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Analysis on Influencing Factors of Financial Risk in China Media Industry Based on Entropy-critic Method and XGBoost

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Abstract: *In order to strengthen the government's understanding and control of the current situation of the media industry, it is necessary to evaluate the performance evaluation and financial risk of media companies. Based on this, firstly, by selecting the data of 66 Chinese listed media companies, this paper analyzes the financial performance evaluation indicators of their four abilities, including operating ability, profitability, development ability and solvency. Then combine the traditional evaluation methods with machine learning, and use entropy method and xgboost to quantify and evaluate the comprehensive financial performance and risk of enterprises. The empirical results show that the model can well reflect the financial risk of enterprises. In addition, we can get that the weights that affect the company's financial risk ability are profitability, development ability, solvency and operation ability from large to small. Finally, this paper puts forward relevant suggestions to promote the healthy development of the media industry and optimize the internal financial management.*

Keywords: *Media Industry; Financial Risk Evaluation; Entropy-critic; XGBoost*

1. Introduction

With the continuous development of the socialist market economy with Chinese characteristics, the media industry has achieved a development process from weak to strong since the reform and opening up. It has changed from the traditional newspaper industry to diversified operations, and then to cross-media operations, which constitutes the complete development context of the media industry. Policy measures such as the "Guiding Opinions on Promoting the Integrated Development of Traditional Media and Emerging Media" and "Opinions on Accelerating the Deep Integration of Media Development" have brought new opportunities for the development of media industry. Media companies are seizing the opportunity to make a new layout and strive to achieve faster and better development in the future. It is of great importance to construct a financial risk model for media companies in order to prevent and respond to potential corporate financial risks, as well as to maintain the stable development of the media industry market and better meeting the information needs of people.

The relevant research on financial risk assessment has begun as early as the 1930s, Fitzpatrick (1932) [1] et al. used a single variable to predict the financial crisis of the enterprise.William Beaver (1996) [2] first proposed a monadic discriminant analysis model. Edward I. Altamn (1968) [3] first proposed the multivariate model.The proposals of these models and their research methods have laid the foundation for subsequent financial risk research. As the research progressed, the domestic literature on financial risk research of listed companies has gradually become richer, the application of models has also become more and more diversified. In 1996, Yang Jihua, Zhou Shouhua, and Wang Ping [4] established the F-score model. Chen Jing (1999) [5] conducted in-depth research and analysis on the basis of existing foreign financial risk models and carried out a systematic study of the financial risks of domestic listed companies on the basis of quantitative for the first time.

Financial risk research can effectively reduce risks and losses. Scholars at home and abroad have used different financial indicators and different models to make predictions, and through continuous optimization of the models, they have obtained better management results. However, the research on this issue still needs to be further in-depth. Based on this, we construct a new financial risk assessment model, which is objective and targeted for the media industry. Specifically, the entropy weight-Critic

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combination weighting method is introduced to determine the weight of each indicator which makes the weights of the indicators have high contrast and objectivity. On this basis, the machine learning method is introduced to obtain the influencing factors which enriches the research methods of the related theories of corporate performance evaluation. The financial risk influencing factors proposed in this article have certain practical significance and forward-looking in practical applications.

2. Financial Risk Evaluation Index System and Data Preprocess

2.1. Construction of Financial Risk Indicator System

In consideration of the dual attributes of the media industry-ideological attributes and industrial attributes, capital agglomeration and industry restrictions in business activities, and a series of characteristics, as well as the three basic principles of the construction, including index system-consistency, systemicity, and applicability, and on the premise of satisfying the timeliness and hierarchy of the index construction system, starting from the perspective of factors affecting the operating performance of listed media companies, based on the existing literature (Li He et al, 2006[7]; Matin et al, 2019 [8]; Xiao Yi et al, 2020 [9]), select 13 financial indicators in 4 aspects of profitability operation, debt repayment and development. Based on these, this article establish a suitable business performance evaluation index system for listed media companies. According to the correlation between the index value and performance evaluation, the index system includes two types of evaluation indexes, which are profit-based indicators and cost-based indicators. The profit index is a positive index. The larger the index value, the better the performance of the evaluation content. Cost indicators are negative indicators. The smaller the indicator value, the better the evaluation content. The indicator system is shown in Table 1.

The financial data of the sample companies are derived from the basic financial data, which has been disclosed by Sina Finance's listed media companies in 2020. One of the characteristics of these data is that it is easy to collect and quantitatively calculate. Since there are certain differences between the nature, dimension, magnitude and other characteristics of each evaluation index, we need to standardize the original data in order to eliminate the impact of the difference on the final result.

Table 1: Listed media company performance evaluation index system

Class of Evaluation Indexes	Name of Evaluation Index	Nature of Index
Profitability(Z1)	Operating profit margin X1	P
	Net sales margin X2	P
	Cost and expense utilization X3	P
	Return on assets X4	P
Operating capacity(Z2)	Liquid assets turnover rate X5	P
	Turnover rate of total assets X6	P
	Fixed assets turnover rate X7	P
Debt solvency(Z3)	Debt-to-asset ratio X8	N
	Cash rate X9	N
	Interest payment multiplesX10	P
	Liquidity ratio X11	N
Development capacity(Z4)	Revenue growth rate of main business X12	P
	Total assets growth rate X13	P

3. Model Construction of Financial Risk Influencing Factors

This article takes the listed companies of Chinese media as the research object. The first step is to select the parameters which representing each capability index, construct an index system and normalize the parameter indexes. Then, when quantifying corporate performance indicators, the entropy method-critic combination weighting method is introduced. Finally, the XGBoost method is used to evaluate the four major indicators affecting corporate financial risks, while the visual method is used to extract the quantitative impact of a single characteristic variable on the financial risks of the Chinese media industry.

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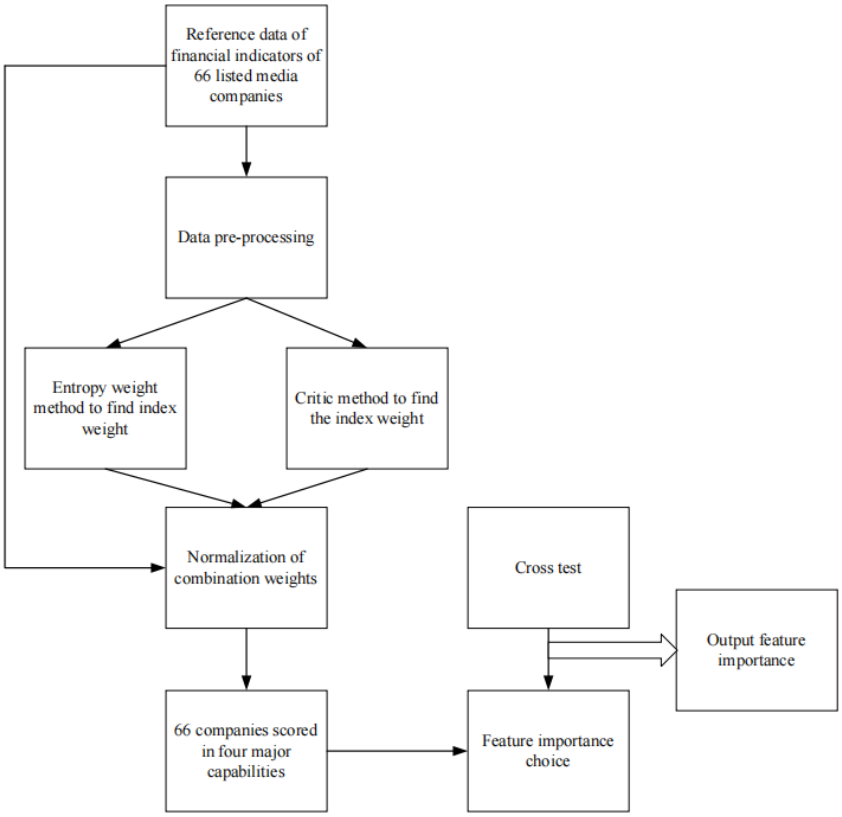

Figure 1: An analysis flow chart of the financial risk influencing factors

3.1. Quantitative of Financial Capability Based on Entropy-critic

In order to objectively and effectively study the performance of the media company in the sample, a combination of entropy method and Critic is used for performance evaluation, which can avoid the impact of subjective methods. The results are as follows:

Table 2: Weights of performance indicators portfolio

Index	Entropy method	Critic	Combination weight
X1	0.0428	0.0564	0.0299
X2	0.0392	0.0619	0.0301
X3	0.0633	0.0656	0.0515
X4	0.0456	0.0660	0.0374
X5	0.1245	0.0767	0.1185
X6	0.1134	0.0717	0.1008
X7	0.1239	0.0824	0.1266
X8	0.0422	0.0740	0.0387
X9	0.1523	0.1031	0.1946
X10	0.0823	0.0763	0.0779
X11	0.0653	0.0949	0.0769
X12	0.0669	0.1014	0.0842
X13	0.0383	0.0694	0.0330

Construct a weighted performance evaluation matrix, and multiply the performance evaluation matrix with the entropy-Critic combination performance evaluation index weighted vector to obtain the weighted performance evaluation matrix, then we can obtain the scores of four factors (z). From Tab. 2, it can be seen that the Operating capacity and Debt solvency account for more weight in the comprehensive weights. Among them, the Cash rate which represents the Debt olvency accounts for the largest proportion among all indicators. It shows that media companies should pay more attention to the use and supervision of cash in their daily operations.

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3.2. Analysis on Influencing Factors of Financial Risk

The financial risk of listed companies is a two-category model. One type is financially normal, and the other type is treated with special treatment. In China, if the net profit of a listed company is negative for two consecutive years, it will be marked and treated specifically, that is, it will be marked ST . If the net profit of a listed company is negative for three consecutive years, it will be warned of delisting and will be marked $^{*}ST$. In the sample, the ratio of ST companies and non-ST companies is 8:25. At present, the basic models and methods widely used in financial risk prediction focus on traditional statistical models and machine learning methods. Among the machine learning methods, the XGBoost algorithm is a relatively new ensemble learning method in the field of machine learning at present, and it has strong superiority and robustness in predictive classification problems. It generates learners iteratively, and there is a strong dependence between the previous and subsequent learners. This article chooses XGBoost algorithm to study the factors affecting financial risk. The average structural score gain of branching features can reflect the importance of the features, that is, the importance of the financial default forecast for listed media companies, and the importance ranking of all features can be derived from this:

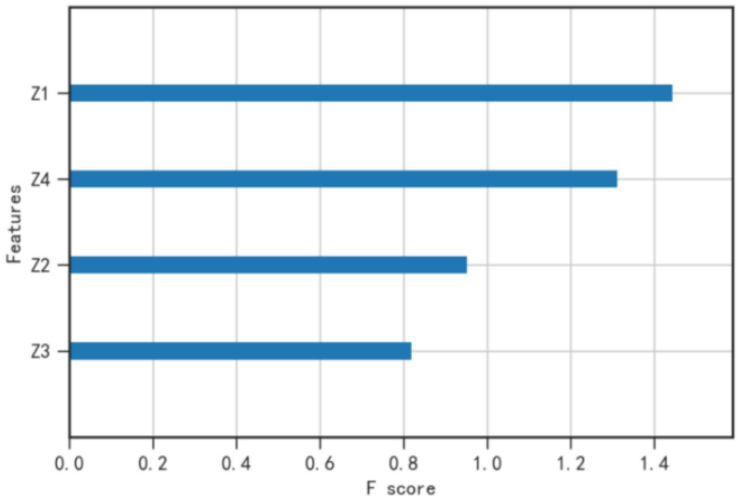

Figure 2: Ranking of the four major capabilities of listed media companies by importance

According to XGBoost and cross-validation analysis, for the performance evaluation of listed media companies, the weights that affect the company's financial risk ability are profitability, development, debt repayment, and operation, in descending order. It can be seen from Table 4 that the profitability of the media companies marked with ST is negative. We can tell that the profitability has a greater impact on the performance evaluation of media companies, and the experimental results are consistent with the actual situation. In the process of daily operation, media enterprises should focus on improving profitability. In the future work, more variables can be introduced, such as the content of other chapters in the company's annual report, company research reports, financial news, investor comments, etc., to better analyze the impact of different text content on the financial risk forecast of listed companies and improve the model's prediction accuracy.

4. Conclusion

The financial situation of listed Companies in the media industry is an important factor related to the long-term development of enterprises. Therefore, in the operation process of listed companies, a scientific and reasonable financial performance evaluation model should be established to evaluate the financial situation of enterprises timely and accurately. According to the evaluation results, the future development of the enterprise is effectively planned to improve the operation efficiency and avoid financial risks to a certain extent. Based on the relevant financial data, this paper constructs the financial risk evaluation index system of the media industry, and uses the combination of traditional evaluation methods and machine learning to construct a new financial risk evaluation model. The empirical results show that among the four capabilities selected, the degree of impact on the financial performance of listed media enterprises from large to small is profitability, development ability, operation ability and solvency. Based on this, combined with the actual development of the media industry, the following suggestions are put forward:

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As far as the performance evaluation of the media industry is concerned, profitability occupies a relatively high share. However, it can be seen from Table 4 that only a few listed media companies have high profitability, so the companies need to constantly explore new profit models. For example: companies can take the road of diversified operations, pay attention to the development of formal products and extended products, and expand profitability. Companies can establish cross-media business concepts, integrate traditional media and new media, and open up new horizons for profit. As far as the media industry is concerned, its development capability cannot be underestimated either. The sustainable and healthy development of an enterprise is of great significance to the steady development of the enterprise itself and the entire society. Companies can build brand advantages and speed up sustainable development. The government can introduce relevant policies, such as tax cuts and financial support, to help media companies develop steadily and healthily as well as to make up for their shortcomings in corporate development.

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