL INFORMATION MANAGEMENT BASED ON OPTIMIZED BP NEURAL NETWORK

3.1 Model Building

In the process of enterprise financial information management, the main work flow of BP neural network risk prediction model is to propagate the learning signal of normal data index forward and the risk error back propagation.The index data of enterprise's management ability, debt repayment ability, profitability and growth ability are input into BP neural network model as input items. The sample data is imported from the input layer, and the risk items of each index data are identified through a large number of fuzzy rule operations in the hidden layer, and then exported through the output layer, so that the network output value approaches the expected output value, and this cycle is repeated until the expected output value is reached.Let the index vector set of input neural network risk assessment model be X:

$$X = \{x_1, x_2, ..., x_n\}^T \quad (1)$$

Then the output vector set can be expressed as Y:

$$Y = \{y_1, y_2, ..., y_n\}^T \quad (2)$$

If we assume that wi is the weight from the index data input layer to the intermediate hidden layer, k is the number of neurons contained in the intermediate hidden layer, and x_i is the threshold value of the intermediate hidden layer, then the input k_j of each neuron included in the hidden layer can be expressed as follows:

$$k_j = \sum_{i=1}^{n} w_{ij} - \chi_j \quad j = 1,2,.....,k \quad (3)$$

If the transfer function f(x) in the enterprise financial information management risk prediction model is:

$$f(x) = \frac{1}{1+e^{-x}} \quad (4)$$

In this case, the output unit λ_i of the intermediate hidden layer can be described as:

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$$\lambda_i = \frac{1}{1+exp\left(-\sum_{i=1}^{n} w_{ij} - \chi_j\right)} \quad (5)$$

The index data filtered and processed by the fuzzy operation of the hidden layer reaches the output layer, and the input term St and output term nt of the neurons in the output layer are respectively:

$$\varsigma_t = \sum_{j=1}^{n} v_{jt}\lambda_j - \xi_t \quad (6)$$

$$\eta_t = \frac{1}{1+exp\left(\sum_{j=1}^{n} v_{jt}\lambda_j - \xi_t\right)} \quad (7)$$

Where v_{jt} is the weight from the middle hidden layer to the output layer, and ξt is the threshold value of the output layer. In the process of enterprise financial information management, BP neural network risk prediction model, on the one hand, can improve the identification accuracy of financial information management risk; on the other hand, the model can also control the reverse propagation of risk identification error in the model. The error μ_i of single risk sample is as follows:

$$\mu_t = \frac{\sum_{t=1}^{n}(y_t - \eta_t)^2}{2} \quad (8)$$

The overall error of the risk prediction model system is:

$$\mu_T = \sum_{i=1}^{n} \mu_t \quad (9)$$

In order to reduce the calculation error of each node in the enterprise financial information management risk model, and modify the network weights and thresholds, it is necessary to reduce the single sample error value μ_i:

$$\Delta v_{jt} = \frac{-\tau\partial\mu_t}{\partial v_{jt}} \quad (10)$$

According to the modified output layer weight vector, $\triangle v_{jt}$ can also be expressed as:

$$\Delta v_{jt} = -\tau d_t \kappa_j \quad (11)$$

In the above formula, τ is the learning rate of the model, and d_t is expressed as:

$$d_t = \left(y_t - \eta_j\right)_t \times \left(1 - \eta_j\right) \quad (12)$$

In this case, the weights and thresholds of the hidden layer of the risk prediction model can

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be described as follows:

$$\begin{cases} \Delta w_{ij} = \gamma e_j^n x_i \\ \Delta \chi_{ij} = \gamma e_j^n \end{cases} \quad (13)$$

$$e_j^k = \left(\sum_{i=1}^{n} d_t^n v_{it} \right) \lambda_j \left(1 - \lambda_j \right) \quad (14)$$

Based on the above complete BP neural network model calculation, the information risk index weight and threshold range of input layer, middle hidden layer and output layer can be identified according to the requirements, and a training is completed. In the process of repeated learning and training, the output results are easy to fall into local optimum. In order to eliminate the influence of this adverse factor, this paper uses particle swarm optimization to strengthen the convergence ability of the model and improve the robustness of the financial management risk identification algorithm.The fitness function of particle swarm optimization is used to solve the fitness of each calculation process, and the training error in the process of risk identification of BP neural network information management is reduced. In order to find the optimal value in the whole world, the BP network model should be given the optimal initial weight and threshold to realize the risk prediction and control in the process of enterprise financial information management.

3.2 Empirical Test

This paper takes the financial information risk management sample data of 53 A-share listed companies from 2014 to 2016 as the research object, and uses the method of comparative study to study the difference between the prediction results of LPM risk prediction model and BP neural network financial information management risk prediction model, and the selected financial index system.

Compared with the prediction results of the two models, the regression results of the risk prediction model based on BP neural network are closer to the maximum likelihood value, so it is proved that the model has better fitting degree and higher accuracy of risk prediction. In order to more intuitively compare the error rate, misjudgment rate and accuracy index of the two models, the relevant data are counted, as shown in TABLE I.

TABLE I. Index comparison of two models

Particular year	Risk identification error rate%		Risk miscalculation rate%		Risk prediction accuracy rate%	
	LPM model	BP model	LPM model	BP model	LPM model	BP model
2014	2.31	1.25	4.58	0.13	91.45	96.25
2015	2.45	1.24	3.26	0	92.36	97.13
2016	3.06	1.03	4.01	0.05	90.15	97.15

Through the comparison and analysis of the sample data, the risk error recognition rate and

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risk misjudgment rate of the financial information risk prediction model based on BP neural network algorithm are significantly lower than that of the LPM model; and the accuracy rate of the risk prediction is better than that of the LPM model.

Finally, the sample data of the selected listed companies are comprehensively evaluated to verify the performance of the model in terms of profitability, model response, comprehensive profit and return on investment, and the curve is drawn, as shown in Fig. 1-fig. 4.

It can be seen from the change curve of index data in figure 1-figure 4 that the risk prediction model of financial information management based on BP neural network algorithm meets all the requirements of an effective model, and can accurately predict and identify the financial management information in the future accounting period.

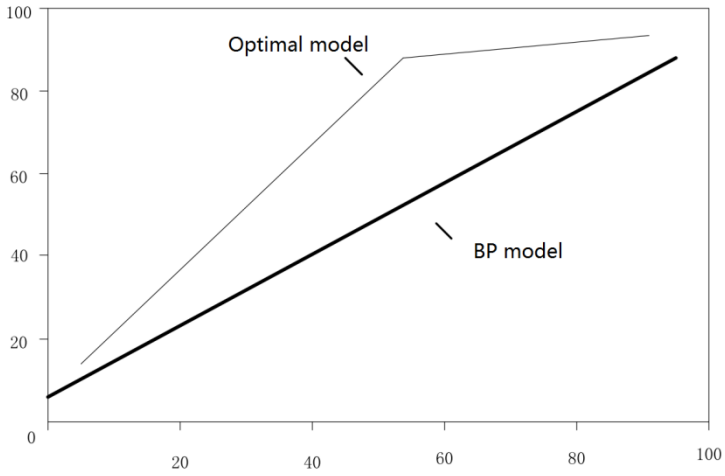

Fig 1: Gain graph of risk model based on BP neural network algorithm

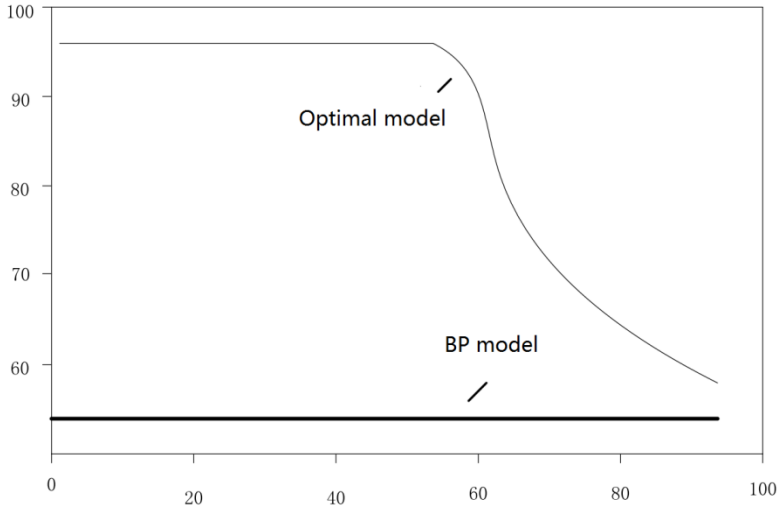

Fig 2: Response diagram of risk model based on BP neural network algorithm

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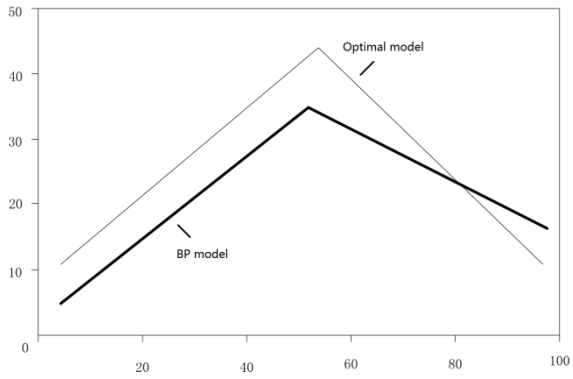

Fig 3: Profit change chart based on BP neural network algorithm

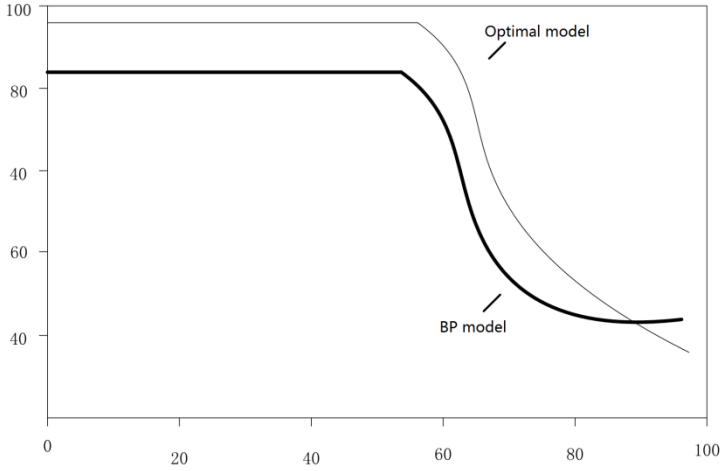

Fig 4: Change chart of return on investment based on BP neural network algorithm

IV. CONCLUSION

Financial information has become an important resource for enterprises to participate in market competition in the future. The traditional risk prediction model of financial information management is difficult to meet the requirements of enterprise financial management in terms of misjudgment rate and accuracy. This paper constructs a more effective financial risk management prediction model based on BP neural network algorithm. The empirical research results show that the risk prediction model designed in this paper has higher accuracy of risk prediction and better practical application effect.

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