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Financial Risk Prediction Model Based on Categorical Regression Tree Algorithm from the Perspective of Education Management

Fengyiyi Chen

Department of Accounting, Xijing University, Xi'an, Shaanxi Province, China
582429112@qq.com

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Abstract: The beginning of the modern era started with the reform and opening up, because the reform and opening up at the level brought people real changes in life. Another purpose of reform and opening up is to gradually release the economic strength contained in the country, so that a relatively rich environment for economic development has now been formed. The overall environment that is friendly to economic development is conducive to the development of the overall economy, which will make the development of the entire industry continue to move forward. However, as economic development is undergoing financial transformation in terms of content, this has caused many companies to have a series of problems. For most companies, the first problem is that it is difficult to raise funds from assets, and the overall market competition is gradually increasing, and even the phenomenon of corporate bankruptcy will eventually appear. The key reason for these is the financial risk that occurs when the enterprise itself is operating and managing. The emergence of financial risks does not appear at the same time, and most of them are caused by the accumulation of time. Therefore, this paper proposes a method for early warning of corporate finance - classification and regression tree algorithm, so as to minimize the financial risk of the company itself. In order to achieve this purpose, this paper will study the content of the prediction model through the construction of the content of the financial risk prediction model and the application of the classification and regression tree algorithm in the financial risk prediction. Correspondingly, the financial risk prediction experiment based on the classification and regression tree algorithm was carried out, and finally the authenticity of the corporate financial information was increased year by year, reaching 90.11% in 2019, but the distorted information also reached 89.11%. From the above results, it can be seen that the algorithm based on classification and regression tree can well predict financial risk.

1. Introduction

Economic development is always important to the development of a country, and enterprises of all sizes play an important role in this. Under the background of reform at the national level,

enterprises have already transformed from the previous economic model to an economic model that is more adaptable to market changes. Under this situation, the economic strength of the entire country has been boosted. In addition to the reform, the policy of opening up is continuously deepened. The implementation of this policy is conducive to the integration of the country's economy with the world. These economic development steps are all necessary for a country. Because the world is now difficult to cut off from each other, economic development is not the development of a country, but the long-term and stable development under deep cooperation. This is closely related to the general yearning for life in the current world. But these are all demonstrated through the form of economic development. This highly interconnected state will also bring some problems, that is, the pressure on the survival of various enterprises will continue to increase, and at the same time, the financial risks of the enterprises themselves will continue to accumulate.

The awareness of the company's own financial risks is not as easy to detect as imagined. When it is revealed, it will generally bring substantial harm to the enterprise itself. The factors leading to these reasons are mainly caused by the accumulation of early risks and the difficulty of predicting recent risks. In this case, different companies will have different results, and the serious results may even be bankruptcy as mentioned above. This paper will establish a financial risk prediction model, so as to effectively avoid the financial risk from the early stage. For the development of the enterprise itself, the effective management of finance is very important, and the risk management is the key. In some developed countries in the world, such a similar phenomenon has already occurred, and it is difficult to find financial risks relying solely on human resources. The purpose of this paper is to use a classification-based regression tree algorithm to effectively analyze and process a large amount of relevant data, and finally achieve effective prediction and processing of enterprise risks.

2. Related Work

The analysis of financial risk is very important for an enterprise no matter how large, and it is even more important when dealing with large-scale economic problems. For the study of financial risk, different people have made research in different directions. Bo Lia realized the control of financial risk by changing the management mode of the enterprise itself, and maximized the profit of the enterprise in the process [1]. KA Peck conducted a corresponding study on the relationship between enterprises, and improved some methods to better predict and deal with financial risks [2]. Russell took a different approach, collecting data from some platforms and building the final financial forecasting model through some institutions [3]. RE Shaw managed financial risks to a certain extent by implementing a new type of guarantee, and in this way the process of financial auditing is more formalized [4]. Yan used data mining methods to analyze, process and predict financial risks [5]. Among the above studies on financial risk, there are various methods used, and the corresponding results of these methods are relatively useful. It's just that the above methods of dealing with financial risks are based on human management or simple data processing, which is far from enough for the long-term development of an enterprise. The treatment of financial risk in this paper relies on the algorithm of classification and regression tree.

For the processing of financial risks, the method used is the classification and regression algorithm. The characteristic of this processing method is that the risks can be well classified. For this method, there is already a corresponding research method. Gaby established a new database before processing the financial risk classification and regression algorithm, so as to better improve the sensitivity of the model [6]. A KAD modified the classification and regression tree algorithm to some extent in order to better analyze and deal with the risks faced by enterprises [7]. MUDC Caldas has carried out a brand-new plan for the enterprise's own financial management, and has carried out the classification and regression tree algorithm processing on the basis of its whole [8].

Z Li improved the accuracy of the final pre-model by using a classification and regression algorithm for large amounts of data [9]. When Q Zhou's handling of financial risk is explained with the help of classification and regression tree algorithm, it also combined different ways. Finally it can well deal with the related issues of financial risk [10]. The most important of the above research results is the more rigorous treatment of financial risks. Some of the above studies have directly applied the classification and regression tree method, and some have carried out improved applications. The results reflected by these results are very good. The application of this algorithm can greatly improve the work efficiency for the financial management of enterprises. In the end, the risk can be handled well.

3. A Method of Establishing Financial Risk Prediction Model Based on Classification and Regression Tree Algorithm

3.1 Content Construction of Financial Risk Prediction Model

The most important thing in the development of an enterprise is to maximize the profit of the enterprise and realize the long-term stable development [11]. This is one of the goals that everyone in the market is pursuing together. On a smaller level, it is for the development of the enterprise itself, but it is also of great help to the economic development at the national level. This kind of risk may only be a very small change at the beginning, but due to the neglect of the management and the relative inaction, the risk is gradually enlarged so that it becomes an unavoidable risk. For an enterprise, the first thing that must be understood is the classification of financial risks, because the types of these risks are summed up through the actual cases of certain enterprise financial management. However, the development of enterprises cannot just stop at these typical financial risks [12]. The corresponding classification of financial risks is shown in Figure 1.

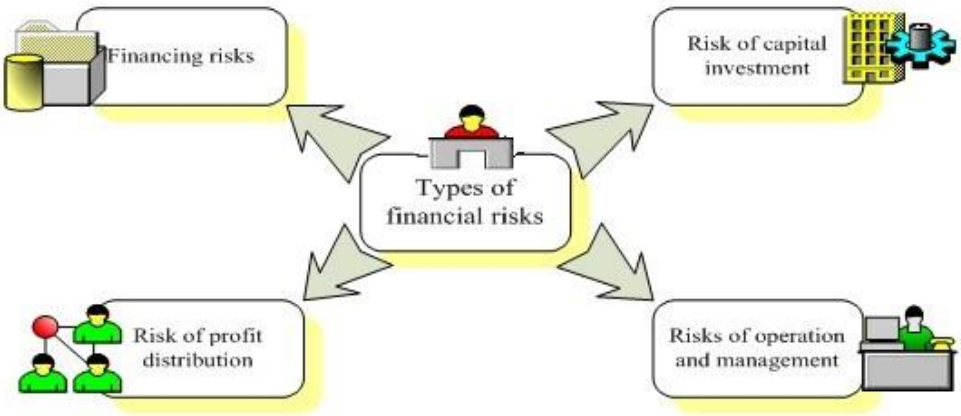


Figure 1: Classification of Financial Risks

Figure 1 provides a good overview of the types of financial risks, but these risks are the general category of all financial risks, and have a certain reference for specific financial risks. Because the development of an enterprise is carried out gradually based on its own actual situation. Although it will basically involve the four aspects of operation in the figure, the specific risks need to be determined in combination with its own operation and management conditions [13]. In operation and management, because the position of the enterprise is between the upstream enterprise and the downstream audience, the risks it faces also come from two levels [14]. In addition, the most important thing for the final distribution of profits is to use these profits to make better profits again, but many factors make this factor become an important financial risk. Of course, after the enterprise

knows what risk factors it may have, the most important thing is to put forward corresponding solutions for the above-mentioned possible risks. The corresponding strategy for dealing with this is shown in Figure 2.

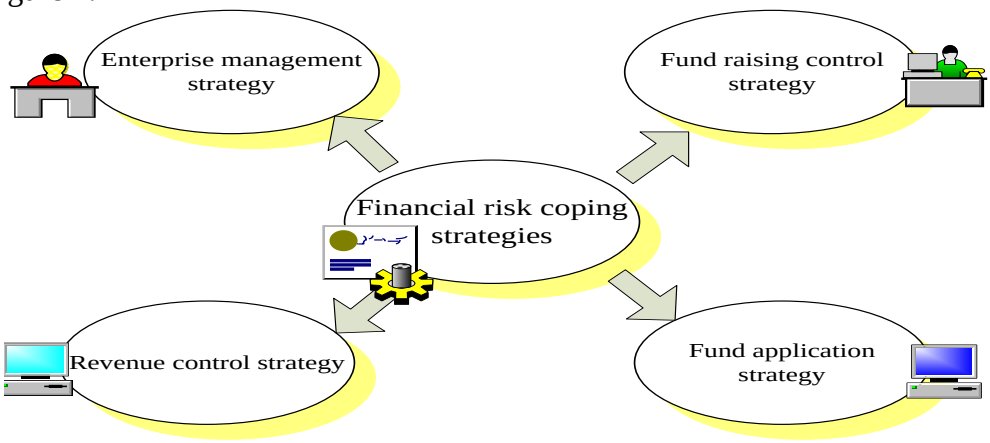


Figure 2: Coping Strategies for Financial Risk

The Figure 2 gives the corresponding response methods for the various risks in Figure 1. These methods can well see the principles of how companies deal with the risks they face [15]. First of all, the most important thing for the financing risk of an enterprise is to use some of the remaining funds of the enterprise to a certain extent, so that it can flow well and the risk can be better controlled. The risk generated by the investment of funds is mainly used for the reasonable application of enterprise funds, which can well reduce the losses suffered by the enterprise to a minimum [16].The last step is to deal with the risk of profit distribution, which corresponds to the reasonable distribution of the cost of the output in the income. However, in order to better deal with financial risks, financial risks should also have certain predictions. The specific process is shown in Figure 3.

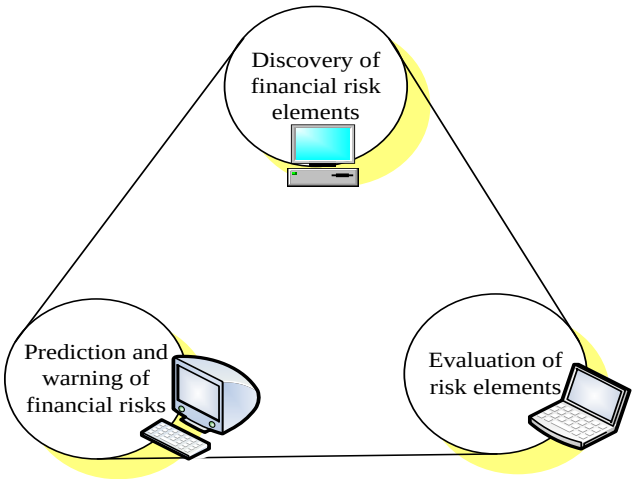


Figure 3: Forecasting Process for Financial Risk

Figure 3 shows the forecasting process of financial risk to a certain extent. As can be seen from the figure, the specific steps from the discovery of financial risks to the prompting of enterprises are very simple [17]. Many companies overlook key steps in predicting financial risks. The first step is to explore potential risks within the enterprise, as these often originate internally and lack proper identification mechanisms. Next, it's important to assess the selected financial risks; addressing all potential risks can be overwhelming and hinder enterprise development. Finally, identified risks

should be addressed by relevant departments, which is crucial for tackling current challenges. This process facilitates smoother enterprise development, but merely identifying risks is insufficient; a deeper examination of financial risks is essential for understanding potential crises [18].The characteristics of the corresponding stages and crises are shown in Figure 4.

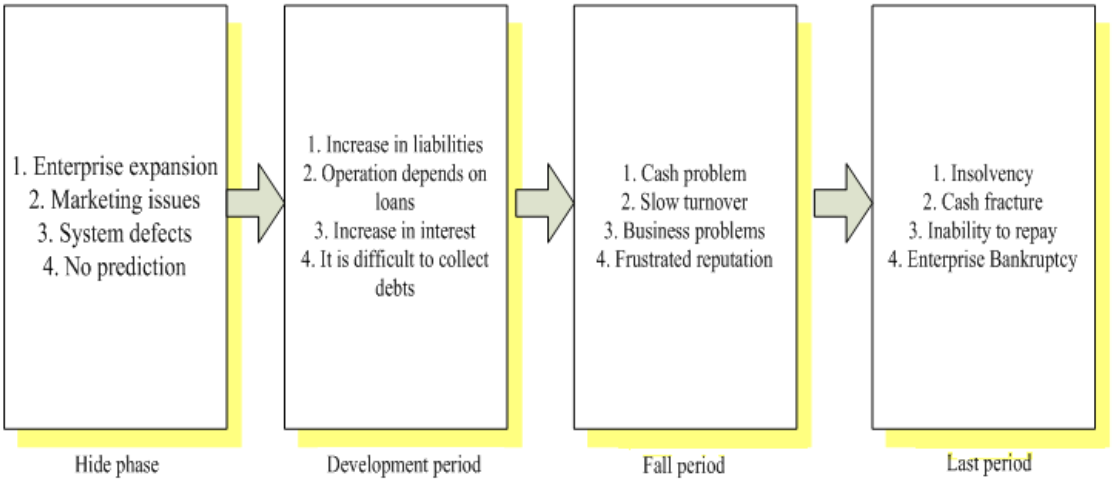


Figure 4: Financial Risk Crisis Content

Figure 4 provides a comprehensive description of financial risk points and categorizes enterprise issues by development periods. The initial hidden stage represents the budding period of various risk factors, making prediction challenging due to its inconspicuous nature. As the enterprise progresses, financial risks become more apparent, allowing for early intervention. The next stage highlights critical problems, where further development becomes difficult and improvement opportunities diminish. This process illustrates the periodic changes in crisis characteristics throughout the enterprise's development, underscoring the need to build a system model for predicting corporate financial risks. The corresponding system structure is shown in Figure 5.

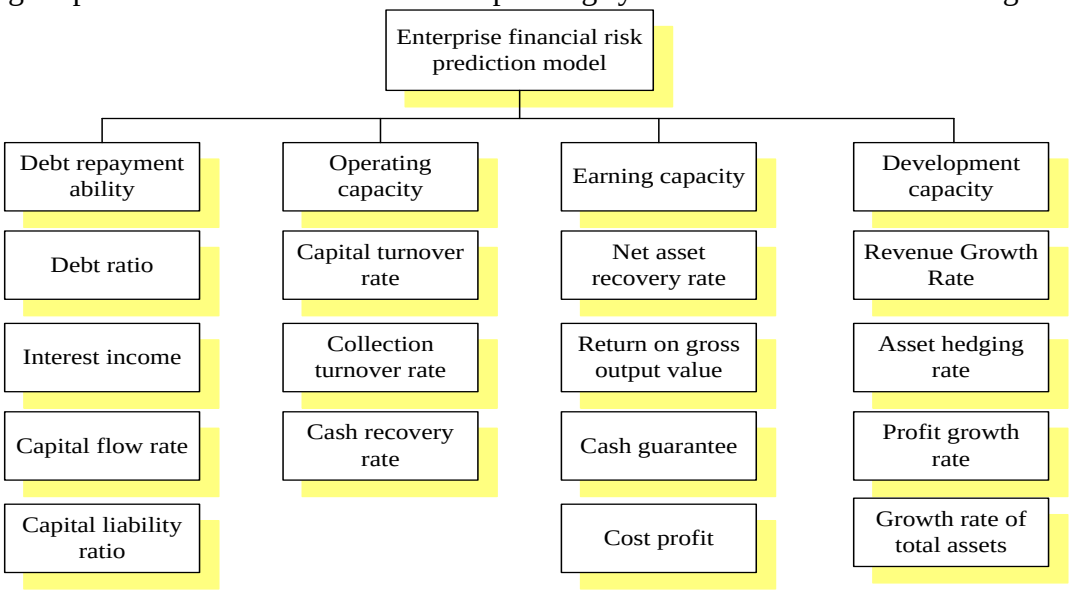


Figure 5: Financial Risk Prediction System Model

Figure 5 emphasizes the importance of designing a comprehensive predictive model for enterprise development. The development process typically follows a fixed trajectory from rise to

peak, eventually facing decline. The model aims to extend this process as long as possible. While a financial risk prediction system has been established, risks often remain hidden, necessitating algorithmic transformations using modern technology. Real-time risk monitoring through computer technology significantly enhances efficiency compared to manual observation.

3.2 Application of Classification and Regression Tree Algorithm in Financial Risk Prediction

In this paper, the financial risks faced by enterprises in the process of development are carried out in the context of the prediction model constructed above, because this enables enterprises to mine their own financial risks in combination with some previous entry points. At this time, the application of the algorithm in the financial risk is to transform the original financial risk prediction system into a computer program, which is also to achieve a more intelligent processing of the enterprise financial risk in the later stage. The algorithm applied in this paper needs to be implanted when identifying corporate financial risks. The corresponding implantation process is shown in Figure 6.

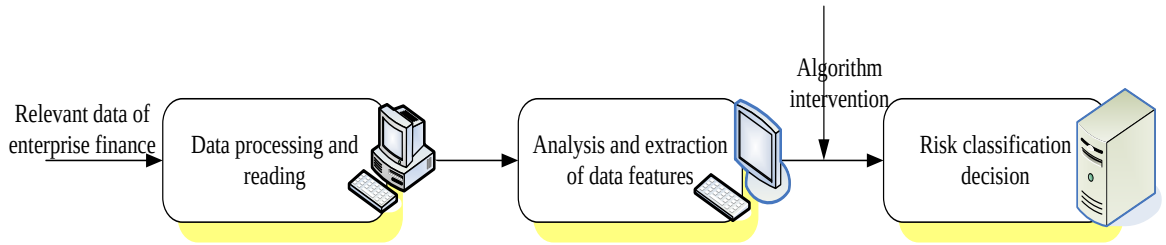


Figure 6: The Process by Which Algorithms Intervene in Financial Risk

In Figure 6, the intervening part of the algorithm is well explained, that is, before the financial risk is classified and processed, it is necessary to perform certain processing on the financial risk data of the enterprise. Now supposing there is an enterprise financial data sample M, the number of the data sample is represented by $M(q)$, the corresponding sample number is a_i, and the corresponding sample probability in the data set M can be expressed as the following formula.

$$P(q)=\frac{M(q)}{m} \tag{1}$$

The q in the formula represents the key points in the data sample, and m represents all the financial data samples. The financial data in the data sample also needs to be classified, and the probability of occurrence of the corresponding sample at this time is:

$$P(t_j|q)=\frac{M_j(q)}{M(q)} \tag{2}$$

The $M_j(q)$ in the formula represents the number of samples that the key point q belongs to t_j categories. Then assuming that there are two q_α and q_β in the key point, the corresponding sample occurrence probability can be expressed as:

$$\begin{cases} P_{\alpha} = \dfrac{P(q_{\alpha})}{P(q)} \\ P_{\beta} = \dfrac{P(q_{\beta})}{P(q)} \end{cases} \tag{3}$$

The calculation of the formula is to re-divide some data in the sample in a certain proportion. An enterprise will generate a lot of financial-related data since it starts to operate. In order to explore the financial risks of the enterprise to a certain extent, the use of effective data can save a lot of processing steps. However, when a specific parameter needs to be detected, the corresponding relationship is as follows:

$$P(t_j|q) = \max_i P(t_i|q) \tag{4}$$

The process of processing the financial data of the enterprise in the formula is a holistic processing based on a set. However, for the complex and changeable financial data sample set, some data separation processing is required. First of all, it is necessary to determine the functional relationship of the hybridity above the key nodes. The corresponding formula is as follows:

$$H(q) = f\left(P(t_1|q), \cdots, P(t_n|q)\right) \tag{5}$$

In the formula, f represents all functions above n combinations of $(P_1, \cdots, P_n)$, and $P(t_j|q)$ represents the probability that the key node q corresponds to the occurrence of samples of category t_j. For the case of large and cluttered data samples, the G function is used, and the corresponding expression is as follows:

$$H_1(q) = \sum_{i \neq j} P(i|q)P(j|q) \tag{6}$$

The formula can handle the problem of complex data samples well, but different methods are needed for the case of large error between samples. At this time, the corresponding mixing function can be expressed as:

$$H_2(q) = 1 - \max_i P(t_i|q) \tag{7}$$

The above calculation functions process data that may have large differences in financial data, so that the information in it can be better processed and mined.

4. Financial Risk Prediction Experiment Based on Classification and Regression Tree Algorithm

4.1 Data Validation of Financial Risk Prediction Model

The most important thing for a company to evaluate its own development is to grasp its own revenue. The above understanding of corporate finance is also gradually developed from this. For the revenue situation, the financial management of the enterprise is the most important. Because the continuous optimization of financial management will not only bring a certain amount of income to the enterprise itself, but also ensure that the operation of the enterprise will gradually improve. Therefore, the financial management of an enterprise is extremely important, but the financial risk management will be more prominent. Its importance has been explained above. Therefore, it is an

extremely important task to predict the financial risks of enterprises. The prediction model has been established above, and the corresponding financial risk reference value needs to be set, as shown in Table 1.

Table 1: Financial Risk Prediction Reference Values

Risk degree	Parameter value	explain	Whether financing is available
crisis	$L > 80$	Extremely high risk	no
high	$60 < L \leq 80$	Very high risk	no
middle	$20 < L \leq 60$	High risk	no
low	$5 < L \leq 20$	Average risk	no
nothing	$L \leq 5$	Less risk	yes

The results in Table 1 show that the development of an enterprise needs to meet certain parameters. The parameters in the table above are defined according to the following formula:

$$L = \frac{Z_i V_i}{m} \tag{8}$$

Z in the formula represents different risk factors, V represents the proportion of each factor, and m corresponds to the quantity. Combining the data in the table, it can be seen that if an enterprise seeks the above-mentioned financing development, the value of L needs to be no greater than 5. The corresponding result statistics are shown in Table 2 and Table 3.

Table 2: Relationship between Corporate Financial Risk Income and Returns

	profit	Loss to gain	Profit to loss	loss
Total sales revenue	63.121	113.213	147.311	101.715
Gross profit	11.211	12.013	15.121	9.003
Net profit	3.112	-3.171	1.311	-1.337
Revenue growth rate	6.31%	11.37%	27.11%	-10.71%

Table 3: Relationship between Financial Risk Expenses and Returns

	profit	Loss to gain	Profit to loss	loss
Unit capital outflow (yuan)	0.991	0.371	0.217	0.417
Asset turnover rate (Times)	0.901	0.873	0.851	0.611
Turnover days (days)	16.11	37.13	15.33	113.71
Capital flow ratio	1.37%	0.73%	0.83%	0.79%

The data in Table 2 and Table 3 correspond to the revenue of an enterprise, and these have a certain relationship with the financial indicators. The data in Table 1 is the key data for risk determination, while Table 2 and Table 3 are important data for testing the financial risk prediction model. Now deal with the corresponding financial risks for the financial risks of a certain A company within 5 years. The corresponding results are shown in Figure 7.

Figure 7 illustrates changes in the company's finances through its revenue. Over five years, financial expenditures have risen annually, peaking at 10.03 million yuan in 2021. Meanwhile, revenue and management expenses were 9.01 million yuan and 9.11 million yuan, respectively,

indicating growth but still trailing financial expenditures. The utilization rate of expenses has also increased, with management expenses reaching 5.17% in 2021 and financial expenses peaking at 8.13%. These findings highlight the irreplaceable role of financial expenses.

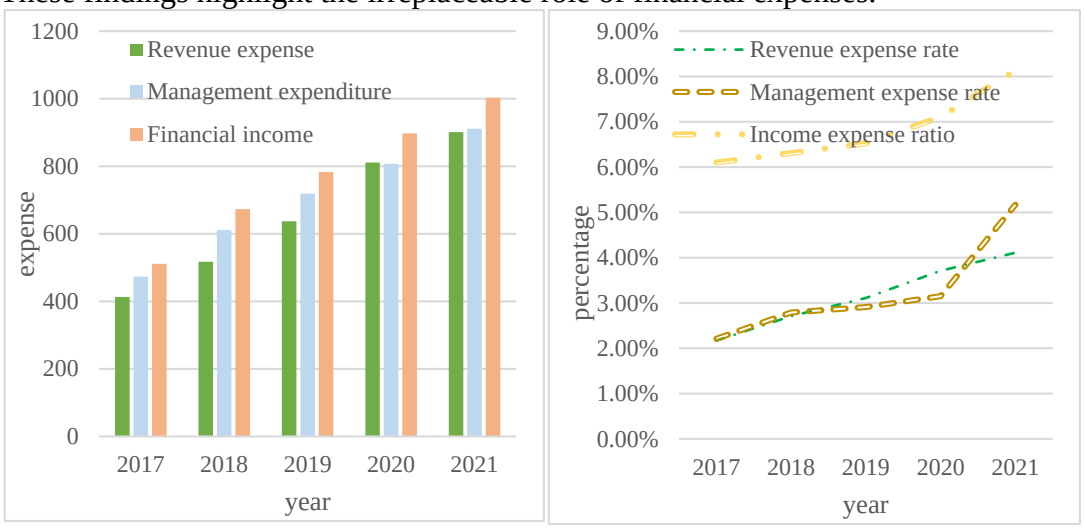
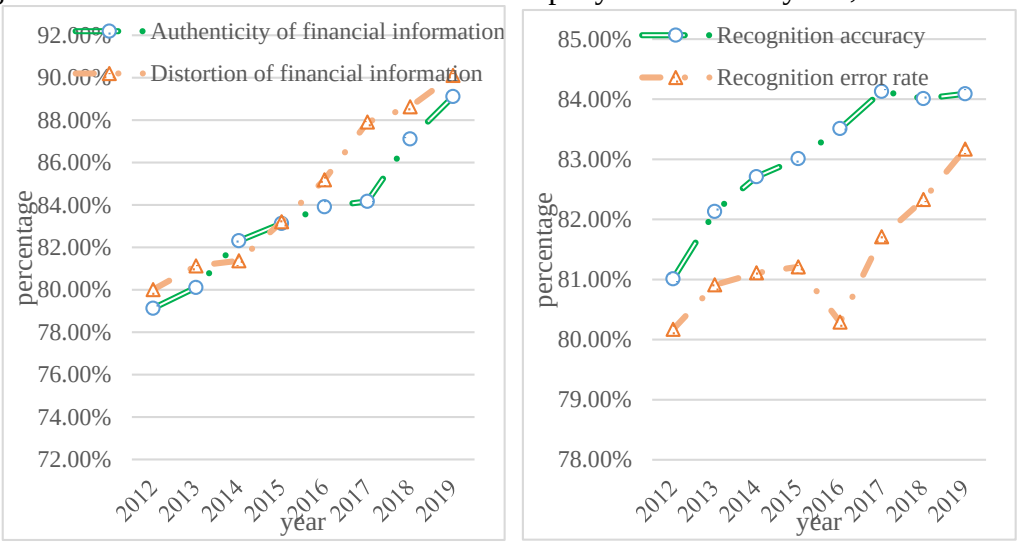


Figure 7: Five-year Financial Situation of the Company

4.2 Experiment of Classification and Regression Tree Algorithm for Financial Risk Processing

The application of the classification and regression tree algorithm can greatly avoid financial risks. This method of avoidance enables many potential risks to be discovered, which is helpful for the operation and management of the enterprise itself. The following collects the results of processing risks in the financial data of a certain company over several years, as shown in Figure 8.



(1) Authenticity of Corporate Financial Data (2) Recognition Rate of Risk Prediction Model

Figure 8: Results of Corporate Financial Risk Treatment within 8 Years

The results in Figure 8 are obtained by processing the financial data of the company through the classification and regression tree algorithm. The result in Figure (1) is that the authenticity of the financial information of the company has been processed to a certain extent. The trend is that the authenticity has increased year by year and reached 90.11% in 2019. However, the distorted information has also reached 89.11%. The accuracy of recognition has been rising, with the highest

in 2017, reaching 84.13%. The recognition error rate was the highest in 2019, reaching 83.17%. This result indicates that the prediction of the risk model can effectively reduce the risk, and the authenticity of the internal financial data of the enterprise is also guaranteed.

5. Conclusion

The object of this article is the financial risk of an enterprise, which plays an extremely important role in the overall development of an enterprise. The purpose of an enterprise's development is to continuously improve its own income. In order for enterprises to survive better in a competitive environment, it is necessary to ensure their own operating conditions and prevent financial risks of enterprises. Financial risks are difficult to detect at first, but the accumulation of such related problems can threaten the financial health of the company itself. There will be overlapping effects between various risks, which will also make many risks difficult to avoid. However, this paper used the algorithm of classification and regression tree algorithm. The algorithm classifies financial risks according to characteristics and then uses calculation rules to process data. The risks selected by this method are of great help to corporate decision-making.

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