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### Retraction

# Retracted: Early Warning System for Penalty Constrained Financial Risks of Enterprises under Diversified Investment

#### **Journal of Mathematics**

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

- (1) Discrepancies in scope
- (2) Discrepancies in the description of the research reported
- (3) Discrepancies between the availability of data and the research described
- (4) Inappropriate citations
- (5) Incoherent, meaningless and/or irrelevant content included in the article
- (6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

#### References

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# Research Article

# **Early Warning System for Penalty Constrained Financial Risks of Enterprises under Diversified Investment**

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Based on the understanding of the main types and purposes of enterprise diversification investment, this paper conducts an indepth analysis of the environmental, structural, and scale risks of enterprise diversification investment and uses this as the basis for the effective construction of a risk prevention model. It can help enterprises effectively avoid investment risks, avoid bringing huge economic losses to enterprises, and help lay a good foundation for the positive development of enterprises. With the rapid development of social economy, enterprises must realize diversified investment if they want to improve their market economy status. However, due to many factors, they face greater economic risks and even cause serious economic losses to enterprises. Therefore, effective measures must be taken to prevent risks and promote the sustainable development of enterprises so as to obtain more economic benefits.

#### 1. Introduction

Enterprise diversification investment can be broadly classified into the following types [1]: (1) concentric diversification type [2], which refers to the development of investment and operation in a diffuse direction with the existing main business as the core, with correlation and noncorrelation characteristics; (2) vertical integration type [3], which can be divided into two forms: forward integration refers to the promotion of enterprises to expand their business scope and develop in the direction of the end market, and backward integration is the development of the upstream supply chain end; (3) the horizontal integration type, which refers to market-centered product sales, overlapping or spreading on the original basis, is also a relevant diversification; and (4) the overall diversification type, which has a strong mixed nature, diversifying investments in technology, markets, and other aspects, both relevant and irrelevant. The main purpose of diversification is to avoid over-reliance on a single market, to diversify business risks and thus reduce the risks faced by unilateral investments, to

increase revenue opportunities for the enterprise, and to promote the process of sustainable development.

The main focus of this study is the early warning system for financial risks in corporate diversification. The selection of indicators is dependent on the selection of financial indicators that reflect the risks of corporate financing, investment, capital operation, and earning distribution. On the basis of theoretical analysis combined with specific cases of companies, the early warning system of financial risks is thoroughly studied. The analytical framework diagram for this paper is shown in Figure 1. The following flowchart explains the methodology and the complete process of the proposed method by classifying it into three major portions.

The rest of the article is organized as follows: Section 2 highlights some of the theoretical foundations such as the definition of risk and its classification and the content and placement of financial risk warnings. In Section 3, the construction of financial risk early warning is described. First, we determined the early warning index weight and then calculated the values of financial warning. Finally, the study is winded up in Section 4, which presents the conclusion.

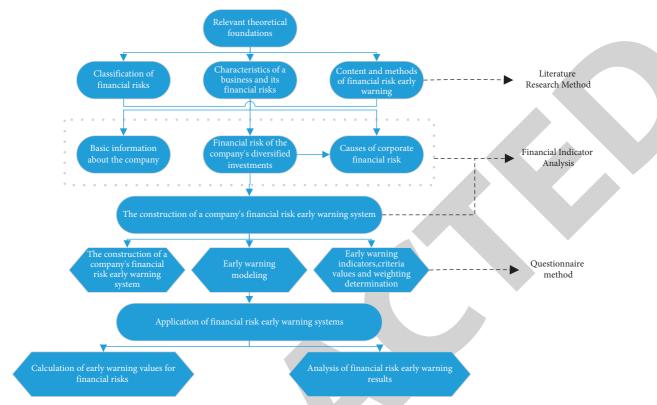


FIGURE 1: Analysis framework diagram.

#### 2. Relevant Theoretical Foundations

2.1. Financial Risk Definition and Classification. The financial activities of an enterprise include financing activities, investment activities, capital operation activities, and allocation activities, which exist throughout the cycle of the enterprise's business operations. Financial risks are divided into the following risks: financing risk, investment risk, capital operation risk, and revenue distribution risk.

2.1.1. Financing Risks. Financing activities are the most fundamental source of capital for a business in its day-to-day operations [4]. From the moment a company starts operating, its capital becomes the product or service that it produces and through which it generates more capital. In the process, the ratio of equity to debt will bring risks to the subsequent operation of the enterprise; for example, if the enterprise's debt financing is too large, it will make the enterprise's financial leverage high, although it is possible to expand the enterprise's revenue, but the pressure to repay the capital and interest later will be great. The pressure of repaying the debt will be very high, which will bring great financial risks to the overall operation of the enterprise, and if there are problems with the working capital of the enterprise, the enterprise may also face a direct break in the capital chain, which may lead to bankruptcy in serious cases.

If you cannot raise capital, you cannot do well. Most companies now raise capital by issuing shares, bonds, attracting investment, and so on. At the same time, the company has to pay dividends, interest, or repay the principal

of loans and sometimes other related costs. Only with the right decisions and efficient management a can company achieve its predetermined goals. In practice, however, the market environment is quite complex, and there is a high risk of errors in decision making, which can affect the allocation of funds and thus the actual profitability of the company, thus increasing the likelihood of financing risks.

For companies, financing risk is one of the most likely financial risks in their business development process [5], as all companies need to expand and grow, and the direct impact of this is an increase in the financial risk. First of all, if an enterprise wants to expand its own financial strength, financing is an important method. Most enterprises raise funds by issuing shares or bonds, thus obtaining some capital income, which in turn means that the enterprise has to bear the capital payments for various operations in the process or needs to repay loans. In its own development process, an enterprise can only ensure the achievement of its business development goals if it makes the right decisions. However, nowadays, the market environment is highly variable, and the market competition is uncontrollable. If an enterprise is affected by changes in market information, it will make incorrect judgements and even make errors in major decisions, which will result in unreasonable business development configurations and lead to serious financial risks as the enterprise is unable to achieve its own expected financial objectives.

2.1.2. Investment Risk. Investment activities are an important part of an enterprise's operation [6]. The funds obtained in the financing activities will be used for new production or

investment in new industries through investment activities, and the success of the investment activities will determine the recovery of the enterprise's funds, including the efficiency and quality of the recovery; if the investment activity fails, it will not be able to recover the funds directly, which will cause the financial risk of the enterprise, causing financial losses. At the same time, from the perspective of the enterprise's investment projects, the type of assets formed will also have an impact on the enterprise's financial risk. Therefore, it is important to carry out a feasibility study beforehand to assess the possible investment risks faced by the company, as well as to assess the company's risk tolerance, and to select investment projects that match the company's risk tolerance so as to prevent the financial risks that may be brought about by the company's financial investment activities [7].

Investment risk refers to the risk that during or after the investment process, the investor will not be able to recover the funds in time due to losses and will not be able to achieve the expected returns, thus affecting the profitability and solvency of the enterprise; in other words, the risk that the enterprise may encounter in the process of its investment activities [8]. In the course of the various investment activities of the enterprise, if the investment income is not well controlled, the capital will not be recovered in the expected manner, which will result in the enterprise encountering financial risks in its financial activities, thus failing to ensure the profitability and repayment level of the enterprise [9]. There are several aspects of investment risk in the enterprise. Firstly, in the course of business, the enterprise may not have a comprehensive understanding of the market environment, which may lead to poor sales of products and a build-up of inventory, thus affecting the capital problems of the enterprise. Secondly, in the process of investment in the enterprise, the enterprise's various production technologies and so on are not up to standard, and the final production results will not achieve the expected results. Then, in the case of enterprises increasing the scale of investment, the internal management of enterprises cannot keep up, resulting in internal management chaos, forming a situation beyond the control of enterprises. Then, with large investments, the debt burden of the enterprise increases, eventually leading to a result that the enterprise cannot afford. Finally, one of the major characteristics of the market economy is that it is highly uncontrollable. If an enterprise cannot keep pace with the development of the market and cannot upgrade its product technology and research and development capabilities, it will be in a disadvantaged position in the market competition, resulting in the enterprise failing to achieve its expected financial objectives.

2.1.3. Liquidity Risk. Capital operations are a production activity that follows the investment activities of an enterprise. The flow of funds from capital operations will affect the liquidity of the enterprise and affect the liquidity risk of the enterprise [10]. If the enterprise's account payable cycle is short, while the account receivable cycle is long, it will directly affect the enterprise's liquidity, greatly reducing the enterprise's liquidity; at this time, if the relevant loans from banks and other financial

institutions cannot be provided in a timely manner, it may have to use the enterprise's long-term funds to supplement the needs of liquidity, which does not seem to exist in the case of capital risk. Related long-term loan data need to be updated dynamically. The rate of return of the relevant long-term loans will be significantly reduced, thus affecting the efficiency of the enterprise's use of funds.

In the course of production and operation activities, there may be an increase in the price of purchased materials, forced production stoppages, and a reduction in orders. Once these circumstances change, the enterprise's capital will change accordingly, affecting the value of the enterprise, resulting in increased costs and reduced profits.

2.1.4. Revenue Distribution Risk. The issue of how dividends are distributed is a highly sensitive one from the perspective of the enterprise's stakeholders [11]. From the perspective of creditors, they would like the company to distribute as little dividend as possible to ensure that creditors' debts are repaid first; from the perspective of shareholders, they would like the company to distribute as much dividend as possible and to recover their investment as soon as possible to achieve the expected financial goals; from the perspective of managers, they would like the company to retain more retained earnings to obtain further capital income and thus increase management salaries. With the need to balance the needs of all parties, the business has to make a comprehensive choice, taking into account the overall interest. Revenue allocation risk refers to the possibility that the financial position will be at risk due to an unreasonable allocation of revenue. If the income distribution policy is not reasonable, the solvency of the enterprise will be weakened, causing the investors and employees of the enterprise to lose motivation, raising the risk of the enterprise's capital operation and thus increasing the possibility of financial risk. The specific manifestation of earning distribution risk lies in balancing the contradiction between dividend payout and accumulation.

#### 2.2. The Content and Placement of Financial Risk Warning

2.2.1. Building a Database of Alert Information and Establishing Alert Coverage. The early warning information database is the result of the conversion of raw warning source information to warning information [12]. The sources of this database include the investment transaction processing system, the management information systems, decision support systems, executive information systems, financial information systems, and other systems' output information. The establishment of an early warning information base is to be based on the early warning of financial risks. The scope of the warning is established by the early warning information base, which is the premise of the early warning of financial risks of the enterprise. Setting the scope of early warning requires clarifying the types and contents of financial risks. The financial risks of enterprises are mainly financing risks, investment risks, capital operation risks, and revenue allocation risks. In addition, the early warning information base should be updated and maintained in a timely manner.

2.2.2. Selecting Early Warning Indicators. Another important part of establishing an early warning system for financial risks in an enterprise is the selection of early warning indicators [13]. Based on the good or bad selection of early warning indicators, you can judge whether the early warning system for the financial risks of an enterprise is scientific enough. According to the characteristics of the enterprise, the early warning system of the financial risk should be established by selecting indicators reflecting the risk of financing, indicators reflecting the risk of capital operation, and indicators reflecting the risk of revenue distribution, which together constitute the early warning indicator system of the enterprise's financial risk.

2.2.3. Setting Early Warning Values for Early Warning Indicators. When setting up an early warning system for the financial risk of an enterprise, the most crucial thing is to set the early warning value of the early warning indicator, which is an important link to ensure the effectiveness of the early warning system. For the determination of the early warning value, the first thing is to reflect the scientific nature of the early warning value; that is to say, the establishment of the early warning value must have a certain scientific basis; the second one is to reflect the overall coordination of the early warning; that is, the process of determining the early warning value must take into account the coordination of the relationship between the various indicators; again, to reflect the stability of the early warning value, the early warning value is to maintain a relatively stable, not in a constantly changing situation. In the early warning analysis of enterprise financial risk, the range of early warning values should be determined in the context of the enterprise's industry.

2.2.4. Building an Early Warning Response Library. A warning response library is a set of contingency responses developed in various risk situations. When a financial risk early warning system issues a risk warning glance, it is necessary to find the corresponding countermeasures to address such warning alerts based on the glance information, the nature of the warning and the level of the warning. The countermeasures in the early warning response library are generally well thought out and inspiring. When the financial risk early warning system issues an alert, the company follows the tips in the early warning response library and analyzes the specific situation of the company before seeking more effective solutions and countermeasures.

The main financial early warning methods currently available can generally be divided into qualitative and quantitative analyses:

Qualitative analysis method: the qualitative analysis method of financial risk early warning refers to the analysis and investigation of the company's situation, which can identify the potential factors and causes of financial risks so that the relevant personnel of the company can arrange risk prevention measures in advance to avoid the occurrence of the financial crisis. Qualitative

analysis methods include standard survey method, "four-stage symptom" analysis method, "four-stage risk" analysis method, the three-month capital turnover table analysis method, and the capital movement flowchart method. In this paper, we mainly use the first two survey methods such as Table 1 and 2 for the standardized questionnaire and the "four-stage symptom" analysis method, respectively.

The qualitative analysis method of financial risk early warning is highly subjective. Therefore, in order to overcome this subjective influence, most researchers began to turn their attention to the quantitative analysis of financial early warning.

Quantitative analysis method: quantitative analysis of financial risk early warning refers to the calculation of financial indicators by selecting specific financial data of the enterprise, using corresponding digital processing methods to digitally process the financial data or nonfinancial data of the enterprise, and then establishing related models. And this model is used to predict the financial risk of the enterprise [14]. A series of variable early warning indicators include indicators that reflect the company's solvency status, profitability status, asset operating capacity status, development capacity status, and cash flow status, and use these indicators to establish a multivariate early warning model [15]. The specific indicators are shown in Figure 2.

# 3. Construction of Financial Risk Early Warning System

3.1. Early Warning Index Weight Determination. According to the relevant requirements of the expert scoring method, by issuing questionnaires, the questionnaire surveys senior managers and experts in the financial risk field of the enterprise on the four aspects of financing risk, investment risk, capital operation risk, and profit distribution risk studied in this article. The indicators are scored. Figure 3 shows the scoring results of the first level of financing risk, investment risk, capital operation risk, and profit distribution risk.

After the weighting process, the weighting values of the first-tier indicators are 28% for funding risk, 24% for investment risk, 25% for capital operation risk, and 23% for return distribution risk.

The weights of the secondary indicators under the funding risk indicator weights are shown in Figure 4.

After the weighting process, the weighting values of the funding risk indicators were obtained as cash flow debt ratio 9.66%, quick ratio 9.80%, and gearing ratio 8.54%.

The weights of the secondary indicators under the investment risk indicator weights are shown in Figure 5.

After the weighting process, the weighting values of the investment risk indicators were obtained as 4.32% for the growth rate of total assets, 6.00% for the operating profit margin, 7.20% for the return on total assets, and 6.48% for the return on net assets.

The results of the risk indicator weighting of the capital operation are shown in Figure 6.

TABLE 1: Standardized questionnaire.

Project	Content of the Survey		
Performance	1. Current status: bad/fair/good		
	2. Outlook: stable/growth/decline/unknown		
	3. Trading partners: growth/stable/decline/unknown		
	4. External creditworthiness: low/average/high/unknown		
Peer group comparison	1. Size and status: small/medium/large/independent.		
	2. Competition among peers: Fierce/general/none		
	3. Sales base: sales route, customer trademark, and advertising special sales method		
	4. Production base: special technology, special equipment, special materials, special products, and		
	special production organization		
	1. Problems: poor return on sales turnover, high costs, low productivity, and insufficient manpower		
	2. Reasons for low sales: fierce competition, industry decline, weak sales capacity, slow product		
Financial management problems	development, and low productivity		
and causes	3. Reasons for low revenue: low prices and high interest rates		
	4. Reasons for low production: low efficiency, insufficient human resources, poor management, and low modernization		
	5. Reasons for high costs: high material costs, inadequate start-ups, and high corporate expenses		
Prospects	1. Guidance: expansion to maintain status quo conversion unclear		
	2. Direction of expansion: overall scale range of personnel		
	3. Specific methods: diversification of new products and new marketing specialization		
	4. Key foundations: product development and design, equipment technology, and sales force		
	personnel cost quality		

TABLE 2: The "four-stage symptom" analysis.

Crisis Incubation period	Crisis onset period	Crisis worsening	Crisis realization
1. Blind expansion	1. Insufficient own capital	1. The operator is unmotivated and preoccupied with financially weak assets	1. Liabilities more than assets and insolvency
2. Ineffective marketing	2. Over-reliance on externally funded business and heavy interest burden	2. Liquidity difficulties	2. Closure announced
3. Neglect of risk management	3. Lack of early warning function	3. Nonpayment of debts due	
4. No effective management system	4. Delaying instigation		
5. Ignoring significant changes in the environment			

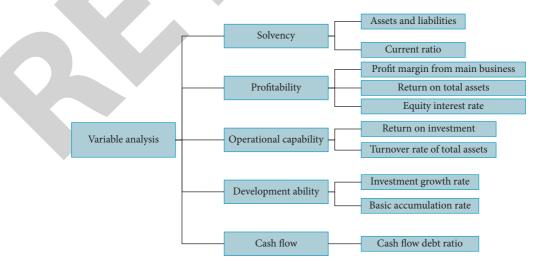


FIGURE 2: Variable analysis index diagram.

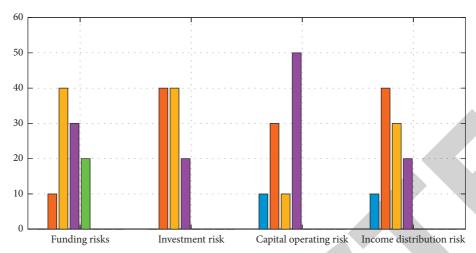


FIGURE 3: Histogram of the results of the first indicator tier scores.

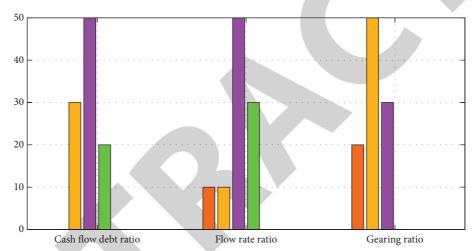


FIGURE 4: Histogram of funding risk indicator score results.



FIGURE 5: Histogram of investment risk indicator score results.

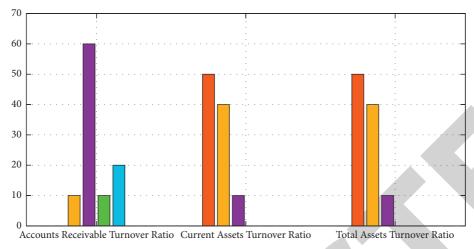


FIGURE 6: Histogram of the results of the scoring of the capital operation risk indicators.

After the weighting process, the weighting values of capital operation risk indicators were 8.00% for account receivable turnover, 5.75% for current asset turnover, and 5.75% for total asset turnover.

The resultant statistics for the weighting of revenue allocation risk indicators are shown in Figure 7.

After the weighting process, the weighting values of the income distribution risk indicators were obtained as 9.43% of the surplus cash guarantee multiple, 7.25% of the operating profit growth rate, and 6.32% of the asset cash recovery rate.

3.2. Calculation of Financial Warning Values. The score calculation of the efficiency coefficient method is divided into basic scores and adjustment scores. Generally, the proportions of basic scores and adjustment scores are relatively fixed at 60 points and 40 points, respectively. However, this division is not precise enough, and it is not conducive to enterprises to obtain the most accurate scores for financial risks. So the calculation formula is adjusted accordingly in the following:

single basic index score = basic score of this file + adjustment score,

the basic score of this crotch = index weight × standard coefficient of this file,

upgrading basic score = index weight × upgrading standard coefficient,

adjustment score = efficacy coefficient × (basic score for the upper file – basic score for this file),

efficacy coefficient =  $\frac{\text{actual value} - \text{standard value} \text{ of this file}}{(\text{standard value} \text{ of the previous file} - \text{standard value} \text{ of this file})}$ 

comprehensive index score = sum (individual index score).

If the actual value is excellent, the efficiency coefficient method is 1.

Initially, the early warning interval is required to be determined because it contains the financial situation. The enterprise is located according to its score. The clarification of the financial warning situation of the enterprise

at this stage will enable the users of relevant information to clearly identify the risks faced by the enterprise's financial situation. Moreover, the determination of the severity of the financial risks will also be allowed. The specific early warning intervals are determined as shown in Table 3.

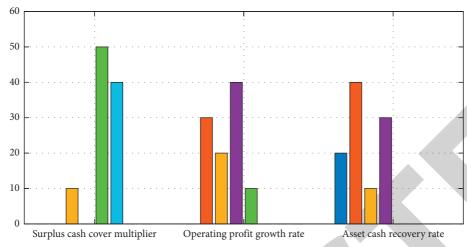


FIGURE 7: Histogram of the results of the revenue allocation risk indicator scores.

TABLE 3: Classification of the company's financial risk warning level.

Early warning level	Early warning interval	Risk status	Description
No warning	(80-100)	No risk	The company is operating in good condition, and there is almost no financial risk
Light warning	(60-80)	Risks of	The enterprise is running normally, some financial indicators are abnormal, and risk of
		concern	concern may occur
Moderate	(40-60)	Less risky	There are problems with the operation of the business, some indicators are clearly
warning			abnormal, and there is a high possibility of financial risk
Severe warning	(20,-40)	Greater risk	Difficult business operations, with most indicators clearly abnormal and a high
			probability of financial risk
Serious warning	(0, 20)	Serious risks	The business is operating in extreme difficulty, with almost all indicators deteriorating and the business facing bankruptcy

#### 4. Conclusion

In the process of corporate diversification investment, it is necessary to clarify the content of risks and their impact and use this as a basis to establish financial risk awareness and achieve effective judgment of corporate investment opportunities. In order to effectively improve the investment efficiency of enterprises, it is necessary to actively construct a financial risk prevention model in a diversified investment environment to actually prevent possible financial risks.

When enterprises want to make industrial investments according to the actual situation, they need to understand and analyze the investment environment, the scale and structure of diversified investments, and make use of effective means to optimize and adjust them. At the same time, in the process of building the model, the degree of resource sharing and the complementarity of investment factors should be fully considered, and the actual and ideal states should be compared and integrated at this stage. Through the construction of multiple systems such as investment systems and actual industrial systems, a diversified and multiattribute financial early warning model can be established.

To sum up, in the process of enterprise development, increasing attention to the prevention of financial risks of diversified investment of enterprises is an inevitable trend to meet the development of modern enterprises, and it is also an important content of improving the market economy

status of enterprises and expanding market development space. Therefore, it is necessary to deepen the awareness of risk prevention and optimize the risk prevention model so as to achieve the harmony and unity of enterprise benefits and investment scale.

#### **Data Availability**

The data used to support the findings of this study are available from the corresponding author upon request.

#### **Conflicts of Interest**

The author declares that there are no conflicts of interest.

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