

Construction of Enterprise Bankruptcy Pre-alarm Mechanism and Analysis of the Applicability of Bankruptcy Law in the Pre-alarm Mechanism

Wang Wei

*School of Business, Hong Kong Baptist University, Hong Kong, 999077, China
okwangwei@life.hkbu.edu.hk*

Keywords: Enterprise bankruptcy; Pre-alarm mechanism; Bankruptcy law; Index system; Risk management

Abstract: Facing the universality of current enterprise bankruptcy and its far-reaching impact on social economy, it is particularly important and urgent to build a pre-alarm mechanism for enterprise bankruptcy. The purpose of this article is to explore how to effectively construct the pre-alarm mechanism of enterprise bankruptcy, and analyze the specific application and effect of bankruptcy law in this mechanism. This article expounds the basic theory and framework of enterprise bankruptcy pre-alarm mechanism, including the concept, significance, theoretical basis and construction framework of pre-alarm. On this basis, the construction strategy and practice of pre-alarm index system are discussed in detail. It also deeply analyzes the applicability of bankruptcy law in the pre-alarm mechanism of bankruptcy, including the basic functions and principles of bankruptcy law, its role in the pre-alarm mechanism and the challenges and countermeasures in its application. Finally, it puts forward a pre-alarm mechanism framework including index system design, information collection and processing, risk assessment, pre-alarm signal release and countermeasures, and discusses the legal support role of bankruptcy law in this mechanism. The research results show that the establishment of enterprise bankruptcy pre-alarm mechanism needs to comprehensively consider financial indicators, non-financial indicators and relevant provisions of bankruptcy law to ensure the accuracy and reliability of pre-alarm results.

1. Introduction

In the current global economic environment, enterprise bankruptcy has become a phenomenon that can not be ignored [1]. With the intensification of market competition, the fluctuation of economic cycle and the increase of internal and external risk factors, more and more enterprises face the threat of bankruptcy [2]. Enterprise bankruptcy will not only cause a devastating blow to the enterprise itself, but also have a far-reaching negative impact on suppliers, customers, employees and the entire social and economic system [3]. Therefore, it is of great significance to build an effective pre-alarm mechanism for enterprise bankruptcy in order to find and deal with potential bankruptcy risks in time, which is of great significance for protecting enterprise interests,

maintaining social stability and promoting economic development [4].

In academic circles, the research on enterprise bankruptcy pre-alarm mechanism and bankruptcy law has achieved certain results [5]. Scholars have deeply discussed the pre-alarm mechanism of enterprise bankruptcy from different angles, and put forward a variety of pre-alarm models and index systems [6]. At the same time, bankruptcy law, as an important legal basis for enterprise bankruptcy treatment, has also received extensive attention and research [7]. However, there are still some deficiencies and disputes in the existing research on the construction method of pre-alarm mechanism, the specific application of bankruptcy law and the combination between them. Therefore, based on the existing research results, this article will further expand and deepen the research in this field.

In view of the importance of enterprise bankruptcy pre-alarm mechanism, this article aims to explore how to effectively construct this mechanism. Specifically, this article will pay attention to the design principle, implementation steps and effect evaluation in practical application of pre-alarm mechanism. At the same time, this article will also analyze the specific application and effect of bankruptcy law in the pre-alarm mechanism of enterprise bankruptcy, and discuss how to provide support and guarantee for the pre-alarm mechanism through legal means. Through this research, it is expected to provide useful reference and enlightenment for enterprise managers, policy makers and legal practitioners.

2. Basic theory of enterprise bankruptcy pre-alarm mechanism

2.1. The concept of enterprise bankruptcy pre-alarm

Pre-alarm of enterprise bankruptcy is a kind of management activity that gives an alarm in advance by monitoring and analyzing various factors that may cause bankruptcy risk in the internal and external environment of enterprises, so that enterprises can take timely measures to prevent and resolve risks [8]. It is not only an important part of enterprise risk management, but also an important means to protect the interests of enterprise stakeholders. Through the pre-alarm of bankruptcy, enterprises can identify potential risk points before the crisis occurs, so as to have enough time to make adjustments and avoid or reduce the losses caused by bankruptcy. At the same time, the pre-alarm of bankruptcy is also helpful to improve the risk management ability of enterprises and enhance their market competitiveness and sustainable development ability.

2.2. Theoretical basis of pre-alarm mechanism

The construction of enterprise bankruptcy pre-alarm mechanism needs to rely on a certain theoretical basis [9]. Among them, the enterprise life cycle theory provides a time dimension reference for the pre-alarm mechanism, which emphasizes the different risks and challenges that enterprises may face in different development stages. Risk management theory provides methodological support for pre-alarm mechanism, which emphasizes the importance of risk identification, evaluation, response and monitoring [10]. Information asymmetry theory reveals the imbalance of information flow between internal and external enterprises, and provides theoretical guidance for information collection and processing in pre-alarm mechanism. These theories together constitute the theoretical basis of enterprise bankruptcy pre-alarm mechanism and provide a scientific basis for the construction of pre-alarm mechanism.

2.3. Construction framework of pre-alarm mechanism

Based on the aforementioned theoretical foundation, this section constructs a framework for an

enterprise bankruptcy pre-alarm mechanism that encompasses the following five key components:

Design of Indicator System: According to the actual situation of the enterprise and the pre-alarm objectives, a comprehensive and scientific pre-alarm indicator system is designed, which includes financial indicators, non-financial indicators, etc.

Information Collection and Processing: Relevant information both internal and external to the enterprise is collected through various channels, and is then organized, classified, and processed to provide accurate data support for risk assessment.

Risk Assessment: A combination of qualitative and quantitative methods is employed to analyze and assess the collected information, determining the magnitude and level of bankruptcy risk faced by the enterprise.

Release of Warning Signals: Based on the risk assessment results, warning signals are promptly released to alert enterprise managers and stakeholders to pay attention and take corresponding measures.

Response Measures: According to the warning signals, corresponding response measures are formulated and implemented, such as adjusting business strategies, strengthening internal controls, and seeking external support, in order to mitigate or reduce the bankruptcy risk.

3. Construction strategy of enterprise bankruptcy pre-alarm mechanism

3.1. Construction of pre-alarm index system

When constructing the pre-alarm index system of enterprise bankruptcy, this article follows the following principles: comprehensiveness, scientificity, operability and dynamics. The setting of specific indicators covers the financial status, operating ability, market competitiveness, industry environment and other aspects of the enterprise, as shown in Table 1:

Table 1: Enterprise Bankruptcy Pre-alarm Indicator System

Indicator Category	Specific Indicators
Financial Status	Debt-to-Asset Ratio
	Current Ratio
	Quick Ratio
	Interest Coverage Ratio
	Return on Net Assets (RONA)
Operating Capability	Inventory Turnover Ratio
	Accounts Receivable Turnover Ratio
	Total Asset Turnover Ratio
	Sales Revenue Growth Rate
	Net Profit Growth Rate
Market Competitiveness	Market Share
	Customer Satisfaction
	Brand Influence
	New Product Development Capability
Industry Environment	Industry Growth Rate
	Level of Industry Competition
	Changes in Industry Policies and Regulations
	Technological Advancements in Industry
Dynamic Indicators	Cash Flow Volatility
	Business Risk Coefficient
	Market Sensitivity

The table aims to comprehensively and scientifically reflect the enterprise's bankruptcy

pre-alarm index system, and help enterprises find potential risks in time and take corresponding countermeasures.

3.2. Pre-alarm model and method

At present, the commonly used enterprise bankruptcy pre-alarm models include Z-score model, Logistic regression model and neural network model. These models have their own advantages and disadvantages, and are suitable for different enterprise types and pre-alarm needs.

Among them, Z-score model is a multivariate discriminant analysis model based on financial ratio, which is suitable for bankruptcy prediction of listed companies. Logistic regression model is a binary classification model based on probability statistics, which is suitable for predicting and judging binary classification problems. Neural network model is a complex network model that simulates the working mechanism of human brain neurons. It has strong nonlinear mapping ability and self-learning ability, and is suitable for dealing with complex data relations and pattern recognition problems. In practical application, we should choose the appropriate pre-alarm model and method according to the specific situation and pre-alarm needs of enterprises, and combine expert judgment and experience to revise and improve it.

At present, the neural network model is particularly prominent in the pre-alarm model of enterprise bankruptcy. This model simulates the working mechanism of human brain neurons, constructs complex networks, and shows strong nonlinear mapping and self-learning ability, which is especially suitable for analyzing complex data association and performing pattern recognition tasks. In actual deployment, it is necessary to closely fit the actual situation and pre-alarm needs of enterprises, select neural network models as pre-alarm tools, and integrate expert opinions and practical experience to continuously adjust and optimize them. The structure of the enterprise bankruptcy risk identification model is shown in Figure 1.

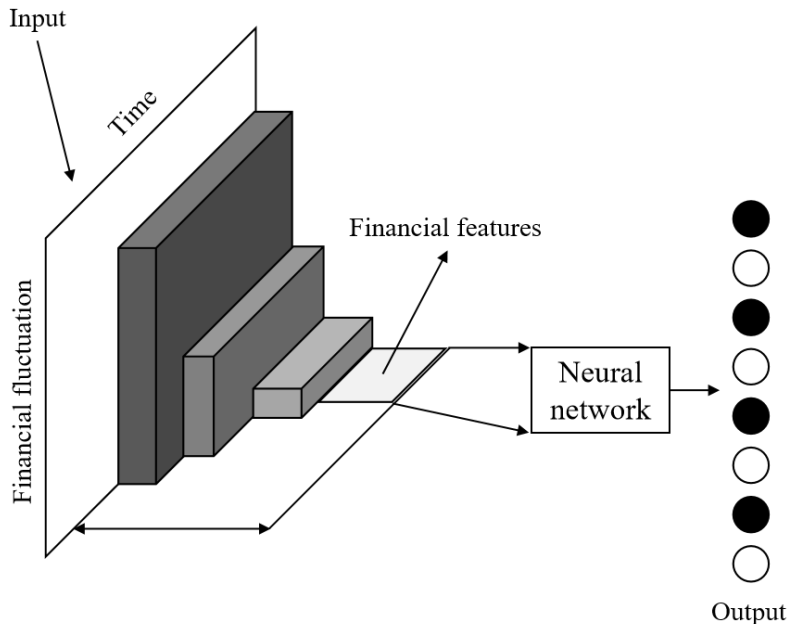


Figure 1: Bankruptcy Risk Identification Model

Assume that the enterprise financial data comprises N samples, with each sample possessing P features, and the input sample being x . The automatic de-noising encoder initially corrupts the input sample x by sampling from a binomial distribution, randomly selecting a subset of samples to introduce noise:

$$n = N \quad p = p_q \quad (1)$$

The automatic encoder, after denoising, transforms the corrupted input x into a high-level representation y via a hidden neural network. Given are the weight matrix W , deviation b , and coding functions $h(\cdot)$ and y , expressed as follows:

$$y = h(Wx + b) \quad (2)$$

The decoder transforms y into z , while z mirrors the structure of input x . z serves as a prediction for x , whereas reconstructing z involves a denoising process that restores the input based on the corrupted sample x . The weight matrix \tilde{W} , deviation \tilde{b} , and decoding functions $g(\cdot)$ and z for a specific decoder can be represented similarly to those of the encoder.

$$z = g(\tilde{W}y + \tilde{b}) \quad (3)$$

4. Applicability of bankruptcy law in bankruptcy pre-alarm mechanism

4.1. Basic functions and principles of bankruptcy law

As a legal norm to adjust the bankruptcy relationship of enterprises, the core function of bankruptcy law is to handle the bankruptcy events of enterprises fairly and orderly and protect the legitimate rights and interests of creditors, debtors and other stakeholders. Its main contents include liquidation, reorganization, reconciliation and other procedures, as shown in Table 2:

Table 2: Overview of Key Contents in Bankruptcy Law

Procedure Type	Main Contents	Objectives & Characteristics
Liquidation	Declaring the enterprise bankrupt, with a liquidation group taking over the enterprise to conduct liquidation, evaluation, disposal, and distribution of bankruptcy assets	Fairly repaying the debts of all creditors and terminating the legal entity status of the enterprise
Reorganization	Conducting business restructuring and debt adjustment for enterprises that may be or are already in a state of bankruptcy but have prospects for revitalization	Rescuing the enterprise, restoring its operating capabilities, and avoiding liquidation
Composition	Reaching an agreement on debt repayment between the debtor and the creditors' meeting when the debtor faces bankruptcy, which is then reviewed and approved by the court to suspend the bankruptcy procedure	Avoiding enterprise bankruptcy, providing the debtor with an opportunity to reorganize the business, and achieving a win-win situation for both creditors and debtors

The basic principles of bankruptcy law include fairness, efficiency and protection of the weak. The principle of fairness requires that all creditors should be treated fairly in the process of enterprise bankruptcy, so as to ensure that they can get corresponding repayment according to legal procedures. The principle of efficiency requires that the bankruptcy process should be as efficient as possible to reduce the social costs and economic losses caused by bankruptcy. The principle of protecting the weak emphasizes that special attention should be paid to the rights and interests of weak creditors and employees in bankruptcy processing to ensure that their legitimate rights and

interests are not infringed.

4.2. The role of bankruptcy law in pre-alarm mechanism

Bankruptcy law plays an important legal support role in the pre-alarm mechanism of bankruptcy. First of all, through the reorganization procedure, the bankruptcy law provides a legal way for enterprises to restore their business ability. When an enterprise is faced with bankruptcy crisis, it can adjust its debt structure and improve its management through reorganization procedures, so as to avoid bankruptcy liquidation and protect its sustainable operation value. Secondly, the liquidation procedure in the bankruptcy law provides legal protection for creditors. When the enterprise can't avoid bankruptcy, the liquidation procedure can ensure that the creditor's rights are paid off fairly, and prevent debt evasion and asset loss. In addition, the bankruptcy law also provides a legal platform for creditors and debtors to solve debt problems through reconciliation procedures, which is helpful to alleviate the debt pressure of enterprises.

4.3. Challenges and countermeasures in the application of bankruptcy law

Although bankruptcy law plays an important role in the pre-alarm mechanism of bankruptcy, it still faces some challenges in practical application. First of all, the lack of law enforcement is a prominent problem. Because bankruptcy cases involve multiple interests, there may be problems such as local protectionism and poor implementation in the implementation process, which leads to the failure to effectively implement the bankruptcy law. In view of this problem, the government should strengthen the law enforcement, improve the enforcement mechanism, and ensure that the provisions of the bankruptcy law are strictly enforced.

Secondly, the low judicial efficiency is also a challenge in the application of bankruptcy law. Bankruptcy cases usually involve complicated legal relations and a large amount of evidence materials, and the trial period is long and the procedures are cumbersome, which leads to low judicial efficiency. In order to improve judicial efficiency, the government can optimize the trial process of bankruptcy cases, strengthen the construction of judges, and improve the professional quality and trial ability of judges.

Thirdly, in practice, due to irregular financial management, the majority of small, medium, and micro-sized enterprises (SMEs) face safety challenges for their operators and shareholders if they voluntarily apply for bankruptcy. For instance, frequent financial transactions or receipt and payment on behalf of the company between operators, shareholders, and the company may be ruled by the court as financial confusion between individuals and the company, resulting in personal collateral liability for the company's debts. Another example is that if shareholders are suspected of capital flight, false capital contributions, or misappropriation of company funds, voluntarily applying for bankruptcy may expose operators and shareholders to criminal risks. Based on these safety considerations, most SMEs prefer to be enforced by the court rather than voluntarily applying for bankruptcy, which reduces the applicability of bankruptcy law among SMEs. To enhance the applicability of bankruptcy law in situations where debtor companies voluntarily apply for bankruptcy, firstly, the government should strengthen training and guidance. Operators and shareholders should standardize their finances and operate in compliance from the inception of the company to avoid the risk of financial confusion. Meanwhile, the law should provide more friendly and lenient bankruptcy policies for non-malicious operators and shareholders. Secondly, the law should offer opportunities for errant operators and shareholders to rectify their mistakes, enabling them to participate in and promote bankruptcy procedures with a more positive mindset and clearer responsibility expectations, thereby resolving social conflicts and promoting economic development.

In addition, the bankruptcy law may face other challenges in practical application, such as inaccurate asset evaluation of bankrupt enterprises and difficulty in convening creditors' meetings. To solve these problems, the government should improve the relevant supporting systems, such as establishing professional asset appraisal institutions and optimizing the creditors' meeting system, so as to ensure the smooth implementation of the bankruptcy law.

5. Conclusions

This article focuses on the construction of enterprise bankruptcy pre-alarm mechanism and its combination with bankruptcy law. By reviewing the common phenomenon of enterprise bankruptcy and its influence on social economy, the article emphasizes the importance and urgency of building a pre-alarm mechanism for enterprise bankruptcy. In this article, the basic theory and framework of enterprise bankruptcy pre-alarm mechanism are elaborated in detail, including the concept and significance of pre-alarm, the theoretical basis of pre-alarm mechanism, and a pre-alarm mechanism framework including index system design, information collection and processing, risk assessment, pre-alarm signal release and countermeasures. In terms of construction strategy and practice, this article deeply discusses the construction principle of pre-alarm index system, the setting and weight distribution of specific indicators, and the applicability of commonly used pre-alarm models and methods in different types of enterprises.

To sum up, the construction of enterprise bankruptcy pre-alarm mechanism is a systematic project, which needs to comprehensively consider the financial situation, operating ability, market competitiveness and other aspects of the enterprise, and formulate a comprehensive and scientific pre-alarm index system and countermeasures in combination with the relevant provisions of the bankruptcy law. At the same time, the dynamic adjustment and optimization of pre-alarm mechanism is also essential to adapt to the changes of internal and external environment of enterprises and the development of bankruptcy law.

References

- [1] Wang Jianyu, Wang Xingyi, Wang Feng. *Research on Financial Crisis Pre-alarm of Listed Companies in Sporting Goods Industry [J]. Technical Economy and Management Research*, 2019, (05):74-80.
- [2] Jia Nan. *Research on information disclosure of actual controllers of listed companies in bankruptcy and reorganization [J]. Securities market herald*, 2023(4):53-61.
- [3] Ding Yan. *The alienation of debt financing of bankrupt and reorganized enterprises and its solution [J]. Journal of East China University of Political Science and Law*, 2019, 22(04):170-177.
- [4] Li S, Quan Y. *Financial Risk Prediction for Listed Companies using IPSO-BP Neural Network[J]. International Journal of Performability Engineering*, 2019, 15(4):1209-1219.
- [5] Jin M, Wang Y, Zeng Y. *Application of data mining technology in financial risk analysis[J]. Wireless Personal Communications*, 2018, 102: 3699-3713.
- [6] Liang Y, Quan D, Wang F, et al. *Financial big data analysis and pre-alarm platform: a case study[J]. IEEE Access*, 2020, 8: 36515-36526.
- [7] Li S, Lin D. *Pre-alarm of financial statement data leakage risk based on grey fuzzy comprehensive evaluation[J]. International Journal of Applied Systemic Studies*, 2023, 10(3):232-242.
- [8] Zeng H. *Influences of mobile edge computing-based service preloading on the early-warning of financial risks[J]. The Journal of Supercomputing*, 2022, 78(9):11621-11639.
- [9] Li S, Chen X. *Research on Financial Risk Crisis Prediction of Listed Companies Based on IWOA-BP Neural Network [J]. Journal of Internet Technology*, 2022, 23(5):955-965.
- [10] Wu J, Jiang N, Wu Z, et al. *Pre-alarm of risks in cross-border mobile payments[J]. Procedia Computer Science*, 2021, 183: 724-732.