

Analysis and Evaluation of Evolution Characteristics of Corporate Convertible Bond Financing Based on Big Data

Yanzhi Xie

* Corresponding author: e-mail 770200803@qq.com

School of Accounting Guangzhou Huali College Guangzhou, China

Abstract—This paper analyzes the evolution characteristics of convertible bond financing in enterprises, and improves the ability of healthy operation and management of enterprise accounting. Based on big data and entropy weight analysis, this paper proposes an analysis and evaluation method of the evolution characteristics of corporate convertible bond financing. A big data analysis model for the evolution characteristics of corporate convertible bond financing is constructed. The entropy weight model of corporate convertible bond financing evolution is optimized by random entropy weight distributed reorganization method, and a sequence reconstruction model for information transmission of corporate convertible bond financing evolution is constructed, and entropy weight is balanced. Using cash flow accounting risk prediction sequence analysis method, this paper analyzes the characteristics of corporate convertible bond financing evolution, uses block processing method to carry out entropy weight parameter interpolation and fusion processing on the transmission symbol sequence of corporate convertible bond financing evolution, constructs statistical analysis and fusion model of big data information of corporate convertible bond financing evolution characteristics, extracts the evolution characteristics of corporate convertible bond financing, analyzes the evolution characteristics of corporate convertible bond financing through entropy weight feature extraction, and uses grey model to classify and identify the evolution characteristics of corporate convertible bond financing evolution, thus realizing the analysis and evaluation of corporate convertible bond financing evolution characteristics. The empirical results show that this method is accurate in analyzing and evaluating the evolution characteristics of corporate convertible bond financing, and the entropy weight balance of corporate convertible bond financing evolution is good, which reduces the risk of corporate convertible bond financing.

Keywords-component; big data; Corporate convertible bond financing; Evolutionary characteristics; Entropy weight analysis

1 INTRODUCTION

Convertible bonds mean that bondholders have the right to convert convertible bonds they hold into ordinary shares of the issuing company in a certain proportion within a specified period of time according to the contract when they purchase and issue bonds. The act of converting into common stock is not mandatory, and bondholders can choose to convert it into common stock and become shareholders of the company, or they can choose not to convert it, hold bonds due, and collect principal and interest at the interest rate agreed in the contract at the time of purchase. Or it can realize or sell the convertible bonds it holds in the circulation market before the bonds expire. In analyzing and evaluating the evolution characteristics of corporate convertible bond financing, it is necessary to combine the design of parameter identification model, integrate big data information, establish parameter identification and adaptive evaluation model, build fuzzy index model, and analyze and evaluate the evolution characteristics of corporate convertible bond financing. It is of great significance to study the analysis and evaluation method of the evolution characteristics of corporate convertible bond financing in promoting the security development of the evolution of corporate convertible bond financing [1].

Those who use the direct weight method are: Zhu Yiming et al . (2014) selected 16 listed banks in 6 years as sample enterprises, sorted out 28 indicators such as profitability, solvency[2], asset quality and growth ability of enterprises, calculated the factors of each year respectively, and used the direct value method to objectively empower them, thus obtaining the comprehensive performance score of enterprises . The research shows that the operating performance of joint-stock banks is significantly better than that of state-controlled commercial banks . Zhang Ping and Yu Jing (2015) selected Chinese enterprises whose A shares were refinanced by means of additional issuance from 2009 to 2010, and compared the changes of ownership structure before and after the fixed increase. The author used factor analysis to calculate the comprehensive scores of business performance. The results show that the performance of enterprises increases in the year of fixed income increase, but decreases after the implementation of fixed income increase. The research also finds that the ownership concentration and performance of enterprises show the same changing trend. In order to comprehensively measure the performance of enterprises, most scholars mostly use factor analysis method. However, Tao Lijuan (2016) thinks that the method of assigning subjective evaluation criteria of enterprise performance to data to determine the weight lacks theoretical significance and has little guiding effect on reality[3] . It is suggested that factor analysis should be considered comprehensively with other methods to measure enterprise performance, so as to ensure that the research on enterprise performance is reasonable and more realistic. Hou Guangwen and Hao Tianlei (2015) evaluated the comprehensive performance of enterprises by using the method of self-power. He built a company performance evaluation system from the aspects of financial profitability, solvency, growth ability of enterprises and operation ability of assets, and calculated the comprehensive financial scores of 20 agricultural listed companies in Shenzhen Stock Exchange in 2013 to comprehensively evaluate the performance of enterprises. The results show that the direct weight method overcomes the determination of factor analysis method[4].

This paper reveals the influence of convertible bond financing on the financial performance of Jiangnan Water Affairs from the market and company levels by combining empirical and case

studies. First of all, in the research of convertible bonds, most of the theoretical research contents in China are focused on the risk identification of convertible bonds financing, the impact of convertible bonds financing on earnings management of companies and the pricing strategy of convertible bonds issuance. However, this paper mainly studies the changes in financial performance after issuing convertible bonds and the reasons for the changes. Secondly, most of the researches on China's convertible bond market use empirical research methods, selecting a large number of listed companies that issue convertible bonds as samples, and studying the financial performance of a single company that issues convertible bonds. Less. In this paper, the influence of convertible bond financing on financial performance is revealed from both market and company levels by combining empirical and case studies. The objective weighted method is used to calculate the company's comprehensive performance score to depict the trend of enterprise's financial performance.

2 ENTROPY WEIGHT MODEL AND RISK CHARACTERISTICS OF ENTERPRISE CONVERTIBLE BOND FINANCING EVOLUTION TRANSMISSION BIG DATA SAMPLING .

2.1 Entropy weight model of corporate convertible bond financing evolution .

In order to realize the analysis and evaluation of the evolution characteristics of corporate convertible bond financing based on entropy-grey model, it is necessary to first construct a big data analysis model of the evolution characteristics of corporate convertible bond financing, optimize the design of the evolution entropy weight model of corporate convertible bond financing by adopting the random entropy weight distributed reorganization method, analyze the risk characteristics of the evolution entropy weight of corporate convertible bond financing by combining the error feedback compensation method, and combine the distributed data structure reorganization and parameter fusion[5]. The entropy weight model design of enterprise convertible bond financing evolution assumes that the arrival delay scale of the transmission path of each enterprise convertible bond financing evolution characteristic distribution data network is an integer multiple of, and adopts the block processing method, and obtains the sparse characteristic distribution set of enterprise convertible bond financing evolution characteristic distribution data as follows:

$$D = \{d_m(t) = \sum_{k=1}^{K(m)} p(t - \tau_{mk}), m = \{1, 2, \dots, N\}\} \quad (1)$$

Wherein, $d_m(t)$ represents the component of corporate convertible bond financing evolution, and τ_{mk} is the delay parameter of corporate convertible bond financing evolution, When $N_s = 1$, the discrete time distribution sequence of the characteristic distribution data of corporate convertible bond financing evolution is expressed as:

$$x(t) = \sum_{m=0}^M w_m d_m(t) \quad (2)$$

Wherein, w_m is the distribution weight of corporate convertible bond financing evolution characteristics, based on the cluster link balanced allocation method, the discrete sequence recombination output of the distribution data of enterprise convertible bond financing evolution characteristics is obtained, and the sampling judgment is carried out by using two adjacent training codes, and the distributed fusion result of enterprise convertible bond financing evolution characteristics sequence is obtained as follows:

$$x(t) = \sum_{m=1}^M \sum_{k=1}^{K(m)} w_{mk} s(t - T_m - \tau_{mk}) + v(t) \quad (3)$$

Wherein, w_{mk} is the gain of entropy weight parameter of corporate convertible bond financing evolution, and $v(t)$ is an additive parameter, and the constraint parameter model of corporate convertible bond financing evolution characteristics is obtained, and the impulse response characteristic distribution set of corporate convertible bond financing evolution network is obtained:

$$X = DW + Z \quad (4)$$

Wherein, D is the digital degree index of financing evolution, W is the rate of change of profit before tax, Z is the total income of enterprises, the impulse response of the data network transmission link is calculated, and the maximum likelihood estimation of the power data transmitted by the enterprise convertible bond financing evolution characteristic distribution data network is carried out. The characteristic association distribution model of the characteristic factors of corporate convertible bond financing evolution is constructed, and the statistical characteristic quantity of the evaluation of the characteristic factors of corporate convertible bond financing evolution is obtained. Using the irrelevance with, the data fusion result of the characteristic distribution of corporate convertible bond financing evolution is obtained as follows:

$$B_{(i+1)} = \lambda_i B_{(i)} + \beta_{i+1}^{-1} x_{i+1} w_{i+1}^T \quad (5)$$

$$C_{(i+1)}^{-1} = \lambda_i C_{(i)}^{-1} + \beta_{i+1}^{-1} w_{i+1} w_{i+1}^T \quad (6)$$

Wherein, λ_i is the distribution characteristic value of the total assets of the enterprise, w_{i+1} is the financial lever under the control of expected income, and $B_{(i)}$ is the proportion of financial investment. Calculate the clustering link characteristic solution of the entropy weight of the enterprise convertible bond financing evolution, and obtain the sparse allocation coefficient of the enterprise convertible bond financing evolution characteristic distribution, and carry out

entropy weight distributed fusion on the current enterprise convertible bond financing evolution characteristic distribution data, and the construction vector is:

$$C_{(i+1)} = \lambda_{(i)}^{-1} C_{(i)} - \frac{\beta_{i+1}^{-1} \lambda_i^{-1} C_{(i)} \mathbf{w}_{i+1} \mathbf{w}_{i+1}^T \lambda_i^{-1} C_{(i)}}{\beta_{i+1}^{-1} \lambda_i^{-1} \mathbf{w}_{i+1}^T C_{(i)} \mathbf{w}_{i+1} + 1} \quad (7)$$

Wherein, $C_{(i)}$ is the equilibrium parameter under the dual financing mode. According to the tap delay control method, the anti-interference design and balanced allocation of the entropy weight model of corporate convertible bond financing evolution are carried out, and the management and prediction model of corporate convertible bond financing evolution characteristics are obtained through the estimation of the minimum mean square error [6].

2.2 Big Data Mining on Evolution Characteristics of Corporate Convertible Bond Financing .

A sequence reconstruction model of information transmission of corporate convertible bond financing evolution is constructed, and entropy weight is balanced. Using the cash flow accounting risk prediction sequence analysis method, this paper analyzes the characteristic factors of enterprise convertible bond financing evolution, and the maximum likelihood estimation model of enterprise convertible bond financing evolution information transmission is as follows:

$$\begin{aligned} D_{(i+1)} &= B_{(i+1)} C_{(i+1)} \\ &= B_{(i)} C_{(i)} - \beta_{i+1}^{-1} (B_{(i)} C_{(i)} \mathbf{w}_{i+1}) \frac{\mathbf{w}_{i+1}^T \lambda_i^{-1} C_{(i)}}{\lambda_i^{-1} \beta_{i+1}^{-1} \mathbf{w}_{i+1}^T C_{(i)} \mathbf{w}_{i+1} + 1} \\ &\quad + \beta_{i+1}^{-1} \mathbf{x}_{i+1} (\lambda_i^{-1} \mathbf{w}_{i+1}^T C_{(i)}) - \beta_{i+1}^{-1} \mathbf{x}_{i+1} \frac{\beta_{i+1}^{-1} \lambda_i^{-1} \mathbf{w}_{i+1}^T C_{(i)} \mathbf{w}_{i+1}}{\beta_{i+1}^{-1} \lambda_i^{-1} \mathbf{w}_{i+1}^T C_{(i)} \mathbf{w}_{i+1} + 1} \mathbf{w}_{i+1}^T \lambda_i^{-1} \end{aligned} \quad (8)$$

Wherein, $B_{(i)}$ is the financial dynamic parameter under the control of expected income, $C_{(i)}$ is the fitness function of the whole process of dynamic early warning, and \mathbf{x}_{i+1} is the random sampling statistics. Under the multi-path entropy weight distribution model, the adaptive control of enterprise convertible bond financing evolution information transmission is carried out. Through fuzzy entropy weight propagation control technology, the statistical analysis model of enterprise convertible bond financing evolution information transmission is obtained, and the adaptive iterative control model is constructed, so that the constraint parameter of enterprise convertible bond financing evolution characteristics is $\mathbf{u} = (\lambda_i^{-1} C_{(i)}) \mathbf{w}_{i+1}$, and the iterative form of data mining of enterprise convertible bond financing evolution characteristics distribution is obtained .

$$C_{(i+1)} = \lambda_i^{-1} C_{(i)} - \beta_{i+1}^{-1} \alpha \mathbf{u} \mathbf{u}^T \quad (9)$$

$$\mathbf{D}_{(i+1)} = \mathbf{D}_{(i)} + \beta_{i+1}^{-1} \alpha \mathbf{z}_{i+1} \mathbf{u}^T \quad (10)$$

Wherein, the weighted association distribution weight of the distribution data of corporate convertible bond financing evolution characteristics is λ_i , and in the process of machine learning, the ambiguity coefficient of the analysis and evaluation of corporate convertible bond financing evolution characteristics is obtained as follows:

$$\lambda_i = \begin{cases} 1 - (1 - \lambda_0)(1 - i/n)^3, & i \leq n \\ 1, & i > n \end{cases} \quad (11)$$

In which, n is the iterative step of data mining for the evolution characteristics distribution of corporate convertible bond financing. Combined with the multi-level analysis method of enterprise convertible bond financing evolution characteristics, the evaluation and prediction model of enterprise convertible bond financing evolution characteristics is obtained, which improves the analysis and evaluation ability of enterprise convertible bond financing evolution characteristics [7].

3 ANALYSIS, EVALUATION AND OPTIMIZATION OF EVOLUTION CHARACTERISTICS OF CORPORATE CONVERTIBLE BOND FINANCING

3.1 Extraction of entropy weight characteristics of corporate convertible bond financing evolution characteristics

The analysis method of cash flow accounting risk prediction sequence is used to analyze the characteristic factors of corporate convertible bond financing evolution. The transmission symbol sequence of corporate convertible bond financing evolution is interpolated and fused with entropy weight parameters of capital return parameter analysis by block processing method, and the feature extraction model of corporate convertible bond financing evolution characteristic distribution data is constructed. The regression analysis model of corporate convertible bond financing evolution characteristic distribution data is constructed by Saleh-Valenzuela statistical model, and the distribution function of corporate convertible bond financing evolution characteristic is obtained under IEEE 802. 15. SG3a communication protocol:

$$h(t) = H \sum_{m=1}^M \sum_{k=1}^{K(m)} \alpha_{mk} \delta(t - T_m - \tau_{mk}) \quad (12)$$

Let the node of the distribution data network of enterprise convertible bond financing evolution characteristics be expressed as b_i , the number of frames used for enterprise convertible bond financing evolution characteristics is N_f , and the distribution time interval of enterprise

convertible bond financing evolution characteristics is T_f . The entropy weight distribution of enterprise convertible bond financing evolution characteristics is as follows:

$$T_s = N_f T_f \quad (13)$$

Based on the method of filter matching detection, the tap model of the evolution characteristic distribution of corporate convertible bond financing is obtained:

$$s_{PPM}(t) = \sum_{i=-\infty}^{\infty} \sum_{j=0}^{N_f-1} p(t - iT_s - jT_p - c_j T_c - a_i \varepsilon) \quad (14)$$

$$s_{PAM}(t) = \sum_{j=-\infty}^{\infty} d_j p(t - jT_s) \quad (15)$$

Based on the extraction of entropy weight characteristics of enterprise convertible bond financing evolution characteristics, the data mining and entropy weight characteristics extraction of enterprise convertible bond financing evolution characteristics are carried out, and the extracted entropy weight characteristics are as follows:

$$Z_1 = B \sum_{w \in W} q^w - \sum_{a \in A} x_a [t_a(x_a) + \beta v_a] \quad \forall v_{\min} \leq v_a \leq v_{\max} \quad (16)$$

In the formula, the first item on the right indicates the enhancement coefficient of the analysis and evaluation of the financing evolution characteristics of convertible bonds. Combined with cost-effectiveness, the statistical analysis and fusion model of big data information on the evolution characteristics of corporate convertible bonds financing is constructed, the evolution characteristics of corporate convertible bonds financing are extracted, and the evolution characteristics of corporate convertible bonds financing are analyzed by entropy weight feature extraction. The sparse characteristics of the distribution of the evolution characteristics of corporate convertible bonds financing are as follows:

$$D_{opt} = \lambda X V^{-1} W^T (W V^{-1} W^T)^{-1} \quad (17)$$

In the process of solving D_{opt} , the methods of regression analysis and grey model reconstruction are used to fuse and extract the evolution characteristics of corporate convertible bond financing, and grey model classification and recognition are carried out according to the results of feature extraction[8].

3.2 Entropy-grey model and analysis and evaluation output of the evolution characteristics of corporate convertible bond financing

Self-adaptive mining and feature classification identification are carried out on the distribution data of the evolution characteristics of corporate convertible bond financing, and the fusion expression of the evolution characteristics of corporate convertible bond financing is obtained as follows:

$$y(n) = x(n) * h(n) + n(n) \quad (18)$$

$$\tilde{x}(n) = y(n) * W(n) \quad (19)$$

$$\hat{x}(n) = g(\tilde{x}(n)) \quad (20)$$

In the formula, $\hat{x}(n)$ is the estimated value of enterprise convertible bond financing evolution characteristics, $h(n)$ is the entropy weight decline of enterprise convertible bond financing evolution characteristics distribution, which is the interference component of enterprise convertible bond financing evolution characteristics distribution, and $n(n)$ is the direct spread spectrum sequence of enterprise convertible bond financing evolution characteristics distribution. The discrete sequence of big data with input characteristics of corporate convertible bond financing evolution is, the expected response is, and the balanced special output of corporate convertible bond financing evolution characteristics fusion is:

$$d(t) = a(t)c(t) = \sum_{n=0}^{\infty} d_n g_c(t - nT_c) \quad (21)$$

Wherein

$$d_n = \begin{cases} +1 & a_n = c_n \\ -1 & a_n \neq c_n \end{cases} \quad (n-1)T_c \leq t \leq nT_c \quad (22)$$

Based on the entropy weight distribution method, the entropy weight feedback modulation of the enterprise convertible bond financing evolution system is carried out. Combined with the direct sequence spread spectrum technology, the iterative formula of quantitative regression analysis for risk assessment of the enterprise convertible bond financing evolution system is obtained as follows:

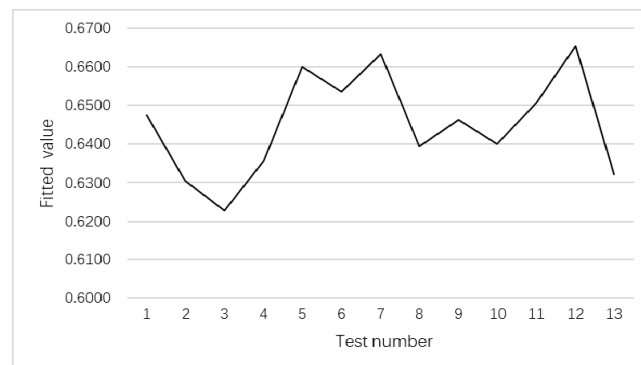
$$\begin{aligned} \hat{e}(k) = & z_R(k) \left(|z_R(k)|^2 - \hat{s}_R^2(k) \right) \\ & + j z_I(k) \left(|z_I(k)|^2 - \hat{s}_I^2(k) \right) \end{aligned} \quad (23)$$

In the formula, $\text{sgn}(\cdot)$ stands for symbolic function, $\hat{s}_R(k)$ and $\hat{s}_I(k)$ are fuzzy characteristic components of risk assessment and prediction of enterprise convertible bond financing evolution system.

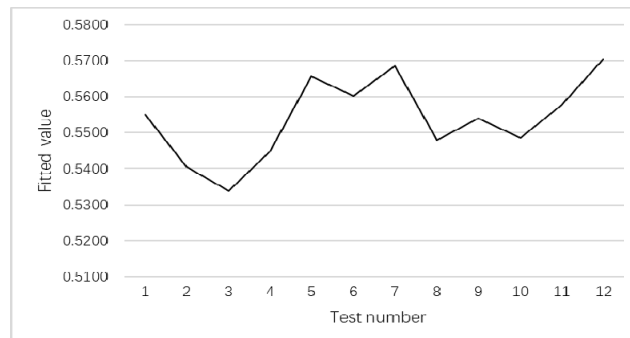
According to the principle of maximum likelihood estimation and grey model prediction, this paper analyzes and evaluates the evolution characteristics of enterprise convertible bond financing, and uses grey model to classify and identify the evolution characteristics of enterprise convertible bond financing, thus realizing the analysis and evaluation of enterprise convertible bond financing evolution characteristics.

4 EMPIRICAL TEST ANALYSIS

In order to verify the application performance of this method in analyzing and evaluating the evolution characteristics of corporate convertible bond financing, the simulation tools for analyzing and evaluating the evolution characteristics of corporate convertible bond financing are Matlab and Visual C++. The entropy weight of the evolution of corporate convertible bond financing gives people a frequency of 14KHz, the regression coefficient of data samples is 0.233, and the minimum mean square adaptive filter parameter is 0.34. The optimal weight coefficient of the grey model is 0.18, the multipath delay difference is 1.45ms, and the multipath delay parameters of corporate convertible bond financing evolution are (0, 3.0, 6.0, 7.0, 8.0). According to the above parameters, the evolution characteristics of corporate convertible bond financing are analyzed and evaluated, and the transmission baseband signal and balanced output of the corporate convertible bond financing evolution system are obtained as shown in Figure 1.



(a) Evolution parameters of corporate convertible bond financing



(b) Evolution parameters of corporate convertible bond financing 2

Figure 1. Distribution of evolution parameters of corporate convertible bond financing .

Taking the evolution sequence of corporate convertible bond financing in Figure 1 as the research sample, the evolution characteristics of corporate convertible bond financing are analyzed and evaluated, and the convergence curve of the predicted output is shown in Figure 2.

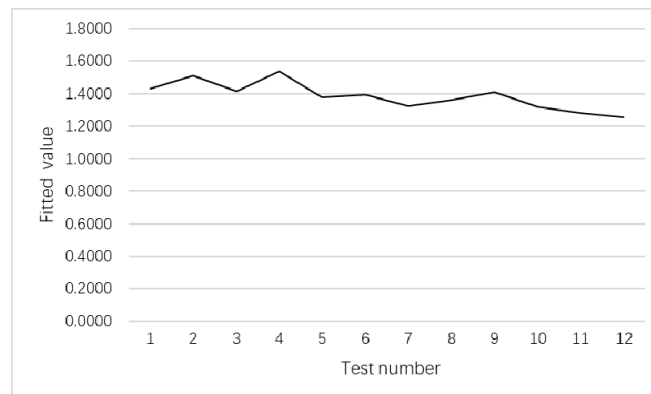


Figure 2. Convergence curve of analysis and evaluation of the evolution characteristics of corporate convertible bond financing.

Analysis of Figure 2 shows that this method has good convergence in analyzing and evaluating the evolution characteristics of corporate convertible bond financing, and tests the accuracy of analyzing and evaluating the evolution characteristics of corporate convertible bond financing. The comparison results are shown in Table 1. Analysis of Table 1 shows that this method has higher accuracy in analyzing and evaluating the evolution characteristics of corporate convertible bond financing, which improves the risk resistance of corporate convertible bond financing.

TABLE 1. COMPARISON OF THE ACCURACY OF ANALYSIS AND EVALUATION OF THE EVOLUTION CHARACTERISTICS OF CORPORATE CONVERTIBLE BOND FINANCING .

Number of tests	BP	MPC	This method
10	0 . 606	0 . 653	0 . 931
20	0 . 590	0 . 635	0 . 944
30	0 . 583	0 . 627	0 . 928
40	0 . 595	0 . 641	0 . 948
50	0 . 618	0 . 665	0 . 922
60	0 . 612	0 . 659	0 . 925
70	0 . 621	0 . 668	0 . 914
80	0 . 599	0 . 644	0 . 920
90	0 . 605	0 . 651	0 . 927
100	0 . 599	0 . 645	0 . 913

5 CONCLUSIONS

In this paper, combined with the design of the parameter identification model of corporate convertible bond financing, the big data information fusion of the analysis and evaluation of the evolution characteristics of corporate convertible bond financing is carried out, and the parameter identification and adaptive evaluation model of the analysis and evaluation of the evolution characteristics of corporate convertible bond financing are established. In this paper, an analysis and evaluation model based on entropy weight-grey model for the evolution characteristics of corporate convertible bond financing is proposed, and the impulse response of data network transmission link is calculated, and the maximum likelihood estimation is carried out for the power data transmitted by data network with the distribution of the evolution characteristics of corporate convertible bond financing. According to tap delay control method, the anti-interference design and balanced allocation of entropy weight model of corporate convertible bond financing evolution are carried out. Combined with the multi-level analysis method of corporate convertible bond financing evolution characteristics, the evaluation model of corporate convertible bond financing evolution characteristics is obtained, which improves the analysis and evaluation ability of corporate convertible bond financing evolution characteristics. The analysis shows that this method has higher accuracy and better convergence in analyzing and evaluating the evolution characteristics of corporate convertible bond financing.

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