Research on the Linear Prediction Model of Financial Financing Reliability under Earnings Management

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Abstract: Aiming to reduce the risk of financial financing and improve the reliability of financial financing, the research on the linear prediction model of financial financing reliability under earnings management model is summarized. A linear prediction model of financial financing reliability is proposed based on earnings management model. Taking the ratio of assets and liabilities and the interval of social capital financing as the constraint index, the empirical analysis model of enterprise financing decision is established, and the earnings management analysis of enterprise financial financing is carried out by using financial leverage. The linear prediction model of financial financing reliability is established by using AHP and the least square fitting method is used to realize the reliability evaluation and quantitative prediction of financial financing risk. The empirical results show that the model is reliable and accurate.

1. Introduction

Sufficient and sustained capital investment is an important condition for the continuous operation and expansion of an enterprise. The capital source of the enterprise is generally bank loan. However, the bank loan system in our country often requires a strict asset mortgage and guarantee system, and must have real property such as buildings, machinery and plant as collateral[1]. However, many SMEs cannot meet the conditions of bank loans, so that they cannot obtain the funds needed for development from banks. In recent years, the risk forecasting financing method under earnings management mode can alleviate the financing problem of small and medium-sized technological enterprises to a certain extent and support the development of small and medium-sized enterprises[2]. In this way, small and medium-sized enterprises can apply to the bank for loans through the evaluation of the value of the intermediary by the use of intellectual property rights such as patents, trademark rights, copyright and other intellectual property rights owned by small and medium-sized enterprises. At present, local governments are highly motivated to promote risk forecasting and financing under earnings management mode, and have also formulated corresponding supporting policies. But in the actual operation, the business is not as smooth as expected. The main reason is that the risk of intellectual property valuation and market disposal has not formed an effective management and sharing mechanism. Because intellectual property has the risk of intangible assets

and difficult to determine the value, banks often cannot accept only intellectual property as collateral for loans. Therefore, it is of great significance to analyze the risk composition of the risk forecasting loan under earnings management mode and to evaluate the risk situation accordingly, which is of great significance for the development of the risk forecasting financing business under the earnings management model. Based on the perspective of intangible assets evaluation institution, this paper analyzes the risk composition of risk forecasting loan under earnings management mode, and establishes the corresponding risk evaluation index system of intellectual property value evaluation. Multi-attribute decision making is used to evaluate the risk of intellectual property financing projects. Therefore, it has great significance to study the linear prediction model of financial financing reliability under the earnings management model[3].

2. Theoretical analysis and financing reliability modeling

2.1. Analysis on constraint variables of Financial financing reliability prediction under earnings management mode

We need to realize the financial financing reliability prediction under the earnings management mode and realize the quantitative evaluation and promotion of the enterprise performance through the enterprise financing decision optimization, it is necessary to construct the constraint parameter model of the enterprise financing decision effectiveness. Under the earnings management model, the effectiveness of SME financing decision is influenced by the explanatory variables, the control variables and the decision statistics, among which, The explanatory variables are mainly expressed as the validity variable of financing decision (FME) and the explained variables of financing mode (FM,) are mainly corporate social capital (SC), financing political relevance,(PC), control variables, including enterprise size (Size), market capitalization, book value ratio,(MB), etc., wealth, etc[5]. The reliability data of service financing can be regarded as a set of nonlinear time series. The nonlinear time series analysis method is used to analyze the trend of financial financing reliability, and the accurate prediction of financial financing reliability time series is realized. To discretize and analyze the discrete data of financial financing reliability time series, the method of phase randomization is used to analyze the prediction signal model of financial financing reliability time series.

$$z(t) = x(t) + iy(t) = a(t)e^{i\theta(t)} + n(t) \tag{1}$$

Using the traditional linear time series analysis method to predict the financial financing reliability, the error will lead to the poor convergence of the system and the low precision of the financial financing reliability time series prediction[6], the following steps are used to implement the capital sequence analysis of financial financing:

(a) The time series $x(k)$ of financial reliability is obtained by K-L discrete Fourier transform.

(b) By measuring the characteristics of the time series of financial reliability, we can obtain the univariate time series $\{x_n\}$, to discretize the fluctuation time and get the $x'(k)$.

(c) The nonlinear components of financial financing reliability time series are analyzed by using multidimensional structure-aided space test method, the substitute data are generated, and the substitute data of financial financing reliability time series are obtained.

2.2. Financing reliability decision model

Taking asset-liability ratio and social capital financing interval as constraint indexes, an empirical analysis model of enterprise financing decision is established. The analytical model of

time series signal of financial financing reliability is decomposed into statistics with many nonlinear components. To calculate the stationary time series characteristics of financial financing reliability time series:

$$C_{or3} = \frac{\left\langle \left(x_n - \overline{x}\right)\left(x_{n-d} - \overline{x}\right)\left(x_{n-D} - \overline{x}\right)\right\rangle}{\left\langle \left(x_n - \overline{x}\right)^3\right\rangle} \tag{2}$$

Where, x_n denotes nonlinear time series of financial financing reliability, d denotes transmission delay, $D = 2d$, $\overline{x}$ denotes mean square error in phase space, and $\langle x(n)\rangle$ represents mean value of $x(n)$:

$$\langle x(n)\rangle = 1/N\sum_{n=1}^{N} x(n) \tag{3}$$

The method of phase space reconstruction of financial financing reliability time series is described as follows: a nonlinear time signal is expressed by differential functional equation and is divided into two parts:

$$z_{n+1} = F(z_n) \tag{4}$$

The nonlinear time finite element set of the differential equation constructed by the time series of the financial financing reliability expressed above is based on the evaluation of the value of the risk forecasting financing under the earnings management model on the one hand by the intangible assets appraisal organization. The evaluation makes detailed analysis, determines its existence risk and carries on the analysis, provides some reference for the financing price appraisal organization[7].

3. Optimization of financial financing reliability prediction model

The TOPSIS multi-attribute decision method of interval number attribute valueb is used, the risk forecasting and financing in earnings management mode is evaluated. In panel data, X_m is the clustering center of data prediction, and its K-order nearest neighbor feature vector is used, and the distance between two points represents Euclidean distance, which is:

$$d_m(0) = \left\|X_m - X_k\right\| \tag{5}$$

The Lyapunov exponent spectrum is obtained, and the risk of risk forecasting financing in earnings management is determined. For value evaluation organizations, when evaluating the value of an intellectual property right, there is a risk of assessing the subject, assessing the risk of the object, according to the largest Lyapunov index of the time series of financial financing reliability, the characteristic trend of the scalar time series of financial financing reliability is estimated, which indicates the increase of two vectors. Long dimensional vector field, as:

$$\left\|X_{m+1} - X_{k+1}\right\| = \left\|X_m - X_k\right\|e^{\lambda_1} \tag{6}$$

The recursion diagram $R(i,j)$ of financial financing reliability is constructed. The formula is expressed as follows:

$$R(i,j) = H\left(\varepsilon_i - d_{ij}\right), \quad i,j = 1,2,...,N \tag{7}$$

According to the above analysis of various factors of risk forecasting financing risk under earnings management mode, we can evaluate the risk of subject and object risk. The risk prediction and financing risk evaluation index system of earnings management model from the perspective of

value evaluation is established from the four aspects of business risk and macro risk, and the feature extraction is carried out in the recursive graph, and the phase space is obtained by using the index system of risk prediction and financing risk evaluation under the earnings management model of value evaluation. The vector evolution of time series of financial reliability is expressed as follows:

$$X_{m+1}(m) = X_{k+1}(m) \pm \sqrt{(d_m(0)e^{\lambda_1}+)^2 - \sum_{i=1}^{m-1}[X_{m+1}(i) - X_{k+1}(i)]^2} \tag{8}$$

On the basis of determining the risk prediction and financing risk evaluation index under earnings management model, the AHP is used to divide the specific indicators into one and two. The three layers and the weight of each index are determined, and the prediction value of the financial financing reliability series is obtained as follows:

$$x(t_{n+1})' = X_{m+1}(m) \tag{9}$$

Finally, the calculated time series of financial financing reliability are chosen. Any point in the phase space of the reconstruction of financial financing reliability is expressed as X_n, in the earnings management mode, the steps of improving the financial financing reliability prediction algorithm are expressed as follows:

(1) Taking into account that most of the evaluation indexes are qualitative, an initial value x_0 is generated in the financial financing reliability sequence Gao Si distribution $N(0,1)$.

(2) Set $N_0 = 0$, $D_0 = 1$, 对 $k = 1, 2, \cdots, n-1$, the prediction feature points of financial financing reliability in phase space are produced iteratively by the following formulas, $j = 1, 2, \cdots, k$.

$$N_k = r(k) - \sum_{j=1}^{k-1}\phi_{k-1,j}.r(j) \quad , \quad D_k = D_{k-1} - N_{k-1}^2 / D_{k-1}$$

(3) In the process of calculating the time series of financial financing reliability in Gauss self-similar process, a linear forecasting model of financial financing reliability under earnings management mode is established by using AHP, and the period of financial financing reliability time series is obtained. m_k and standard deviation ε_k.

$$m_k = \sum_{j=1}^{k}\phi_{kj}.x_{k-j} \quad , \quad \varepsilon_k^2 = (1 - \phi_{k,k}^2).\varepsilon_{k-1}^2, \quad \varepsilon_0 = 1$$

(4) The expected value m_k and standard deviation ε_k, in the quantitative recursive process of financial financing reliability time series are evaluated synthetically by multi-attribute decision making method. The obtained $\{y_k\}_{k=1}^{N-1}$ is a predictable financial financing method. The reliability time series and the least square fitting method are used to realize the reliability evaluation and quantitative prediction of the financial financing risk, and the accurate prediction of the financial financing reliability is realized through the above treatment.

4. Empirical analysis and verification

The software of Simulink and SPSS are used to carry on the empirical analysis, when using the multi-attribute decision method approaching the ideal point to evaluate the risk forecast financing risk under the earnings management mode, it is necessary for the experts to advance each three-level index in Table 1. Row interval value is assigned, and then multi-attribute decision making method approaching ideal point is used to evaluate the risk situation synthetically. Taking only nine indexes subordinate to the first-level index of evaluating object risk as an example, the experts assign the interval number of the nine indexes, and apply the multi-attribute method based

on approaching the ideal point to forecast and melt the risk in earnings management mode. The objective risk of capital evaluation is evaluated comprehensively. The results of the empowerment of five experts are expressed as w=(0.0438, 0.1435, 0.565, 0.0565, 0.6544, 0.433, 0.545, 0.076, 0.01676). Suppose there are six sample companies that need to use their intellectual property rights to apply for loans from banks, and the intellectual property rights of these six companies need to commission intermediaries to evaluate their value. Therefore, the reliability closeness of financial financing is calculated CI=0.545, c_2=0.546, c_3=0.6467, c_4=0.5456, c_5=0.6551, c_6=0.6544, according to the above parameters, the linear prediction of the financial financing reliability is carried out under the earnings management mode, and the time series diagram of the financial financing reliability prediction is shown in figure 1.
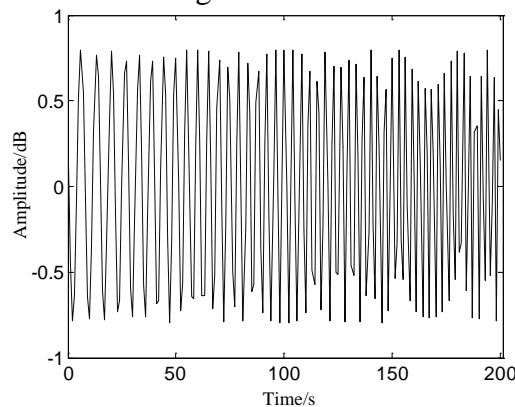

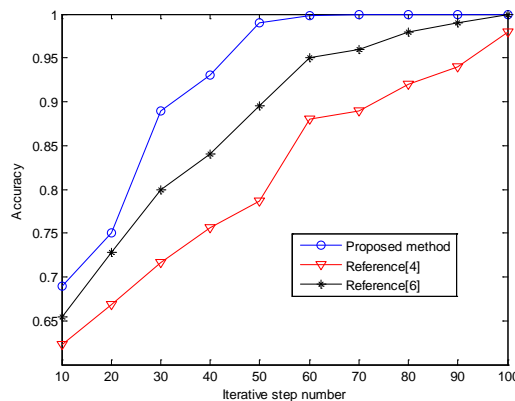Figure 1. Time series diagram for reliability prediction of financial financing

Figure 2. Comparison of prediction accuracy

According to the time series diagram of figure 1, the relationship of financial financing reliability prediction closeness is determined. From the point of view of risk control, the best financial financing project is $x6$, because the value evaluation result of the project shows that its comprehensive risk is the smallest. The reliability prediction accuracy is tested by different models, and the comparison results are shown in figure 2.

Figure 2 shows that the risk of risk forecasting financing under earnings management model has many aspects. From the perspective of value evaluation institution, the factors influencing risk evaluation of risk forecasting financing under earnings management model are analyzed. This paper analyzes and selects and establishes the multi-level index of each factor, determines the weight of each index through the analytic hierarchy process, and constructs the risk evaluation index system of the risk prediction financing in the earnings management mode in the aspect of value evaluation. The interval value multi-attribute decision making method approaching ideal point is used to evaluate the risk of risk forecasting and financing projects under different earnings management

models. The reliability prediction of financial financing based on this model has higher accuracy and better performance.

5. Conclusions

In this paper, a linear prediction model of financial financing reliability based on earnings management model is proposed. Taking the ratio of assets and liabilities and the interval of social capital financing as the constraint index, the empirical analysis model of enterprise financing decision is established, the earnings management analysis of enterprise financial financing is carried out by using financial leverage, and the surplus is established by AHP. The linear prediction model of financial financing reliability under the management mode, combined with the least square fitting method, the interval value multi-attribute comprehensive evaluation method adopted in this paper, is an improvement of the traditional evaluation method to the qualitative index simple score. The result increases the maneuverability of experts to assign index, ensures the completeness of information, and improves the objectivity of evaluation to a certain extent.

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