

Research on risk Prediction of enterprise Financial management based on optimized BP neural network algorithm

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Abstract. The construction and development of the new age, although our country enterprise quantity is increasing, but the financial risk is also increased, so how to do a good job in risk prediction and management decisions, truly achieve expected set of financial management goal, improve the ability of enterprises to cope with risk consciousness, is the enterprise leadership and management of the main problems are discussed. Enterprise financial risk management is an important part of enterprise management. Financial personnel should accurately predict the possible risks of financial management and formulate effective risk prevention and control and solutions when integrating and analyzing relevant data, so as to ensure that enterprises can achieve sustainable development goals. Therefore, this paper takes 53 listed enterprises as an example, on the basis of understanding the risk prediction method of enterprise financial management in recent years, according to the BP neural network algorithm after optimization, in-depth discussion on how to optimize the BP neural network algorithm as the core, do a good job in the risk prediction of enterprise financial management. The final experimental results show that BP neural network algorithm has research value in the risk prediction of enterprise financial management.

Keywords: BP neural network algorithm; Enterprise; Financial management; Risk prediction

1. Introduction

While adhering to the development of socialist market economy, enterprises of all walks of life have a very broad development prospect, but because they do not have a good reserve of human resources, there are mistakes in the evaluation of capital strength, so the final development of enterprises is difficult to match with the social economy. At the same time, financial managers have an imperfect understanding of their own strength and risk prevention, so a large number of financial problems emerge during the development of the enterprise, which will cause huge economic losses. In essence, enterprise financial management is an important part of enterprise management, according to the current financial laws and regulations and basic principles of management, the organization and management of enterprise financial activities, in order to effectively deal with the economic work of enterprise financial relations. Integrated research on the current situation of enterprise financial management in recent years shows that there are mainly the following problems: First, the enterprise does not have a scientific capital structure. [1.2]During the period of financing management, most enterprises will not deeply investigate the capital market, which leads to the whole financing process becomes very blind, enterprises will also form an unreasonable capital structure, so as to increase the risk of financial management; Secondly, the liquidity of the enterprise is not sufficient. Most enterprises have few current assets and a large proportion of internal inventory, which leads to the lack of liquidity of goods, thus causing security risks to the development of enterprises. Especially for small and medium-sized enterprises, excessive internal backlog of goods will occupy too much working capital, leading to the daily production and operation of enterprises faced with huge financial pressure; Finally, enterprises are faced with a more stressful external environment. The external competition pressure brings more influence to the financial management of enterprises, which leads to the more unstable comprehensive development of enterprises, which means that the financial management and risk prediction of enterprises are faced with more challenges.[3.4]

Enterprise financial risk assessment is not only a systematic evaluation process, but also a scientific and quantitative demonstration process. In the new era of theoretical and technological innovation and development, enterprise financial management and risk prediction put forward a variety of methods, such as Delphi principal component analysis, analytic hierarchy process, grey system analysis, fuzzy comprehensive evaluation method. Although these methods play a positive role in practice, they will be affected by random factors during the evaluation period, and the final results will also be limited by the work experience, knowledge and technology of managers, which is often one-sided and subjective. In the rapid development of neural network, because of its self-adaptation ability, self-organization ability, self-learning ability and other characteristics, it can effectively overcome the influence of subjective factors, so it has been widely used in the risk prediction of enterprise financial management.

In the 1980s, American physicist J.J. Hopperfield put forward the interconnected network feedback function in his research, and accurately defined the energy function. This research is directly related to the function of neuron state and connection weight value, which can effectively solve optimization problems and associative memory. In the mid-1980s, D.Eluhamet and J.L McClelland put forward the back-propagation algorithm of multi-layer ante-term neural network in their research. This theory, also known as BP network, mainly solves problems that cannot be solved by perception. BP neural network algorithm is one of the most widely used contents during the development of the current artificial neural network. The specific example is shown in Table 1 below, which has strong practicality and utility. In this paper, on the basis of understanding the research status of BP neural network algorithm, according to the optimized BP neural network algorithm, comprehensive assessment and prediction of the financial risk of listed enterprises.[5]

Table 1 Application example of neural network

Application field	Examples of application
Aerospace and space industry	High performance aircraft autopilot, flight path simulation, aircraft control system, autopilot intensifier, aircraft component simulation, aircraft component fault detection, etc
The auto industry	Auto autonomous driving system, policy behavior analysis
The banking sector	Check and other documents read, credit card applications evaluated
Credit card Behavior Check	Used to identify unusual credit card behavior associated with a lost credit card
The defense industry,	Weapon guidance, target tracking and recognition, face recognition, new sensors, sonar, radar, image processing and data compression, feature extraction and noise suppression, signal and image recognition
Electronics	Coding sequence prediction, integrated circuit chip layout design, process control chip fault detection, robot vision, Nonlinear modeling of speech synthesis
The entertainment industry	Animation, special effects, market forecast
The financial sector	Real Estate Appraisal, Loan Guidance, Mortgage Examination, Group Debt Appraisal, Credit Crve Analysis, Securities Trading Procedures, Group Financial Analysis, Currency Price Forecasting
Industrial	Predict gases and other industrial processes produced by furnaces to replace complex and expensive equipment
The insurance industry	Policy application evaluation and output optimization
Manufacturing	Manufacturing process control, product design and analysis, the process and machine diagnosis, real-time particle recognition, visual quality inspection system, welding quality analysis, the paper predicts that computer chip quality analysis, chemical analysis, product design analysis of machine maintenance, project bidding, operation and management, dynamic modeling of chemical process system, etc
Medicine	Breast cancer cell analysis, EEG and ECG analysis, prosthesis design, transplantation time optimization, reduce medical expenses, improve medical quality
Oil and gas	Exploration
Robotics technology	Walking route control, forklift robot, control controller, vision system, etc
Voice	Speech recognition, speech compression, vowel classification, text-speech synthesis, etc
Securities	Market analysis, automatic bond rating, stock trading advisory system, etc
The telecoms industry	Image and data compression, automatic information service, real-time voice translation, user payment processing system, etc
The traffic	Truck brake diagnosis system, vehicle scheduling, travel scheduling system, etc

2. Method

2.1 Artificial neural network

Neural network is a parallel distributed system composed of a large number of processing units, which can be connected by variable weights. Among them, neuron is the most basic processing unit of artificial neural network, which refers to a nonlinear device with both input and single output. The specific structure is shown in Figure 1 below:

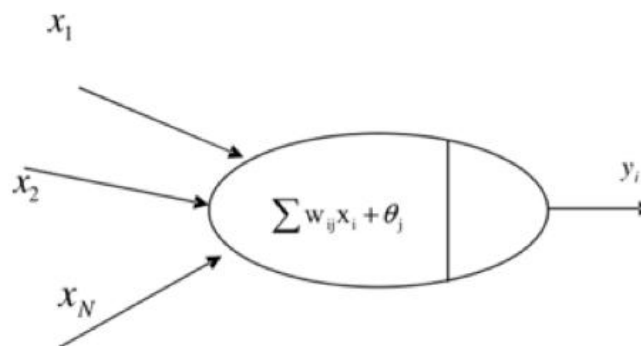


Figure 1. Structure of a neuron

The processing units of artificial neural networks are connected with each other, and all the connections constitute a directed graph. Each connection corresponds to a real number, also known as the connection weight. The set of weights can be regarded as long-term, and the full matrix W can be used to represent the connection pattern in the network, and the elements contained in W are W_{ij} . The type of connection weight value is usually divided into two types, one refers to the excitation form, the other refers to the inhibition form. The positive weight value represents the excitation connection, the negative weight value represents the inhibition connection, and the connection mode of the connection weight value is the characteristic description of the artificial neural network.[6.7]

2.2 Model Functions

The international research theories on enterprise risk financial information management model are mainly divided into two models, one refers to the four-stage theory, the other refers to the five-stage theory. Among them, the former pays more attention to technical factors and plays a leading role in enterprise financial information management, which involves four stages: physical control, automation technology, information resources and knowledge management. The overview of the latter is closer to the real situation during the actual operation of the enterprise, can clearly show the enterprise financial information management as the core of the financial, will integrate analysis of the enterprise's administrative information, management information, strategic information, financial information content, and finally centralized and unified management. The five-stage theory includes five stages: statistics, information processing, management system, end-user management and information resource management.

Although from the point of view of details and objects, enterprise financial and economic management is included in the modern management science, therefore, the enterprise financial information management mode and the development mode of modern management science have consistency. From the perspective of management mode classification, enterprise financial information management refers to the intersection of enterprise financial activities and modern information management behavior, which needs to use information technology to update and optimize, so as to improve the financial governance environment and management system. In this study, the financial information risk management index system as shown in Table 1 below is constructed, focusing on the internal financial risks of enterprises, and calculating the probability of risk occurrence and the degree of loss caused by certain measurement methods, so as to provide an effective basis for enterprise risk prevention decisions.

Table 2 Financial information risk management index system

Short-term solvency	X ₁ current ratio
	X ₂ Quick ratio
	X ₃ Working capital to assets ratio
Long term solvency	X ₄ Asset liability ratio
	X ₅ Debt to equity ratio
	X ₆ Long-term debt to equity ratio
Ability to operate	X ₇ Inventory turnover ratio
	X ₈ Total asset turnover
	X ₉ Accounts receivable turnover ratio
Profitability	X ₁₀ Main business ratio
	X ₁₁ Profit margin on total assets
	X ₁₂ Return on equity
	X ₁₃ Loss ratio
Growth ability	X ₁₄ Main business growth rate
	X ₁₅ Total asset expansion rate

2.3 BP neural network algorithm

The emerging risks of enterprise financial management come from all activities of its daily operation and management, whether it is the ability of operation and management or the level of profitability, etc., will affect the improvement of financial information management and risk prediction. Can effectively predict the financial information risk of the enterprise, according to the different financial indicators represent, to fully consider the data access and perfect sex, according to our country enterprise financial information risk management research present situation, the table 1 multiple financial indicators as a standard risk assessment, using the BP neural network algorithm to construct financial information management risk prediction model.

BP neural network algorithm is a kind of multi-layer feedforward neural network problem processing method which simulates the work of human brain. It has the classification ability of complex models and the mapping ability of multi-dimensional functions. Time is a nonlinear mapping from input to output. The structure of neural network model includes input layer, hidden layer and output layer, and the gradient descent method is used to calculate and analyze the minimum value of the objective function. At the same time, BP neural network model has the ability of data parallel processing, storage, learning, will take the enterprise operation index data as the input item, after the input model, can accurately identify the risks faced by the enterprise financial information management. The specific process is shown in Figure 2 below:[8.9]

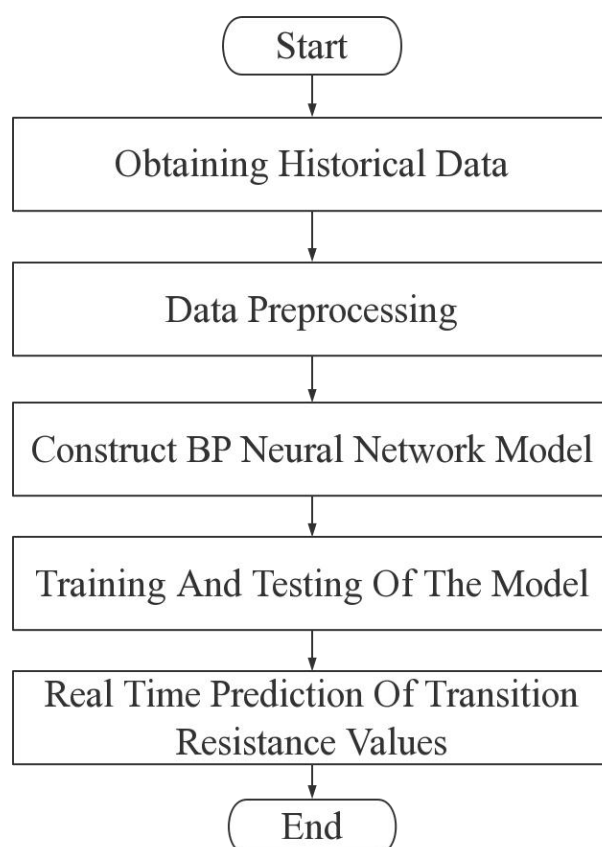


Fig. 2 Flow chart of risk identification based on BP neural network

3. Result analysis

The study in this paper has no basis with the financial information risk management samples of 53 listed enterprises from 2018 to 2020. By using the comparative research method, the results of the difference between the LPM risk prediction model and the BP neural network financial risk prediction model are deeply discussed. At the same time, the stepwise regression method was used to randomly select the data with F value less than 0.1 from the index system samples in the recent three years. In order to avoid the occurrence of multiple contributions in the period of financial management risk prediction, BP neural network prediction model will be tested and analyzed for multiple contributions, and the specific results are shown in Table 3 below:

Table 3 Analysis results of multiple contribution detection

	TOF	VIF
X ₃	0.372	2.615
X ₅	0.947	1.058
X ₆	0.856	1.175
X ₉	0.241	3.968
X ₁₂	0.864	1.145
X ₁₃	0.487	2.071
X ₁₄	0.635	1.845
X ₁₅	0.984	1.569

Combined with the above-mentioned analysis, this study selected eight evaluation index was not significant between multiple contributions, respectively using two kinds of model for regression results can be found, with BP neural network as the core of risk prediction model regression results

more close to the maximum likelihood value, thus proved that this model fitting degree is higher, more accurate risk prediction results.

In addition, by studying the error rate, accuracy rate and misjudgment rate of the two models, it can be seen that the misjudgment rate and recognition rate of the risk prediction model with BP neural network algorithm as the core are lower than those of the LPM model, but the accuracy of risk prediction is higher. Thus it can be seen that there is still no complete theoretical basis for the selection of the number of hidden layer neurons of BP neural network. Therefore, in the process of practical simulation, the number of hidden layer neurons should be selected by experience. Only the network provides performance indicators that meet the given requirements, then the number of hidden neurons that can meet the requirements can be selected. The more the number of neurons, the more time and complexity of network training. In this paper, the basic principles and algorithms of BP neural network are outlined in detail, and according to the rich results of previous studies, the convergence performance and proficiency speed of the network model are effectively improved. Finally, it is proved that the optimized BP neural network algorithm has application value in the risk prediction of enterprise financial management.[10]

4. Conclusion

To sum up, financial information, as the key content of the construction and development of modern enterprises, is the main resource to participate in market competition. However, the traditional information management risk prediction model can not meet the needs of the new period of work, so researchers put forward the optimized BP neural network algorithm in the practice of exploration. Comparing the traditional model with the BP neural network algorithm model, we can see that the former has lower misjudgment rate, accuracy rate and error rate than the latter. In this paper, after using the optimized BP neural network algorithm to construct a more efficient forecasting model, to obtain the practical application effect is stronger, so research of scholars in our country should continue to strengthen the research and application of the BP neural network algorithm combine with optimize the risk characteristics of enterprise financial management innovation, to effectively prevent the possibility of financial risk. At the same time, we should strengthen the training of professional and technical personnel, and actively introduce advanced technical theories, so as to build a good operating environment for enterprise financial management.

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