Research and Application of Computer Big Data System in Early-Warning Methods and Online Monitoring Technologies

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Abstract. Corporate financial index is a collection of corporate financial information, which can truly and reliably reflect the financial status of a company. In order to monitor the size of corporate financial risks and prevent and reduce risks from bringing crises to enterprises, this paper proposes a financial early-warning computer big data model for listed real estate companies based on extension theory based on traditional financial early-warning methods, and combining them with each company The specific actual data is verified to provide suggestions for the development of listed real estate companies quickly and dynamically.

Keywords: Big data, computer system, financial system, financial early warning.

1. Introduction

Risk refers to various uncertain factors that affect the normal operating activities of a company, such as the company's profitability, operating capacity, cash capacity, and safety factors. These factors are interrelated and interact with each other, thus affecting the business performance of the enterprise. Therefore, in the risk warning, not only the risk level must be seen, but the trend and rate of change of risk transformation must also be understood. The extension early warning method uses the correlation function in eltenacs to evaluate things, because the correlation function can not only describe the degree of qualitative and quantitative changes in things, but also reflect the strength of the change trend, and explain the characteristics of the general law of things change [1]. Applying the correlation function to the early warning of corporate financial risk status, the resulting assessment result can not only reflect the level of risk, but also explain the strength of the trend of risk transformation in a certain direction, which is conducive to the early detection and avoidance of risks by corporate managers. Develop a reasonable risk response plan. Therefore, how to use the extension method to construct a reasonable financial risk early warning model has attracted the attention of many scholars. This article will use computer software technology and database technology to build an early warning system based on the characteristics of financial risks of real estate companies, and design financial risk early warning software for real estate companies to achieve fast, efficient, and convenient tracking and forecasting of the financial status of the company, and for fast dynamics It is important to monitor the level of enterprise risk.
2. Selection of early warning indicators
Since real estate companies are easily affected by national macroeconomic policies, the impact of macroeconomics on listed real estate companies is included in the early warning indicator system of this article. Related indicator systems include current ratio, asset-liability ratio, main business income, net profit, sales profit rate, return on assets, return on net assets, main business growth rate, net profit growth rate, GDP growth rate, and inflation rate.

3. Construct a matter-element model for the extension of early warning of financial distress of listed real estate companies
According to the matter-element theory, the same thing-element body can be expressed as:

\[
\begin{align*}
R_m = \begin{bmatrix}
N & N_1 & N_2 & \cdots & N_m \\
\vdots & \vdots & \vdots & \ddots & \vdots \\
c_1 & V_{11} & V_{12} & \cdots & V_{1m} \\
c_2 & V_{21} & V_{22} & \cdots & V_{2m} \\
\vdots & \vdots & \vdots & \ddots & \vdots \\
c_n & V_{n1} & V_{n2} & \cdots & V_{nm}
\end{bmatrix}
\end{align*}
\]  

Formula (1) is the matter-element body of the financial status of the target real estate listed company. Among them, N represents the complete set of things \(N_1, N_2, N_3, \ldots, N_m\), representing the early warning level of \(N_1, N_2, N_3, \ldots, N_m\), where it represents the early warning level of the financial status of the listed real estate company; \(v_{ij}\) is the magnitude of the corresponding financial status early warning level, and \(c_i\) represents the itch feature of the matter element N (early warning indicator).

3.1. Determine the classic domain and the section domain
In actual operation, it can be determined according to the expert experience method. The classic domain of the same phenotypic matter-element body:

\[
\begin{align*}
R_y = \begin{bmatrix}
N & N_1 & N_2 & \cdots & N_m \\
\vdots & \vdots & \vdots & \ddots & \vdots \\
c_1 & (a_{ij}, b_{ij}) & (a_{ij}, b_{ij}) & \cdots & (a_{ij}, b_{ij}) \\
c_2 & (a_{ij}, b_{ij}) & (a_{ij}, b_{ij}) & \cdots & (a_{ij}, b_{ij}) \\
\vdots & \vdots & \vdots & \ddots & \vdots \\
c_n & (a_{ij}, b_{ij}) & (a_{ij}, b_{ij}) & \cdots & (a_{ij}, b_{ij})
\end{bmatrix}
\end{align*}
\]  

The formula (2) is the classic domain of the same-character matter-element body, where \(N_j\) represents the j level in which the thing P is divided, \(c_i\) represents the I early warning target, and \(v_{ij} = (a_{ij}, b_{ij})\) represents the value range of \(N_j\) with respect to the index \(c_i\), that is, each early warning level Regarding the range of the corresponding early warning indicators [2]. The node domain of the same feature matter element body:

\[
R(p) = \begin{bmatrix}
(a_{11}, b_{11}) \\
(a_{12}, b_{12}) \\
\vdots \vdots \\
(a_{m1}, b_{m1}) \\
(a_{11}, b_{11}) \\
(a_{12}, b_{12}) \\
\vdots \vdots \\
(a_{m2}, b_{m2}) \\
\vdots \vdots \\
(a_{mn}, b_{mn})
\end{bmatrix}
\]  

(3)
Equation (3) is the same domain of the matter-element body, where \( R(P) \) represents the domain-item of the matter-element early-warning model of the financial status of the listed real estate company; \( N \) is the entire hierarchy, and \( v_{mk} = (a_{mk}, b_{mk}) \) represents the financial early-warning of the listed real estate company. The allowable value range of index \( C_k \) in level \( N \). The financial distress of listed real estate companies is directly related to the interests of investors, relevant stakeholders, and the company. Therefore, based on previous experience, this article divides the financial early warning levels of listed real estate companies into four levels: no-alarm, light-alarm, medium-alarm, and heavy-alarm. Based on the above classification standards, it is convenient to make intuitive judgments on the financial distress of listed companies [3]. Determine the weight coefficients \( \alpha_i \) and \( \sum \alpha_i = 1 \) according to the analytic hierarchy process. Calculate the correlation function \( K(x) \) of each indicator of the early warning object with respect to each early warning level \( j \). The formula is as follows:

\[
K_j(v_j) = \begin{cases} 
\rho\left(v_{ij}, v_j\right), & x \in X_0 \\
\rho\left(v_{i}, v_{ip}\right) - \rho\left(v_{i}, v_j\right), & x \notin X_0 \\
-\rho\left(v_{i}, v_j\right), & x \in X_0 
\end{cases}
\]  \hspace{1cm} (4)

Calculate the correlation degree of the warning object with respect to the warning level \( j \):

\[
K_j = \sum_{i=1}^{n} \alpha_i k_j(v_j)
\]  \hspace{1cm} (5)

Among them is the weight coefficient of each early warning index calculated by \( \alpha_i \) using the analytic hierarchy process; \( k_j(v_j) \) is the correlation function of each early warning index in the above formula (4) at each early warning level. According to the correlation function, the value of each early warning object can be calculated [4]. The degree of relevance under each warning level.

4. Financial Early Warning Evaluation

All the original data involved in the research in this article are obtained through websites such as China Listed Companies Information Network, Securities Star, and Oriental Fortune Network. The original data are shown in Table 1. In addition, the GDP growth rate in 2019 was 15.7, and the inflation rate was 3.25.
Table 1. Raw data of sample listed companies

| Company name                  | Assets and liabilities | Main business income | Net profit | Roe  | Net profit growth rate |
|-------------------------------|------------------------|----------------------|------------|------|------------------------|
| Vanke A                       | 66.11                  | 35526.61             | 4844.24    | 16.55| 110.81                 |
| Shahe shares                  | 66.23                  | 186.38               | 2.24       | 0.64 | -93.41                 |
| ST Merchants                  | 63.58                  | 4111.64              | 1157.88    | 14.65| 83.37                  |
| COFCO Real Estate             | 39.16                  | 823.77               | 465.94     | 13.54| 382.35                 |
| Oceanwide Construction        | 54.13                  | 4208.16              | 658.68     | 8.07 | 154.66                 |
| Yehuda Real Estate            | 49.61                  | 250.34               | 113.34     | 21.54| 382.35                 |
| LYGEM Real Estate             | 55.67                  | 443.66               | 4.59       | 10.52| -3.22                  |
| Xufei Investment              | 22.11                  | 3.79                 | 1.89       | 1.22 | 29.49                  |
| Zhong Tian City Investment    | 73.87                  | 619.50               | 102.48     | 27.47| 954.52                 |
| ST Zhongruan                  | 37.03                  | 267.92               | -57.29     | -18.45| -267.2721             |
| Great Wall                    | 63.5991                | 1081.9998            | 200.9978   | 10.82| 281.2132              |
| Rhine Real Estate             | 80.0021                | 991.9862             | 107.7892   | 27.91| 21.3451               |
| High-tech development         | 91.9754                | 664.6743             | -272.542   | -293.09| -69.982               |
| Poly Real Estate              | 67.9832                | 8114.2346            | 1488.9843  | 12.85| 122.4366              |
| Chong Hing Property           | 46.9987                | 40.5621              | 119.0453   | 30.31| 602.3456              |
| Beijing Urban Construction    | 64.9871                | 1600.234             | 265.3242   | 7.96 | 145.982               |
| Guanghua Holdings             | 59.0432                | 124.9768             | 11.8654    | 4.76 | -54.321               |
| Delong Real Estate            | 61.0034                | 325.9254             | 37.8432    | 3.08 | 28.112                |
| Yichang shares                | 57.0321                | 2074.765             | 298.764    | 12.98| 115.9832              |
| Celebrity Property            | 42.7543                | 1285.9973            | 296.1279   | 20.763| 151.086               |
| Wanting Real Estate           | 68.543                 | 2175.98              | 165.0316   | 6.89 | 462.021               |
| Shona Henge                   | 176.990                | 586.789              | 460.031    | 278.034| 1250.734              |
| Suning Global                 | 80.1154                | 2054.7831            | 289.5432   | 29.12| 272.3256              |

Taking Vanstone Real Estate as an example, the correlation between the above indicators and each level is calculated according to formula (4), and the correlation matrix formed is as follows:

\[
K_p = \begin{bmatrix}
K_1 & K_2 & K_3 & K_4 \\
-0.295 & 0.7 & -0.14 & -0.427 \\
0.7 & -0.28 & -0.64 & -0.76 \\
0.4 & -0.84 & -0.92 & -0.947 \\
-0.76 & -0.64 & -0.28 & 0.7 \\
-0.707 & -0.56 & -0.12 & 0.3 \\
-0.68 & -0.52 & -0.04 & 0.1 \\
-0.68 & -0.52 & -0.94 & 0.1 \\
0.3 & -0.88 & -0.94 & -0.96 \\
-0.88 & -0.82 & -0.64 & 0.9 \\
-0.413 & -0.12 & 0.6 & -0.302 \\
-0.195 & 0.8 & -0.34 & -0.56
\end{bmatrix}
\]
The result shows that Vanstone Real Estate's feature value of the early warning level variable is 3.336054, which means that the company's financial status is biased towards the middle police, which reflects the trend of improvement and improvement compared to the previous operating conditions.

5. Computer-based enterprise financial early warning system design

5.1. Overall architecture design

In the construction of the overall architecture of the system, this article adopts the B/S+MVC architecture model. That is, the introduction of the three-tier structure of B/S allows users to complete the early warning analysis of the financial risks of different enterprises through the web, and then provide a reference for the financial risk early warning of the enterprise [5]. At the same time, the system adopts the MVC architecture in terms of specific technical architecture. The basic structure is shown in Figure 1.

![MVC structure](image)

**Figure 1. MVC structure**

In the above structure, the user sends an access request through the view, and then sends the function request to the model through the logic assignment of the controller. There are different business programs in the model, and finally the model interacts with the data layer through the interface, and finally the result Return to the view through the JSP page. In the early warning analysis system, using the B/S+MVC model to design the system has the following advantages: one is convenient and fast access, no client installation is required; the other is clear logic, which can ensure more stable operation of the system [6]. Therefore, combined with the above analysis, this article designs the overall architecture of the system, as shown in Figure 2.
5.2. Function module design

Based on the above-mentioned system roles and architecture design, this article further takes the financial early warning analysis of listed companies as an example to design the functions of the financial risk early warning model system. The functions that the system needs to implement mainly include adding basic user information, early warning model data input, early warning analysis, and analysis result query functions, as shown in Figure 3.
includes the financial early warning analysis model, which classifies risks through SVM and displays the results of the analysis [7]. The financial early warning model is a key module in the enterprise financial risk early warning system designed in this paper. The specific process of realization is shown in Figure 4. To realize the analysis of corporate financial risks, we must first select training samples and test samples. For example, the petrochemical companies in listed companies are used as the main objects of analysis to conduct early warning analysis on the financial risks of petrochemical companies. After selecting the above samples, retrieve the financial data indicators of the above companies, train the samples according to the relevant indicator data entered in the data early warning input, and combine with the model constructed in this article, and finally display the results of the risk analysis to the user through the interface.

![Figure 4. The implementation process of the financial early warning module](image)

**6. Conclusion**

The establishment of the enterprise financial risk early warning system is to provide the management with effective information about the possible occurrence of enterprise financial risks, and to discover problems in the enterprise’s financial operation in a timely manner, to be able to take corresponding preventive measures in a timely manner. Based on the full investigation and analysis of previous research results and empirical research, this system uses fuzzy comprehensive evaluation methods to design a scientific, reasonable, and highly operable corporate financial risk evaluation index system to conduct dynamic and real-time evaluation of financial risks. And monitoring, so that corporate decision-making and management can timely control the financial operation of the enterprise and the size of the financial risk. Building a financial risk early warning system suitable for real estate companies can not only avoid existing financial crises in time, but also analyse the reasons and make recommendations, and fundamentally eliminate hidden dangers, effectively preventing the risks faced by enterprises.
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