The Integration of Financial Business and the Transformation of Financial Management Functions Based on Internal Control Optimization Algorithm

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The financial and business integration capability of an enterprise is an important part of the financial management capability of an enterprise. Based on the internal control optimization algorithm, this paper constructs a model of enterprise financial business integration and financial management, mainly by combining the principal component analysis principle and the artificial network, to analyze and obtain the financial management index system of regional listed companies. The model uses component analysis and internal control optimization algorithm to manage the network model, improves the input data of the forecast model, and uses the internal control algorithm to search for initial weights and thresholds for the management network, which solves the problem of the accuracy of financial management forecasts. In the simulation process, according to the idea of cross-validation, this paper selects the ratio of the number of samples in the training set and the test set to be 25: 10. It divides the research sample data into two categories: a training set and test set, which are respectively used for the training of the optimized control network model. Taking the financial index data of listed companies in the region as a sample set, the results show that the training score of the internal control optimization algorithm is 100. That is, the fit of the training data is 100%, and the test score is 78.95. The output results reflect the financial management evaluation status, effectively improving prediction accuracy.

Povzetek: Prispevek predstavi model integracije finančnega poslovanja in preoblikovanje finančnih funkcij podjetja, ki temelji na algoritmu optimizacije notranje kontrole. Z združitvijo glavne komponentne analize in umetne nevronske mreže model analizira finančne kazalnike regionalnih podjetij. Algoritem optimizacije notranje kontrole izboljšuje napovedno natančnost finančnega upravljanja z iskanjem začetnih uteži in pragov za mrežni model.

1 Introduction

In the era of "Internet", the world economy is increasingly globalized and informalized, enterprises' production and operation environment is changing rapidly, and the operation and development of regional enterprises are facing unprecedented opportunities [1]. Still, at the same time, they are also constrained by environmental factors. Unpredictable environmental factors such as factors [2] and the financial management faced by enterprises are increasing day by day [3]. According to the prediction model's characteristics and practical application needs, an improved network prediction model is proposed. It is concluded that using the internal control signal decomposition and training the internal control network with the decomposed flow signal will avoid the internal control network oscillation caused by the "chaotic" characteristic of the flow; using the wavelet signal with the ability to scale to replace the Sigmoid transfer function of the internal control network [4], [5], [6]. It can make the neural network have better approximation effect and accuracy for the internal control flow signal: the improved prediction model with low-frequency components as training samples and prediction data can effectively improve the prediction efficiency [7].

At present, many enterprises have not recovered from the pain of the crisis. It is deteriorating, the internal management is chaotic, the loss of assets is serious, the capital chain has problems, and the financial situation is also worrying [8]. The handling of management conditions is closely linked [9], [10], [11]. Liquidity risk is systematic in nature, that is, unavoidable, such as exchange rate changes, and the other is non-systematic liquidity risk, which is avoidable, such as the company's decision-making, management structure, etc. [12]. The former can only minimize the impact, while the latter can be reduced or avoided by the management through measures such as rational allocation of resources to prevent the enterprise from facing a liquidity crisis or even bankruptcy [13]. From a certain point of view, modern enterprise management means the enterprise has abundant, stable, continuous and efficient cash flow. The lack of cash flow of the enterprise will consume the credit and reputation of the enterprise [14]. With the support of the government and relevant regulatory authorities, many expressway companies have gradually realized the importance of budget management and have taken internal control of budget management as a part of their business management activities [15], enriching the practice of internal control of budget management in practice.

Based on the internal control optimization algorithm, this paper constructs a financial business integration and financial management model of the enterprise. Taking the financial shared service centre of company Z as an example, it adopts the methods of literature research and case study. It sorts out its construction goals and processes from the internal perspective. From the control point of view, we analyze the implementation effect of Z company's financial sharing centre, try to find out the existing problems of Z company's financial sharing centre and put forward relevant suggestions. Firstly, it summarizes and analyzes the relevant theories of internal control and financial sharing, then introduces the background of Z company, the current situation of the industry and the problems encountered in the development process in detail, and introduces the construction process of the financial sharing centre in detail. The utilization efficiency is not high, and internal communication is hindered. Then, the optimization measures of the Z branch in organizational structure, business process, information platform, talent training and performance management are put forward. Finally, the research conclusions and suggestions of this paper are given.

2 Related work

In recent years, scholars have studied the current situation of the operation and management of the financial sharing centre and found that there are problems, such as unscientific financial assessment and imperfect risk management systems [16]. Combined with theories such as scale economics and standardization, the balanced scorecard is used. Expert investigation methods and other methods have put forward optimization plans for financial management, risk management, information system, internal process and management mechanism, and put forward the idea of developing from entity to virtual financial sharing centre. It provides a certain basis for the decision-making of accounting information users, but the correlation is poor, which greatly limits its usefulness [17]. Since users are more concerned with the information on the future operating conditions, dividend distribution, major investment and financing decisions of the company and their impact, it is necessary for the company to provide future-oriented and highly subjective predictive financial statements.

The internal control method is deeply integrated into all business links and functional departments of enterprise operation and management and is an important management function of the enterprise. Enterprises ensure the smooth development of economic and business activities through the reflection, supervision, analysis, evaluation and other means of internal control, maximize the interests of enterprise stakeholders, and ultimately achieve the goal of increasing the overall value of the enterprise. Liu [18] believed that feature-level data fusion is divided into target state data fusion and target feature fusion. State data fusion preprocesses sensor data, completes data verification, and estimates main parameters and related state vectors. Zhu [19] proposed that the advantage of feature fusion is that massive data compression is conducive to real-time processing, and it can provide reliable feature information for decision analysis to maximize its fusion function and provide the required information analysis.

In applying the internal control classification algorithm, Shao [20] found the existing problems after analyzing the fault information of the smart substation through data mining technology and used the internal control algorithm for reverse tracking, using big data such as Spark. Technical tools deal with the problem and solve the problem of difficult management of a large amount of monitoring data. In terms of operation management and optimization of the financial sharing centre, Hao [21] constructed an optimization model framework of the financial sharing centre based on big data background and solved the problems existing in accounting image management, accounting electronic files and other aspects. Scholars believe that because the group organization is too large, it will cause problems such as lag in information exchange. Based on the background of big data, the construction of an asset management model of the financial sharing centre combined with information technology is proposed, and various aspects of the model and the system are specific [22], [23]. After analyzing the current situation of financial management of the internal financial sharing centre of the enterprise under the background of big data, the researchers constructed a model framework combining the financial sharing model and big data cloud accounting and established six financial management early warning supervision and assessment incentives.

Compared with the current operational management status of financial sharing centers mentioned in the literature, this article focuses more on integrating finance and business through internal control optimization algorithms. Although the literature mentions issues such as unscientific financial evaluation and inadequate risk management systems, and proposes optimization plans, there is a lack of specific algorithm support. The internal control optimization algorithm proposed in this article can accurately analyze and process data to address these issues, thereby achieving more effective financial business integration. Secondly, in terms of financial management indicator system, although the literature has constructed a regional listed company financial management indicator system, there is a problem of poor correlation. This article adopts a combination of principal component analysis and artificial networks to optimize the indicator system, improve the correlation and prediction accuracy between indicators, and better serve the decision-making analysis of enterprises. Through the summary table of research results in the relevant work section, it can be seen that there are some technical gaps and challenges in the fields of financial management and internal control. The solution proposed in this article includes using internal control optimization algorithms for financial business integration and financial management function transformation. Utilize feature level data fusion and internal control algorithms to optimize enterprise management and decision analysis. At the same time, this article constructs an optimization model framework for financial sharing centers based on the background of big data and an early warning supervision and evaluation incentive mechanism. Table 1 shows the summary table of related engineering sections

Table 1: Summary table of related engineering sections

Research field	Research results	Existing technology gap	Solution
Operation and Management of Financial Sharing Center	There are problems such as unscientific financial evaluation and inadequate risk management system	Lack of effective financial and risk management systems	Adopting internal control optimization algorithms
Predictive financial statements	Users are more concerned about the company's future operational status, major investment and financing decisions, and other information	Traditional financial statements mainly focus on the past and lack predictability	Provide future oriented, highly subjective predictive financial statements
Optimization model for financial sharing center	Solved issues such as accounting image management and electronic accounting records	The application of existing models in the context of big data is limited	Build an optimization model framework for financial sharing centers based on big data background, and propose an asset management model in combination with information technology
Internal control methods	Internal control is deeply integrated into various aspects of enterprise management and operation	The application of internal control in data processing and information fusion is limited	Optimizing enterprise management and decision analysis using feature level data fusion and internal control algorithms

3 Construction of enterprise financial business integration and financial management model based on internal control optimization algorithm

3.1 Hierarchy of internal control

The setting network of the structure of the internal control optimization model is determined according to the number of network nodes. At the same time, the mapping relationship between the network nodes and the weights and thresholds of management must be established. This paper studies the problem of financial management forecasting. It is assumed that the network structure is k-n-1, where x(k) is the number of input nodes, x(n) is the number of hidden nodes, and the output nodes are the financial management level of the model and the dimension of the search space.

$$X(n,k) \in \{x(1),x(2),x(3),x(4),x(k),\dots,x(n)\} \tag{1}$$

$$\begin{cases} i = 1,2,3,\dots,q-1,q \\ j = 1,2,3,\dots,p-1,p \end{cases} \tag{2}$$

The weights and thresholds of the management network p-1 correspond to a network node in the internal control. Because the weights and thresholds of the management network are generally initialized to a number between [0, q], each network node in the internal initialization control is [0, p], a random number between. For example, the learning rate of the network is 0.1, the target error at the end of training is 0.01, the maximum number of iterations is 100, the model's transfer function is tansig, the learning function is purelin, and the training function is trainlm. The initial connection weights are the weights and thresholds optimized by the control algorithm. The end of the control algorithm calculation is defined as the calculation reaching the maximum number x(i) of iterations or satisfying the expected error. We take the target error x(j) as the target function and perform the operation.

$$1 < \sum w(i,j \neq n|x(i)x(j) - \theta(i-j-1)|) \tag{3}$$

$$1 - \sum v(i,i-1) - s(i,j \neq n) - \lambda(t,t-1) = 1 - i \tag{4}$$

If the current value is better, the current position is its individual extreme value. Otherwise, it remains unchanged. In general, the extracted feature information represents sufficient pixel information or sufficient statistics. Then the multi-sensor data is classified, aggregated and integrated according to the characteristics of the information. Feature fusion rand(x-i) uses pattern recognition technology first to correlate the features and divide the feature vectors into meaningful combinations rand(x), saving the network node's current position as the group's global extremum.

$$step(x,i) - \frac{rand(x)rand(i)}{rand(x-i)} > 1 \quad (5)$$

$$\Delta v(q(1)) * \Delta v(q(i)) = -ae(k,i)/de(k,j) \quad (6)$$

In the design of the hidden layer e(k, i), the number of nodes in the hidden layer de(k,j) is very important to the whole model. In general, the more nodes in the hidden layer q(i,k), the higher the accuracy of the network operation. However, considering the actual situation, the number of hidden layer nodes should not be too large.

$$d'(q(i,k),i) = (y(i) - x(i))(1 - x(i) - x(j)) \quad (7)$$

$$x(i,j) = \frac{x(i) - x(j)}{1 - x(i) - x(j)} \quad (8)$$

The transfer function x(i)-x(j) is the operation function between the nodes of the hidden layer. This paper intends to use the management network to express a certain nonlinear mapping relationship, so the hyperbolic tangent function tansig with convergence properties is selected; the learning function is a function that determines the change of the model adjustment amount. In this paper, the gradient descent momentum learning function purelin is selected; Table 2 selects the trainlm with mean square error as the training function.

Table 2: Description of internal control levels

Internal node	**N 1**	**N 2**	**N 3**	**N 4**	**N 5**	**N 6**
Trainlm a	0.8677	0.98352	0.80084	0.04004	0.64346	0.36525
Trainlm b	0.24795	0.26523	0.3036	0.01518	0.05353	0.78002
Trainlm c	0.26741	0.97923	0.19658	0.00983	0.21822	0.04127
Trainlm d	0.33618	0.20117	0.92842	0.04642	0.25069	0.57922

According to the cluster analysis results above, there are only 1 sample with average financial status and 1 sample with mild risk and 2 samples with severe risk. Therefore, we stipulate that the test set consists of 1 sample with normal financial status and 1 sample with mild financial status. The network model is trained. The input layer data of the 25 training set samples are shown. Based on the research results of many domestic and foreign scholars on enterprise financial management forecasting, this paper focuses on the quantifiable financial factors that affect enterprise financial management, from the short-term and long-term solvency, operating ability, profitability and growth ability of corporate financial statements. Starting from five characteristics, a total of 14 representative financial management influencing variables are selected to construct the financial management evaluation index system of listed companies.

3.2 Optimization of financial indicators

The role of the association layer is to map the input vector of financial indicators from low latitude to high latitude and transform nonlinear data into linear separable. Therefore, the input layer of the internal control and the correlation layer are nonlinear, and the activation function is a Gaussian radial basis function. After the mapping of the Gaussian function, the nonlinear data becomes linearly separable data. The activation function is a linear function. The idea of internal control is to construct the association layer space through the inner control function and map the input vector i-j to the association layer f(i)-f(j), so there is no need to connect with weights. The specific operation g(t,t-1) is to divide the population into several sub-populations by setting the centre point q(x,1-x) in the sample and converging separately. The samples of each sub-population are similar.

$$f(x(i),x(j),i-j) > \frac{f(i)-f(j)}{i} - x(i) - x(j) \quad (9)$$

$$\sum \sqrt{1-g(t,t-1)}'\, q(x,1-x) - 1 > 1 - t \quad (10)$$

When the centre point exp(i/j-1) is determined, the mapping relationship between network nodes is further determined. The internal control network algorithm considers that the samples near the same centre point are similar, so the samples near each centre point s(1-t) are gathered towards the centre point. Then the centre point is updated, and the above process d(i-t) is repeated to achieve the convergence effect.

$$1 + exp(i/j-1) \sum 1 - v(x)\, s(1-t-t^2) \in C \quad (11)$$

$$1 - \sum d(i-t)d(k) - v(x-i)\, v(i) - s(1-t^2) < 0 \quad (12)$$

In order to reduce the error d(k), the number of cases needs to be increased, and we want the error to be within a certain parameter. On the other hand, since the occurrence of events obeys the probability distribution v(i), the learning machine cannot always be expected to get good events, so it cannot always be required to output the correct hypothesis as long as the probability of it outputting a hypothesis with an error greater than c(i) is less than a certain parameter. The smaller c(t-1) is, the more instances are needed, thus the longer the computation time. We hope the learning can be completed in the polynomial time of 1/t.

$$\begin{cases} v(i)v(t,t-1) = 1/2i + 5t/i \\ c(i)c(t,t-1) = -1/2i + ct/i \end{cases} \tag{13}$$

$$\begin{cases} r(i = 1,2,3,\dots,q-1,q) \sim q(0,1) \\ r(j = 1,2,3,\dots,p-1,p) \sim p(0,1) \end{cases} \tag{14}$$

The accuracy rate of financial management judgment of 10 sample companies in 2019 is as high as 90%. There are a total of 10 samples, 9 samples are correctly judged, and only one financially healthy company is wrongly judged. The identification accuracy rate of severe risk enterprises is 100%. From this, we can see that the worse the financial status of the company, the higher the discrimination accuracy of the model. Table 3 shows that the financial management evaluation model has a good discriminative effect on the financial management of 10 sample companies in 2019.

Table 3: Financial index optimization algorithm

Financial index	**Optimization algorithm codes**
A variety of financial	Worsts[t] = *max_element(fitnesses);
The financial status $t(j-1)$	Bests[t] = *gbestfit;
A variety of financial management methods	Meanfits[t] = mean (fitnesses, numofparticles);
The financial management	PSO (1000, 2, 2, &gbestfit, gbest);
Sample companies $1+i+j$	Xmin, xmax, initpop, worst, meanfits, bests
The discrimination $q(0,1)$	Srand((unsigned) time(&t));
The company $step(x,i)$	Float xmin [30], xmax [30];
On the financial management	Float initpop [50][30];
The higher $\lambda(t,t-1)$	Float worsts [1000], bests [1000];
Good discriminative effect	For (int i = 0; i < 50; i++)
Evaluation model $v(i,i-1)$	For (int j = 0; j < 30; j++)
Accuracy of the model a^2+b^2	{Rand () % (100 + 100 + 1) -
After comparing $x(n)$	Initpop[i][j] = 100; fitnesses + numofparticles

After comparing various financial management forecasting methods, the artificial network is introduced into the financial management forecasting field, and the model is optimized for the management network's deficiencies, improving the model's running rate and prediction accuracy. In this paper, the distribution parameters of the two-dimensional eigenvectors extracted by each sensor are generated for the simulation, which satisfies the Gaussian distribution. According to this distribution, 500 data are generated for each target, of which the first 300 data are used for training to generate the confusion matrix of each sensor, and the remaining 200 are used as test samples to test the performance of the recognition system. Each sensor is classified using a Bayesian classifier, and the evidence is modelled by the posterior probability output of each classifier.

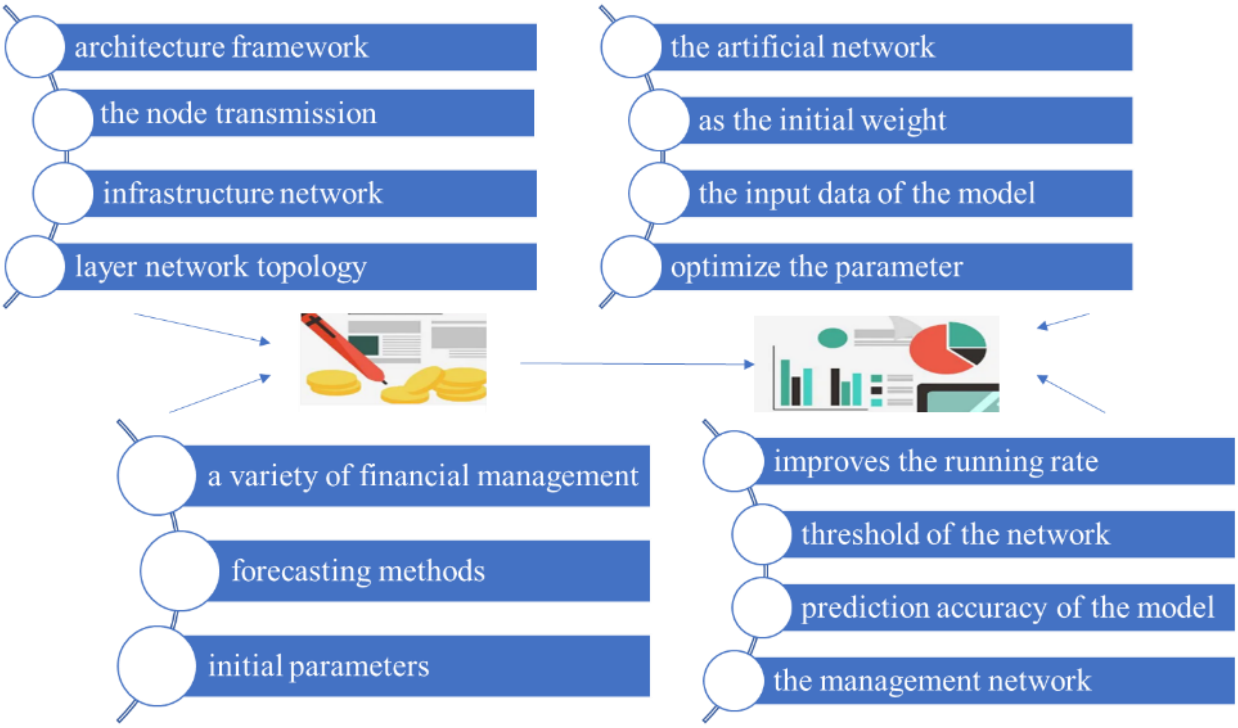

Figure 1: Output layer network topology

The number of output layer network nodes in Figure 1 is usually determined according to the output that needs to be obtained in the actual problem. In general, the settings of network nodes in the output layer are mainly determined by the output variables' data type and size. They are represented by binary "0" or "1". If the actual output is required to have N categories, the number of network nodes in the output layer is N. For example, if N=4, the output value is "0100", indicating that the current input sample belongs to the second category, so the second network node outputs "1", and the rest of the network nodes output "0". This paper divides the financial management status of listed companies into two categories: facing financial management and no financial management, so the output layer network node is set to 1, and the output result is rounded to "0" or "1".

3.3 Corporate financial analysis

The inventory turnover ratio in the operating capacity reflects the turnover speed of the enterprise's corporate finance. The faster the turnover speed is, the better the operating effect of the enterprise, and the better the financial management, the better the liquidity. The accounts payable turnover ratio is a potential reflection of the enterprise's liquidity outflow. The smaller the accounts payable turnover ratio of the enterprise, the more capital of the upstream enterprise is occupied. On the contrary, it indicates that the enterprise has sufficient payment ability to the upstream enterprise and sufficient liquidity of the enterprise. The selection of the three indicators of operating capacity here indicates the company's inventory realization efficiency, the ability to recover accounts receivable, and the ability to occupy accounts payable. On the one hand, these three indicators indicate the strength of the enterprise's production, operation and sales capabilities. Figure 2 can better reflect the company's liquidity by integrating the three factors.

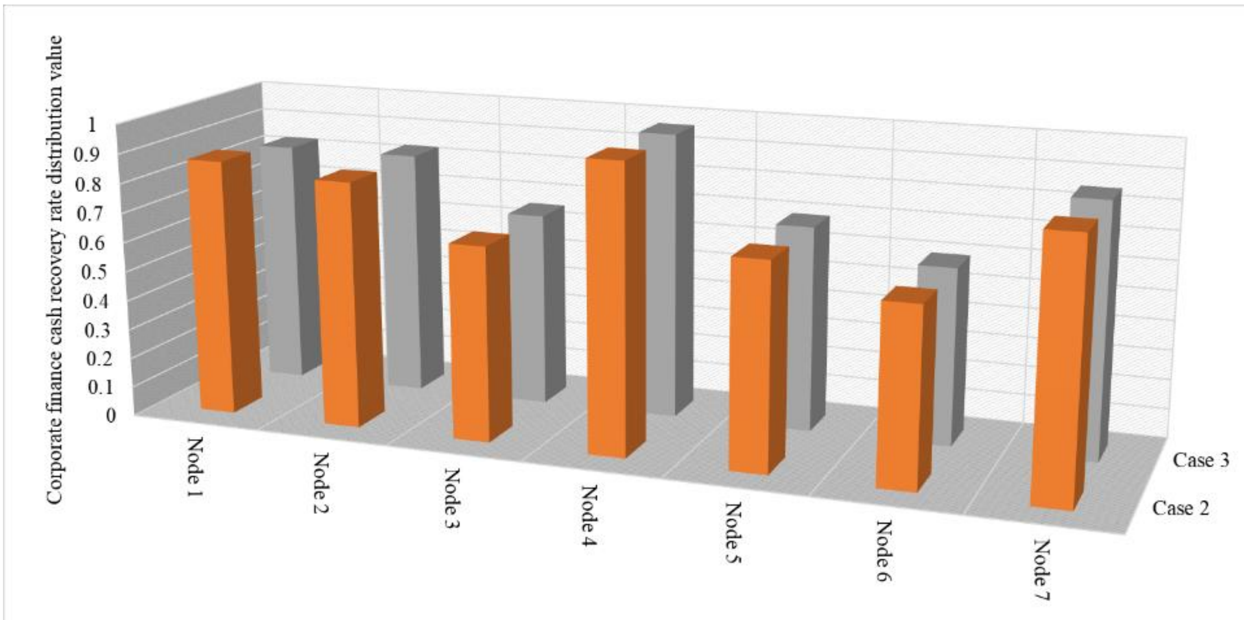

Figure 2: Analysis of corporate financial cash recovery rate

Use bar charts or line charts of different colors to distinguish the total cash recovery rate between ST enterprises and non-ST enterprises. Calculate the mean and standard deviation of the total cash recovery rate for ST enterprises and non-ST enterprises, and add explanations below or next to the chart. From a distribution perspective, among the normally operating companies in 2018, the total cash recovery rate of most companies was between 0 and 0.1, and the company's cash recovery rate also showed a similar normal distribution. The recovery rate is mostly concentrated around 0, with scattered data and a large amplitude. From the distribution, it can be seen that the cash flow recovery rate of normal enterprises is significantly higher than that of ST enterprises, while ST manufacturing enterprises have almost no cash flow recovery in that year. The average total cash recovery rate of non-ST enterprises is 5%. The total cash recovery rate of ST enterprise fluctuates around 0, mostly negative, while the normal operation of the enterprise is around 5%, which is relatively good. Therefore, compared to non-ST companies, ST companies have lower cash recovery rates and greater volatility, which also reflects their characteristics of poor liquidity and unstable liquidity.

3.4 Business integration clustering

Based on the model parameter setting of business integration, different behaviour sets are determined at the edge of the internal control network. Then different services can be performed according to different internal control types when the internal control backbone network is transmitted. The control mechanism of the two is also similar, and the computing work of the internal control network will be concentrated on the edge nodes, so it has better scalability. Through the comparison of these 10 experiments, for this income prediction problem, the management network needs to cycle (that is, adjust the weights of the network) 226,422.4 times on average to reach the predetermined accuracy range. In contrast, the Elman network only needs to cycle 81,507.9 times on average. The number of times is one-third of the management network. That is, the management network has the problem of slow training speed. The average training accuracy of the management network is 0.00064. It is difficult to obtain the training results if the value is smaller, while the average training accuracy of the Elman network is 0.000056, which is more than ten times that of the management network; that is, the management network is prone to fall into a local minimum. The absolute error value of the management network is 709,081,367.46 yuan, and the relative error is 7.18%. The absolute error value of the Elman network in Figure 3 is less, and the relative error is 4.9%.

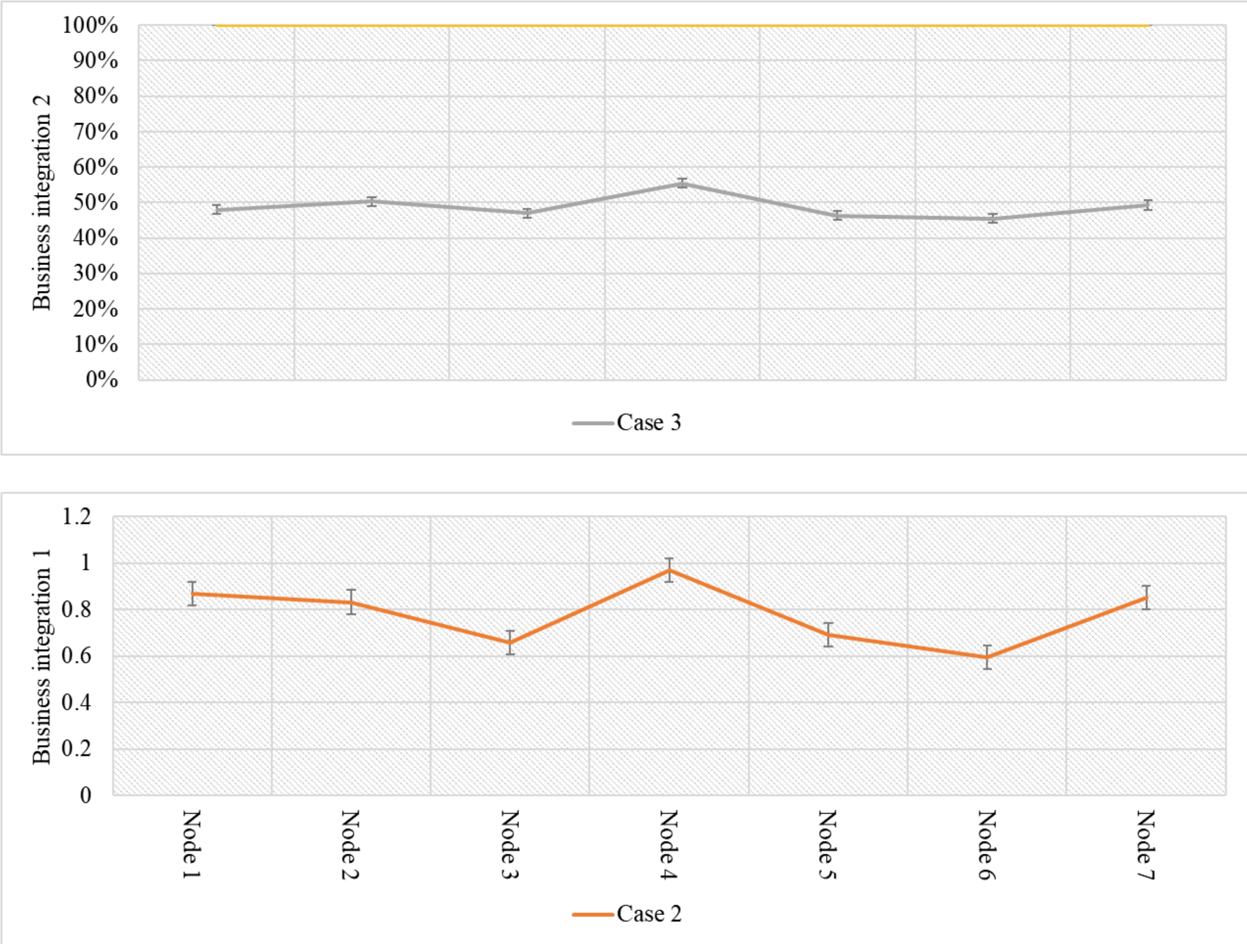

Figure 3: Business integration training clustering

Starting from the relationship between liquidity and profitability, for the selection of financial indicators from five dimensions in the T-3 year of listed companies and the selection of non-financial indicators in many aspects, the prediction accuracy of the established model reaches 84.21%, which is a more comprehensive reflection. This result shows that in year T-3, companies specially treated in year T and companies in normal operation were already differentiated in these indicators. Still, it was more difficult to distinguish based on the current financial situation. Judging from the prediction results, the three models have their own advantages and disadvantages, and internal control is the best. When using the management network algorithm to model, it is assumed that all input indicators and labels have a linear correlation, but this isn't easy to prove. Because the internal control is nonlinear for data processing, processing data in the middle layer is more reasonable. Therefore, the prediction accuracy of the internal control network is the highest.

3.5 Financial management weight allocation

The financial management of listed companies assumes they continue operating for at least four fiscal years. Assuming that the time of publishing "ST" is year t. Because the publication of financial statements in year t-1 is delayed and unrepresentative, and the "ST" stock evaluation index is the occurrence of financial management for two consecutive years, the evaluation basis should be selected. This not only ensures the accounting assumption of continuous 4-year operation stipulated in the previous standard but also makes the selection of samples more scientific. The abnormality of the turnover rate of accounts receivable and inventory turnover rate of ST enterprises shows the instability of the liquidity of such enterprises, and the unstable fluctuation of the liquidity of enterprises is reflected in the sudden increase in these two indicators. In order to alleviate the liquidity crisis, enterprises speed up the turnover of receivables and inventories, which shows that the liquidity of such enterprises is in crisis, and funds are urgently needed to make up the gap.

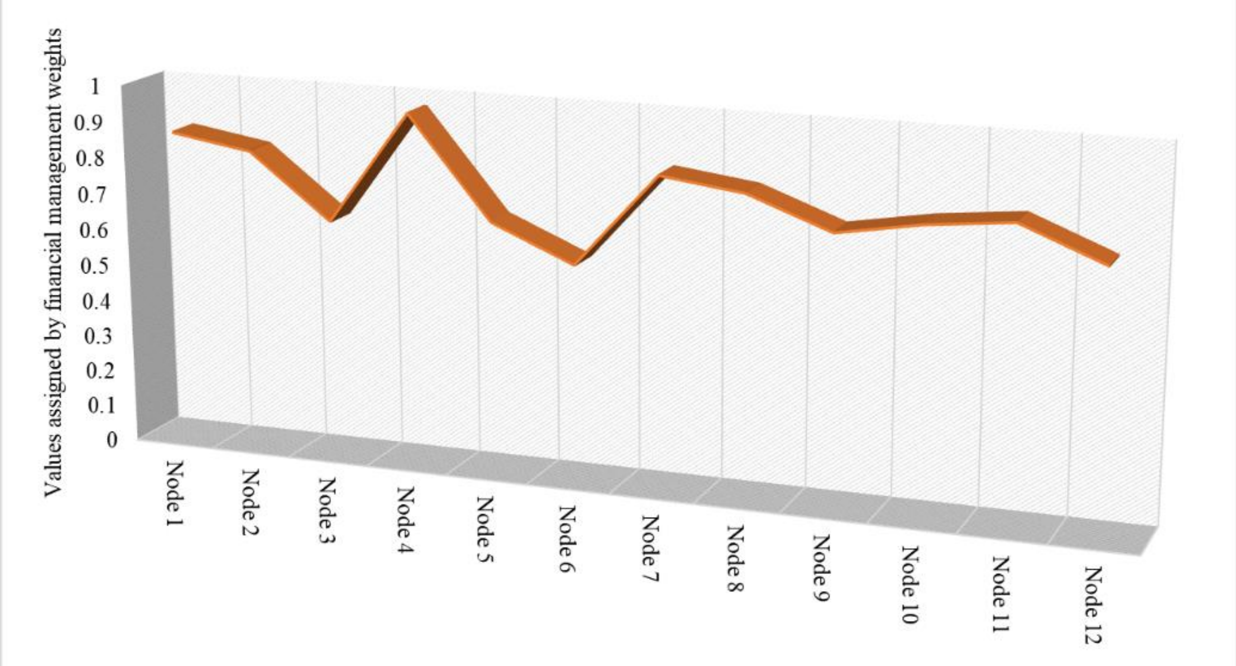

Figure 4: Financial management weight distribution

After optimizing the principal component analysis method and the internal control algorithm, the set in Figure 4 is trained. The recognition accuracy of the internal control prediction model for the test samples reached 86.0%, significantly improved compared with the traditional management model of 66.0% and the general model of 76%. Therefore, the internal control forecasting model has good financial management forecasting ability.

3.6 Extension explanation and validation of internal control optimization algorithms

The design and selection of internal control optimization algorithms are mainly based on the principles of internal control theory and optimization algorithms. The theory of internal control emphasizes ensuring the compliance, accuracy, and efficiency of a company's financial activities through a series of control measures. Optimization algorithms are used to find the optimal solution through mathematical methods under given constraints. In the field of financial management, the application of internal control optimization algorithms aims to achieve precise control of financial business processes through precise data analysis and processing. The algorithm extracts key financial indicators, constructs a financial management indicator system, and uses optimization algorithms to optimize the allocation of indicator weights. This can make financial management more in line with the strategic goals of the enterprise, improve the accuracy of predictions, and reduce decision-making risks.

In order to verify the effectiveness and reliability of internal control optimization algorithms, we have adopted various verification methods. Firstly, we used cross validation to divide the sample data into training and testing sets. Train the model through the training set, and then validate the performance of the model using the testing set. This method can ensure that the model can maintain good performance on unprecedented data. Secondly, we compared it with the baseline model. In addition, we also designed a series of additional test cases to verify the performance of the algorithm in different scenarios. These test cases include listed companies from different industries, enterprises of different sizes, and financial data from different time periods. Through these test cases, we can comprehensively evaluate the applicability and generalization ability of the algorithm. The verification results indicate that the internal control optimization algorithm performs well in terms of prediction accuracy, stability, and generalization ability. Compared with the baseline model, the algorithm significantly improved its score on the test set, demonstrating its effectiveness and superiority in the field of financial management.

4 Application and analysis of enterprise financial business integration and financial management model based on internal control optimization algorithm

Internal control optimization algorithms play a crucial role in building financial business integration and financial management models. The design of this algorithm is based on internal control theory and combines the principles of optimization algorithms, aiming to achieve precise control of financial business processes through precise data analysis and processing. The core of the algorithm lies in the deep mining and analysis of financial and business data. Through principal component analysis, the algorithm extracts key information from a large amount of data to form the core indicator system of financial management. Afterwards, optimization algorithms are used to optimize the allocation of weights for these indicators, in order to improve the accuracy and reliability of predictions. The contribution of internal control optimization algorithms in the field of financial management is as follows: through the application of optimization algorithms, the accuracy of financial management predictions has been significantly improved. This provides a more reliable basis for enterprise decision-making and helps to reduce decision-making risks. The application of this algorithm enables deep integration of financial and business data, breaking down traditional information barriers. This not only improves the operational efficiency of the enterprise, but also helps to achieve coordinated development between finance and business.

4.1 Internal control to optimize data fit

While the confirmation of the number of network nodes in the middle-hidden layer is more complicated, it is related to the number of nodes in the input and output layers. There is currently no effective selection method. Only the optimal number of hidden layer nodes can be determined according to the method of empirical formula, combined with the method of trying to explore; experiments show that when the number of hidden layer nodes is 10, the network has reached a state of convergence and the convergence efficiency is high, where the number of hidden layer network nodes of the internal control model is determined to be 10. Therefore, the improved management network model structure for simulation is 6-10-1.

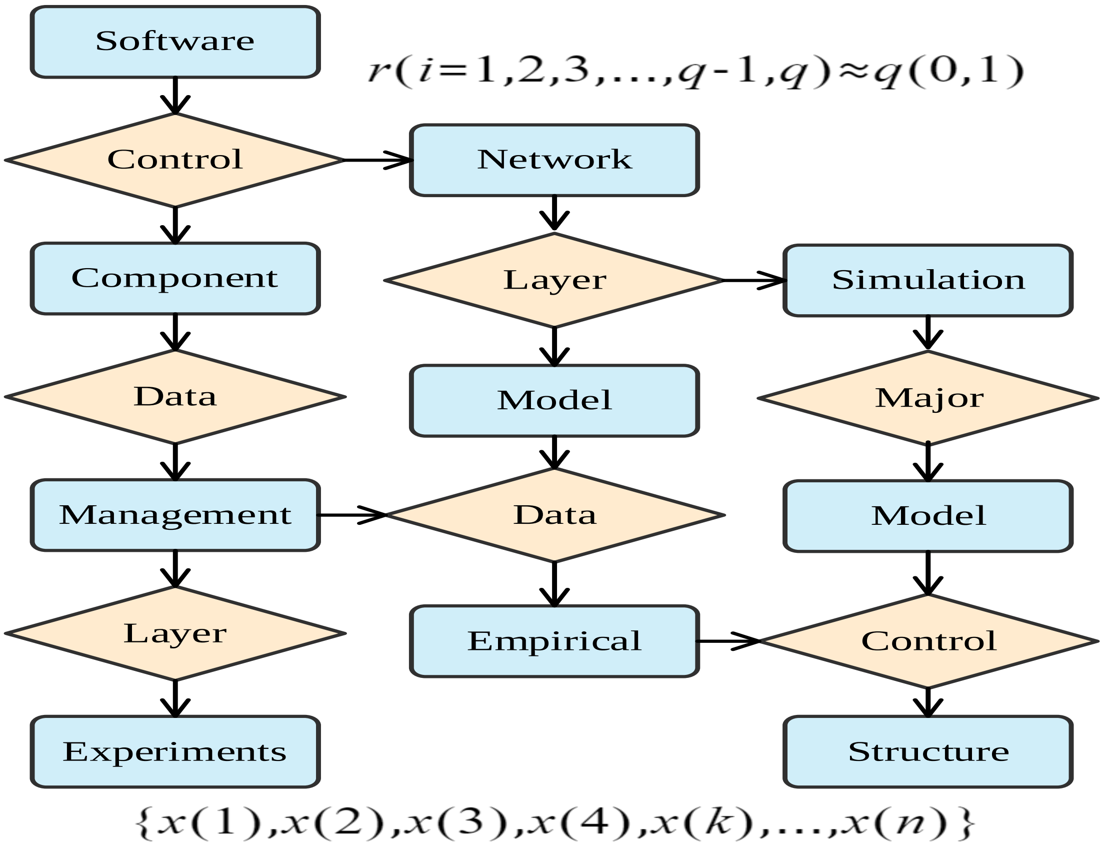

Figure 5: Internal control optimization process

The main purpose of the financial management evaluation model constructed in Figure 5 is to predict its own financial situation based on the specific financial data of the enterprise. In order to avoid the abnormal fluctuation of data caused by economic turbulence and the contingency of the discriminant results and improve the stability of the model, this paper selects the average value of each financial data of listed companies as the input source of the model, trains the financial management evaluation model, and uses 10 tests. The raw data of these 35 sample companies from 2018 to 2019 are all from the annual financial reports, of which 16 financial indicator data are from the four major statements in the annual reports of listed companies. The data of the non-financial indicators are derived from the annual report summaries of listed companies.

4.2 Integrated simulation of enterprise finance and business

In the process of enterprise financial business integration simulation, since the range of the sample is in the range of 0 to 1, it is avoided to disperse the sample in the past, and the expansion constant is set to 2 (i.e., the previous gamma). The dimension of the input vector is 13, the initial centre point is 43, the number of intermediate layers is set to 43, and the output dimension is 1. The score of the training data is 100 points, the fitting degree to the training data is 100%, and the score of the prediction data is 84.21

points. That is, the prediction accuracy of the test data is 84.21%. Separately, the internal control network algorithm has an accuracy rate of 80% in predicting companies with liquidity risks. That is, 8 out of 10 companies are accurately predicted, while the prediction accuracy rate for companies that are operating normally is 88.88%, and the prediction accuracy in 9 companies is 88.88%. In a total of 19 companies, 16 companies are accurately predicted, and the prediction accuracy is high. The prediction effect in Figure 6 is good and has good practical prediction significance. Since the internal control network algorithm has not performed linear transformation on the original data, the wireless parameters are not compared with the previous two models.

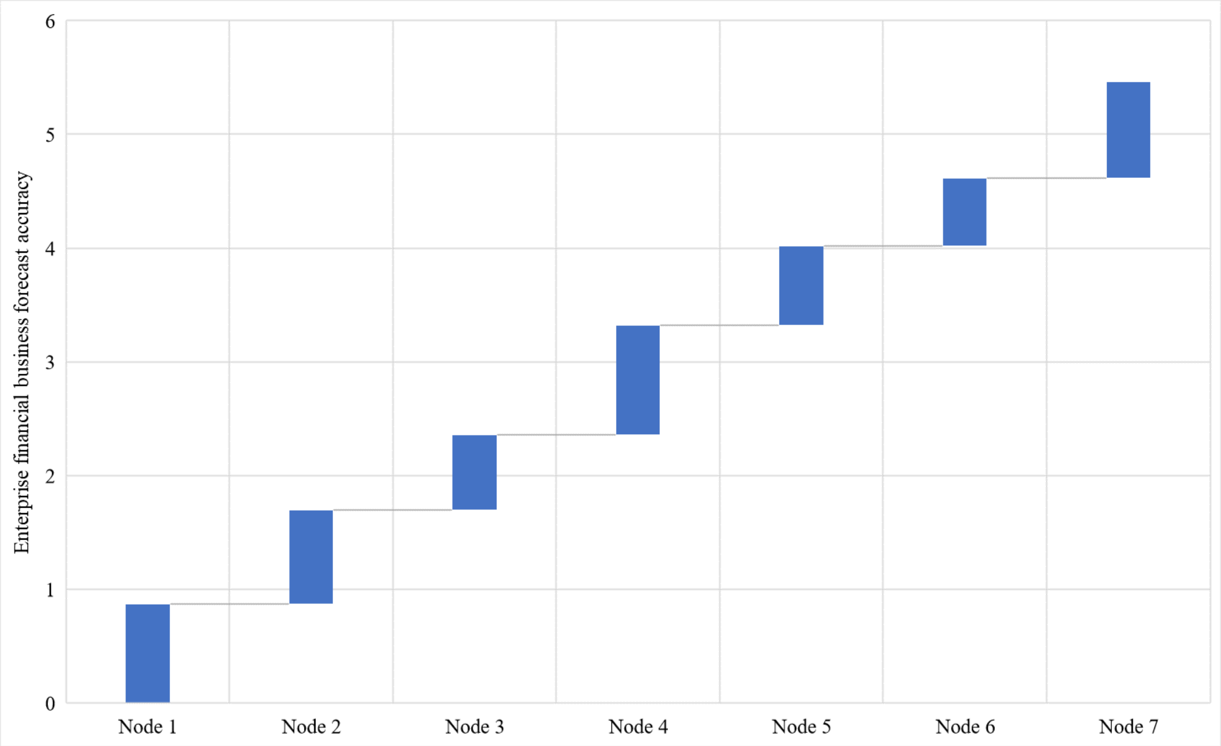

Figure 6: The accuracy of enterprise financial business forecast

In terms of accuracy, the overall prediction accuracy of the internal control network algorithm and the prediction accuracy of liquidity risk companies are higher than those of logistic regression. This is because both networks have learning performance and repeated data analysis, and the prediction accuracy of the two classifications is higher than the other two models. This is because the data set is first of all. The data volume is relatively small, so there are no obvious linear features, and one of the premises of logistic regression is a linear data set, and the activation function of the input layer of the management network is also a linear function. When faced with a data set without obvious linear data features, it is easy to be distorted, and the activation function of the internal control network algorithm is a Gaussian radial basis function, which has an excellent ability to deal with nonlinear data, so it effectively avoids this problem and shows excellent predictive ability.

4.3 Example application and analysis

Based on the specific criteria for the selection of the above research samples, the companies that were specially treated by "ST" for the first time in 2018-2019 were selected as the research objects. The corresponding data range was the financial statement data for 2018-2019, a total of 200 group sample datasets. Among them, there are 62 "ST" sample companies with high financial management, 138 listed companies with low financial management, that is, non-"ST" companies, specific "ST" companies with high financial management and non-"ST" companies with low financial management. The ratio of the number of companies is about 3:7. At the same time, set the initial parameters of the internal control model, such as the learning efficiency of the network $\eta=0.1$, the error accuracy at the end of training $\varepsilon=0.05$, the maximum number of training times is 200, the activation function from the input layer to the hidden layer is tansig, and the hidden layer is tansig.

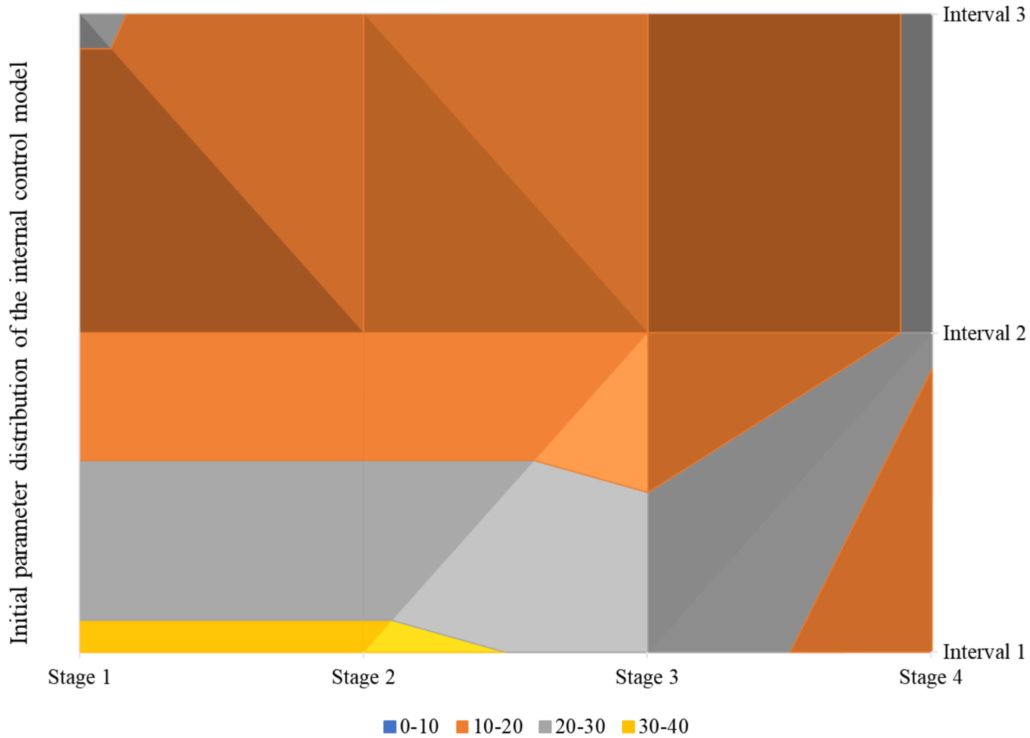

Figure 7: Initial parameter distribution of the internal control model

In the process of many experiments, Figure 7 shows that the accuracy of internal control and management network algorithms varies from 70% to 90%, and the prediction accuracy of management network algorithms for companies with normal operations is much higher than that of companies with abnormal operations. There are two reasons. One is that the number of samples is small, and the training of the two network algorithms is insufficient, which makes the final result volatile. The second is because the data of the T-3 year was selected. In the T-3 year, all the companies in this sample belonged to companies with normal operations, and the data differences were not large. Hence, the learning and discrimination of the algorithm was a big challenge. Although some discriminative variables are selected using KPCA (Kernel Principal Component Analysis) function and cross-report, the differences between the data are still small, which has a certain impact on the prediction of the model.

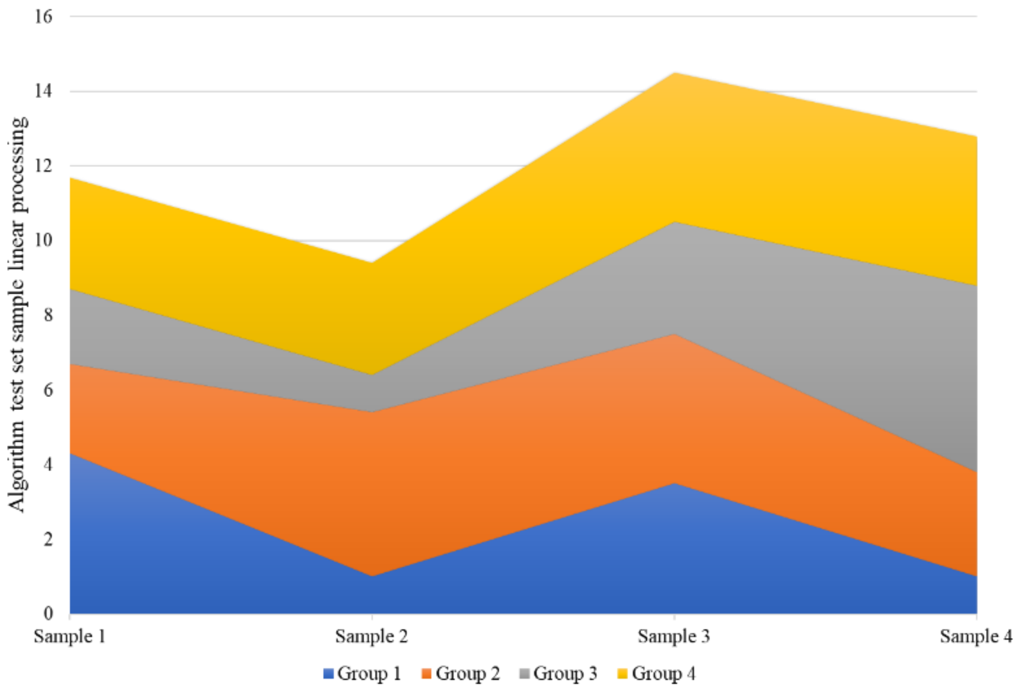

Figure 8: Linear processing of samples in the algorithm test set

The linear processing of the input data by the internal control optimization algorithm results in an accurate judgment of the symbol of the operating debt ratio, resulting in high forecast accuracy. Since both the management network and logistic regression have a linear processing link to the data, the relative magnitudes of the linear parameters of the two models are compared here, as shown in Figure 8. By sorting the influence degree of the parameters in the two models, it can be found that the two models have the same impact on the financial indicators with the greatest degree of influence. The size relationship between the indicators is also similar, with only a few differences, such as the index with the smallest influence factor in the financial index, the logistic regression judges it as the cash asset ratio. Still, the management network judges it as the cash ratio. This difference is because the self-learning nature of the management network automatically updates the weights, so it is different from logistic regression. The internal control network algorithm has shown higher ability than the other two models in this prediction process, and the early warning accuracy of liquidity risk companies is higher. Therefore, this paper considers that the regional listed companies constructed by the internal control network algorithm are here. The liquidity risk early warning has practical significance, and the prediction accuracy of 84.21% also shows that the model has a reference value.

5 Discussion

The current study presents a significant departure from the existing literature, particularly in its methodological approach and focus on addressing contemporary challenges in financial management. While the related work primarily examines issues within financial sharing centers and proposes optimization plans, the focal point of this study lies in the application of internal control optimization algorithms for enhancing enterprise financial management. This represents a novel approach to financial management, emphasizing the integration of internal control theory with optimization algorithms to achieve precise control of financial processes through data analysis.

One key distinction lies in the methodological innovation introduced by the study. While prior research utilizes methods such as balanced scorecard and expert investigations, this study leverages internal control optimization algorithms, principal component analysis, and artificial networks for data analysis. This advanced methodology contributes to improving the accuracy and reliability of financial management predictions, thereby providing a more robust basis for enterprise decision-making. Additionally, the study emphasizes the deep integration of financial and business data, highlighting the potential to break down traditional information barriers and enhance operational efficiency.

Furthermore, the study demonstrates superior prediction accuracy compared to traditional models such as logistic regression. By employing internal control optimization algorithms, the study achieves a prediction accuracy rate of 84.21% for enterprise financial business forecasts, surpassing the accuracy of logistic regression models. This higher accuracy is attributed to the algorithm's ability to effectively handle nonlinear data, thereby avoiding distortions commonly encountered with linear models. Moreover, the study showcases the practical significance of its findings by accurately predicting liquidity risks, which is essential for effective risk management and strategic planning.

However, the study acknowledges certain limitations, including its focus on financial indicator data of regional listed companies and the relatively limited sample range. While these data provide some representativeness, they may not fully capture the financial characteristics of all types of enterprises and industries. Additionally, the study does not delve into the synergistic effects of internal control optimization algorithms with other management functions, leaving room for future research to explore their potential applications in overall enterprise management.

In conclusion, the "current work presents a significant advancement in financial management methodology and predictive accuracy. By integrating internal control theory with optimization algorithms, the study offers practical solutions to contemporary challenges in enterprise financial management, with implications for improving overall organizational efficiency and effectiveness.

6 Conclusion

This study focuses on internal control optimization algorithms and successfully constructs a model for enterprise financial business integration and financial management. By combining principal component analysis with artificial networks, the model effectively extracts key information from the financial management indicator system of regional listed companies. At the same time, the application of internal control optimization algorithms significantly improved the performance of prediction models, with a training data fitting degree of 100% and excellent test scores. This not only solves the accuracy problem of financial management predictions, but also provides strong support for the integration of financial business for enterprises. In addition, the application of the model also helps to promote the transformation of financial management functions, making it more focused on achieving corporate strategic goals and enhancing overall value. In summary, this study provides new ideas and methods for enterprise financial management, which is of great significance for improving the integration ability of enterprise finance and business.

This study mainly focuses on financial indicator data of regional listed companies, with a relatively limited sample range. Although these data have some representativeness, they may not fully cover the financial characteristics of all types of enterprises and industries. The research mainly focuses on the application of internal control optimization algorithms in financial management, but does not delve into their synergistic effects with other management functions. Future research can further explore the potential application of internal control optimization algorithms in overall enterprise management, as well as their mutual influence and synergy with other management functions.

Competing of interests

The authors declare no competing of interests.

Authorship Contribution Statement

Rongxiu Zhao: Writing-Original draft preparation, Conceptualization, Supervision, Project administration.

Duochang Tang **:**Methodology, Software, Validation.

Data Availability

On Request

Declarations

Not applicable

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