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Original Paper

Research on Financial Risk Evaluation of Tobacco Companies Based on Entropy Weight TOPSIS

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Abstract

Domestic economic development has switched from high-speed growth to a new stage of high-quality development, which makes domestic enterprises have to study the connotation of high-quality development. Financial risk assessment is one of the important basis for high-quality development, which promotes the relationship between balanced development and risk. This paper takes tobacco enterprises as the research object, through collecting the existing financial risk evaluation content of tobacco enterprises, and building the financial risk evaluation system, using entropy weight TOPSIS method, calculates the advantages and disadvantages of the financial risk work of each company under the same standard system, promotes benchmarking learning between different tobacco companies, improves the level of financial risk control, and promotes the high-quality development of tobacco enterprises.

Keywords

Tobacco company, Financial risk assessment, Entropy weight TOPSIS, Internal controls

1. Introduction

In recent years, China's economy has gradually entered the stage of high-quality development from the stage of sustained high growth. The problems existing in the internal management of the tobacco industry in the past, such as weak implementation of the internal control system, weak awareness of

risk management, and excessive reliance on institutional shelter, have gradually been exposed. How to strengthen enterprise risk management, how to scientifically analyze the risk problems existing in the production and operation management, and how to effectively identify, objectively evaluate and actively respond as soon as possible have become an important issue facing the tobacco industry.

1.1 Problems in Financial Risk Assessment of Tobacco Companies

At present, the financial risk evaluation of tobacco companies is mainly from five aspects: risk prevention and control system, risk prevention and control means, risk management and control pre judgment, risk identification system and risk control personnel's quality, but there are many problems in practical application. First of all, the risk prevention and control system is not perfect. Because each business line has formulated its own line related management system, there is a conflict between financial management requirements and business management requirements, and there may also be a deviation in system understanding caused by professional barriers, which restricts the regulatory efficiency of enterprises on financial management risks. The means of prevention and control are shown in the audit and accounting of ordinary business activities, and the audit department is usually responsible for the post audit. Lack of risk management and control, lack of pre judgment awareness, and internal audit will be intervened by the head of relevant units or actual executors, resulting in the lack of accuracy of its regulatory results. The risk identification and evaluation system is not perfect. The company's identification of risk points in financial management mostly stems from problems reflected in various inspections, audit supervision, voucher audit, etc. The quality of risk management and control is not high, and the quality level of financial internal control personnel is uneven. In addition, most of the relevant personnel engaged in financial work at the county and district levels are non full-time financial personnel, and the degree of professional education is also different.

1.2 Research on Financial Risk Evaluation

Hu, Bai, and Wang (2018) Using AHP method to determine the index weight and establish DEA model to evaluate hospital financial risk (Hu, Bai, & Wang, 2018); Qi and Cai (2018) Using factor analysis to evaluate the financial risk of real estate enterprises (Cai, 2018); Wu, Bi, and Che (2019) Construction of default risk evaluation model for bond issuers (Wu, Bi, & Che, 2019); Zhao, Yang (2019) Establishing the financial risk evaluation system of Jiugui Liquor by TOPSIS method (Zhao & Yang, 2019); Hu (2020) The outsourcing risk of enterprises is evaluated based on failure mode and effect analysis method (Hu, 2020); Li Y. H., and Li, Y. etc. (2021) It is pointed out that financial risk prevention and control can be established from financial statement data (Li, Y. H., Li, Y., Su, et al., 2021); Wu, Wang, Zhu, etc. (2021)., This paper studies the financial risk control of enterprises from the perspective of resource value flow (Wu, Wang, Zhu et al., 2021); Li (2021) The financial risk evaluation model of feed enterprises was constructed (Li, 2021); Sun, Wang and Zhang (2021) Using TOPSIS method to evaluate the financial risk of enterprises (Sun, Wang, & Zhang, 2021); Guo and Li (2022) Using analytic hierarchy process to construct hospital financial risk system (Guo & Li, 2022); Teng and Li (2022) Research on financial risk prevention and control of cultural and creative

enterprises using entropy weight TOPSIS method (Teng & Li, 2022); Wei, Han, and Wang (2023) Using fuzzy evaluation matrix to evaluate the cash flow risk of real estate enterprises (Wei, Han, & Wang, 2023).

There are a lot of works on financial risk management and evaluation. From the perspective of financial evaluation research, it mainly uses complex decision-making models with multiple influencing factors, such as analytic hierarchy process, TOPSIS method, etc., and is widely used in the industry, including hospitals and enterprises. It also provides a mature, reliable and scientific financial risk model for the financial risk evaluation of tobacco enterprises.

2. Construction of Financial Risk Evaluation System Based on TOPSIS

Build a comprehensive financial management risk evaluation system to improve the level of financial risk management, improve the risk prevention and control system, diversified risk prevention and control, effective risk management and control pre judgment, and continuously improve the risk prevention and control literacy of the whole staff, establish a perfect risk evaluation system, and reduce financial risk through the search for the best.

Entropy weight TOPSIS method is the combination of entropy weight method and TOPSIS method. Entropy weight method calculates the weight value, and TOPSIS carries out comparison and ranking to judge the size of enterprise financial risk.

2.1 Construction of Evaluation Matrix

The evaluation matrix is constructed, including n evaluation indexes and m evaluation objects, and is the evaluation value of the j object corresponding to the i evaluation index.

$$C_m = C_{ij} = \begin{bmatrix} C_{11} & \cdots & C_{1m} \\ \vdots & \ddots & \vdots \\ C_{n1} & \cdots & C_{nm} \end{bmatrix} \quad \text{.....(1)}$$

In order to compare the objects of different units, it is necessary to remove their units. The most effective way is standardization. Generally speaking, the larger the positive index value of the benefit index, the better. On the contrary, the smaller the negative index, the better. A new standardized matrix is formed, which is easier to calculate the proportion of each item.

Positive indicators:

$$N_{ij} = \frac{C_{ij} - min_j\ (C_{11},\ C_{21},\ \ldots C_{n1})}{max_j(C_{11},\ C_{21},\ \ldots C_{n1}) - min_j\ (C_{11},\ C_{21},\ \ldots C_{n1})} \quad \text{.....(2)}$$

Negative indicator:

$$N_{ij} = \frac{max_j(C_{11},\ C_{21},\ \ldots C_{n1}) - C_{ij}}{max_j(C_{11},\ C_{21},\ \ldots C_{n1}) - min_j\ (C_{11},\ C_{21},\ \ldots C_{n1})} \quad \text{.....(3)}$$

Form a new standardized matrix B_N

$$B_N = N_{ij} = \begin{bmatrix} N_{11} & \cdots & CN_{1m} \\ \vdots & \ddots & \vdots \\ N_{n1} & \cdots & N_{nm} \end{bmatrix} \quad \text{.....(4)}$$

2.2 Weight Value Calculation

Proportion calculation after standardization:

$$P_{ij} = \frac{N_{ij}}{\sum_{j=1}^{m} N_{ij}} \quad \text{.....(5)}$$

Calculate the entropy of each index:

$$e_i = \frac{-1}{\ln n}\left(\sum_{j=1}^{m} P_{ij} \ln P_{ij}\right) \quad \text{.....(6)}$$

Calculate the weight of each indicator:

$$w_i = \frac{1-e_i}{\sum_{i=1}^{n}(1-e_i)} \quad \text{.....(7)}$$

2.3 Ideal Point Calculation

Calculate the Euclidean distance and rank the evaluation elements. According to the principle from large to small, the risk of ranking the former is low.

$$d_i^* = \sqrt{\sum_{i=1}^{n} \frac{(N_{ij} - N_{jmax})^2}{w_i}} \quad \text{.....(8)}$$

3. Application of Entropy Weight TOPSIS Financial Risk Evaluation Model

The main responsibilities of the financial management section of tobacco companies include budget, funds, assets, accounting, tax management and other modules. In order to achieve the business development goals, the focus of each module of the financial department is different. Budget management focuses on the company's operation and development orientation, making overall consideration, reasonably planning various resources, controlling and assessing them, and playing a leading role in financial management. The fund management work mainly involves the daily management of bank accounts and funds, and aims at the safety, efficiency and effectiveness of funds. Asset management focuses on the safety, value preservation and structural proportion of assets. Accounting focuses on compliance and authenticity.

3.1 Selection of Evaluation Index

Internal control system. Taking full account of the particularity of the tobacco industry, it has less autonomy in the key areas of traditional financial risks such as financing, financing and investment,

and the demand is not high. Therefore, the main focus of internal control is still the formulation and implementation of various financial management systems. The internal control system includes the financial management system, as well as various industry financial management systems related to the depth of financial management, such as material procurement management system, project investment and maintenance management system, contract management system, monopoly fund management system, logistics storage management system, vehicle management system, etc.

Financial risk prevention strategy. The response to financial management risks is no longer just relying on finance or audit or some other separate department to conduct all-round and multi angle evaluation and disposal of risk matters found in daily inspection and special inspection. The financial department shall cooperate with the special supervision and discipline inspection and supervision departments to coordinate and cooperate with each other according to their respective responsibilities and authorities, and adopt the methods of management supervision, special supervision and discipline enforcement supervision respectively to ensure that the risk matters are fully controllable.

Financial risk prevention and control level. In the process of daily financial management, we supervise financial related behaviors, mainly by means of financial risk assessment (regular written examination), capital flight inspection, comprehensive financial inspection, temporary inspection, special audit and so on, and evaluate various realistic risk matters in this process.

Identification of financial risk level. According to the results of risk information collection and in combination with the actual situation of the unit, analyze and judge whether the risk is caused and its type, and classify the identified risk items into "medium", "medium", "high" and "serious".

Financial risk feedback strategy. In the process of risk identification, assessment and response, if it is found that the process is unreasonable, the system is defective, or the system does not adapt to the development situation and work requirements of the industry, it shall timely put forward relevant opinions and suggestions for improvement, so as to achieve the purpose of improving the system, optimizing the process and consolidating the atmosphere.

3.2 Construction and Standardization of TOPSIS Evaluation Matrix

Invite experts in financial risk prevention and control in the industry to evaluate the five indicators of different tobacco companies, with a score of 1-5, the lowest score of 1 and the highest score of 5, taking an integer.

	internal control system	Financial risk prevention strategy	Financial risk prevention and control level	Identification of financial risk level	Financial risk feedback strategy
Company A	2	3	1	1	1
Company B	4	5	2	1	3

Company C	1	3	4	4	1
Company D	3	5	5	1	2
Company E	1	1	4	4	3
Max	4	5	5	4	3

Normalization of evaluation matrix

	internal control system	Financial risk prevention strategy	Financial risk prevention and control level	Identification of financial risk level	Financial risk feedback strategy
Company A	0.33	2.00	1.67	0.67	0.75
Company B	1.00	2.00	1.00	0.67	1.25
Company C	1.33	3.00	1.00	1.33	0.25
Company D	1.33	2.00	0.67	0.33	1.00
Company E	0.67	3.00	0.67	0.67	1.00

Proportion calculation after standardization

	internal control system	Financial risk prevention strategy	Financial risk prevention and control level	Identification of financial risk level	Financial risk feedback strategy
Company A	0.01	0.07	0.06	0.02	0.03
Company B	0.03	0.07	0.03	0.02	0.04
Company C	0.05	0.10	0.03	0.05	0.01
Company D	0.05	0.07	0.02	0.01	0.03
Company E	0.02	0.10	0.02	0.02	0.03

3.3 Entropy and Weight Calculation

Calculate the entropy of each company

	Entropy
Company A	-0.003
Company B	-0.226
Company C	-0.007
Company D	0.017
Company E	0.006

Calculate the weight of each company

	Weight value
Company A	0.19
Company B	0.24
Company C	0.19
Company D	0.19
Company E	0.19

3.4 Ideal Distance Calculation

Calculate the Euclidean distance and rank the evaluation elements. According to the principle from large to small, the risk of ranking the former is low.

	Euclidean distance value
Company A	8.00
Company B	14.75
Company C	14.74
Company D	11.83
Company E	7.14

Arranged from large to small, B, C, D, A, E, Through the calculation of Euclidean distance, it shows that company B does the best in financial risk.

4. Suggestions on Application of Risk Assessment System

4.1 Assign Value to Risk Items to Realize Quantifiable Risk Identification

Based on the extensive collection of laws and regulations, internal control systems, risk cases and other information, 284 specific financial risk matters in five major aspects of the city were sorted out. At the same time, according to the probability of occurrence of the risk and the possible impact, carry out two-dimensional evaluation, and assign values ranging from 1 to 10 points respectively. In this way, it fundamentally solves the difference in risk assessment caused by personal subjective judgment, reduces misjudgments and omissions caused by staff's lack of professionalism and incomplete access to information, and basically realizes the standardization of risk assessment.

4.2 Predict Risk Matters in Advance and Diversify Management Methods

By means of evaluation, inspection and other means, the risk perception level of relevant personnel is evaluated, and the deviation of ideological understanding and understanding level can be corrected at the first time, and the risk matters can be found and handled at the embryonic stage, so as to reduce the loss caused by "self righteous". At the same time, special supervision and discipline enforcement supervision are included in the risk management system, and the management responsibilities and obligations of other relevant departments other than the financial department are clarified, which makes the implementation ability of the management system more perfect and effective, and also makes up for

the shortcomings of incomplete financial management to a certain extent.

4.3 Establish Team System Guarantee and Realize the Normalization of Dynamic Management

Because the management system is not limited to the risks related to financial accounting, but focuses on the whole process risks related to finance. For example, risks in material procurement management and asset construction and disposal do not involve financial accounting risks in the early stage of implementation, but they still cover many risks related to financial management according to the requirements of standardization and standardization. A risk identification and assessment team covering all lines and departments has been established to regularly update and maintain the formulation of risk lists and assessment standards, regularly evaluate and supervise the level of risk management, strengthen the compliance control of the source, the compliance control of the process and the compliance monitoring of the results, and form a full process financial management risk prevention and control system.

Informatization is a powerful tool to promote the construction of risk assessment system, and the assignment of all risk items is maintained in the data platform. During the process of work items, risk assessment can be carried out according to the constantly updated process data, and risk prompt and early warning can be carried out in time. At the same time, through regular financial management risk training, special analysis and lectures on different types of risks are carried out to improve employees' prediction level of unknown crisis. The personnel of the financial audit department should also change their thinking, gradually transform from the traditional post supervision function to the modern management function, and jointly promote the development of the enterprise.

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