Financial Risk Evaluation System in the Context of Great Intelligence Movement Cloud: A Hierarchical Analysis Approach

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Abstract: This paper examines the financial risk evaluation system in the context of the "Great Intelligence Movement Cloud" and employs the hierarchical analysis method as the primary research tool. With the rapid advancement of "Great Intelligence Movement Cloud" technology, enterprise financial risks have expanded from the offline domain to the information domain, encompassing a broader scope and more diverse channels. The traditional approach to risk identification, relying solely on single financial indicators, no longer meets current demands. Therefore, it is essential to integrate a non-financial early warning indicator system and adopt a combination of quantitative and qualitative analysis methods. Hierarchical analysis enables the decomposition of complex problems into multiple components and organizes them into a hierarchical structure based on their relationships, facilitating a more accurate assessment of financial risk. This study seeks to establish a comprehensive financial risk evaluation system suited to the "Great Intelligence Movement Cloud" context, offering enterprises more precise risk assessments to better address financial risks and achieve steady development.

Keywords: Wisdom cloud; Financial risk; Financial risk evaluation

1. Introduction

The rapid development of "Great Intelligence Movement Cloud" technology—encompassing big data, artificial intelligence, mobile Internet, and cloud computing—presents unprecedented challenges and opportunities for enterprise financial management and risk control. The construction of an intelligent financial system based on "Great Intelligence Movement Cloud" technology enables enterprises to achieve industry-finance integration and provides valuable decision-making support for managers [1].

While significant progress has been made by domestic and international scholars in researching financial risk evaluation systems, most studies primarily focus on traditional financial indicators. Research addressing the

impact of non-financial indicators and weight allocation in the "Great Intelligence Movement Cloud" context remains insufficient. Consequently, this study aims to develop a financial risk evaluation system tailored to the demands of the modern era using hierarchical analysis.

This research conducts an in-depth examination of the effects of "Great Intelligence Movement Cloud" technology on enterprise financial risk, integrating quantitative and qualitative analysis to scientifically determine the weights of financial and non-financial indicators. The resulting evaluation system aims to provide enterprises with comprehensive and precise financial risk assessment tools, enabling effective risk identification, evaluation, and control to achieve stable management and sustainable development.

2. Construction of a financial risk evaluation index system

2.1. Construction of the evaluation system indicators

Wang proposed a financial risk evaluation system that primarily includes asset profitability, debt-paying ability, economic efficiency, enterprise development potential, financial flexibility, and risks associated with debt operations [2]. Yu categorized financial risk into four primary target layers: profitability, solvency, operational ability, and developmental ability indicators [3]. Yang emphasized using capital structure, operational risk, financing risk, and investment risk as key indicators to construct a financial risk evaluation system [4]. Zhu incorporated quick ratio, inventory turnover ratio, and non-financial indicators to analyze financial risk [5].

Building on these existing studies, this paper adopts a four-tiered financial risk evaluation system, comprising the following main dimensions: profitability index, operational capacity index, solvency index, and development ability index. These dimensions and their respective indicators are detailed in **Table 1**.

2.2. Hierarchical analysis method to determine the weight of evaluation indicators

2.2.1. The basic principle of the hierarchical analysis method

Based on the nature of the problem and the overall objectives to be achieved, the problem is decomposed into different components. According to the interrelated influences and affiliations of these factors, they are clustered and organized at various levels to form a multi-level hierarchical structure model. Pairwise comparisons of elements at the same level are conducted to determine their relative importance and to perform a consistency test. Finally, using the layer-by-layer superposition method, the total ranking values of all levels are calculated from the highest to the lowest, thereby obtaining the relative weights of the lowest-level indicators in relation to the highest level [1].

The judgment matrix plays a critical role in decision analysis, weight allocation, and other aspects, serving as a key step in hierarchical analysis. It illustrates the influence relationships among different factors and is used to evaluate the relative importance of various factors in decision-making, thereby determining their weights [2]. Within the matrix, each element must be compared pairwise with all other elements. The relative importance and assignment of pairwise comparisons are detailed in **Table 2**.

2.2.2. Level 1 index weight

Using hierarchical analysis, 25 valid questionnaires were collected. The scores provided by experts were averaged, and the importance judgment matrix for the first-level and second-level indicators was constructed. The maximum eigenvalue (λ_{max}) was calculated from the matrix, and a consistency analysis was performed

Level 1 indicators	Level 2 indicators	Index interpretation
Profitability (A)	Net sales rate (A1)	Net sales rate = (Net profit ÷ Sales revenue) × 100%
	Net interest rate of assets (A2)	Net interest rate on assets = (Net profit ÷ Total assets) × 100%
	Equity net interest rate (A3)	Equity net interest rate = (Net profit ÷ Shareholders' equity) × 100%
	Operating profit margin (A4)	Operating profit margin = (Operating profit ÷ Operating income) × 100%
	Cost/expense profit margin (A5)	Cost/expense profit margin = (Total profit ÷ Total cost and expense) × 100%
Operation capacity (B)	Inventory turnover rate (B1)	Inventory turnover = Sales revenue ÷ Inventory
	Accounts receivable turnover rate (B2)	Accounts receivable turnover = Sales revenue ÷ Accounts receivable
	Current assets turnover (B3)	Current assets turnover rate = Sales revenue ÷ Current assets
	Total assets turnover rate (B4)	Total asset turnover = Sales revenue ÷ Total assets
	Non-current asset turnover ratio (B5)	Non-current asset turnover = Sales revenue ÷ Non-current assets
Debt-paying ability (C)	Current ratio (C1)	Current ratio = Total current assets ÷ Total current liabilities
	Quick ratio (C2)	Quick ratio = (Total current assets − Inventory) ÷ Total current liabilities
	Cash ratio (C3)	Cash ratio = (Monetary funds + Short-term investments) ÷ Total current liabilities
	Asset-to-liability ratio (C4)	Asset-to-liability ratio = (Total liabilities ÷ Total assets) × 100%
	Equity ratio (C5)	Equity ratio = Shareholders' equity ÷ Total liabilities
	Equity multiplier (C6)	Equity multiplier = Total assets ÷ Shareholders' equity
Development capacity (D)	Operating income growth rate (D1)	Operating income growth rate = (Growth in operating income ÷ Last year's operating income) × 100%
	Total asset growth rate (D2)	Total asset growth rate = (Growth in total assets ÷ Total assets at the beginning of the year) × 100%
	Operating profit growth rate (D3)	Operating profit growth rate = (Growth in operating profit ÷ Last year's total operating profit) × 100%
	Capital preservation rate (D4)	Capital preservation and appreciation rate = (Owners' equity at the end of the period ÷ Owners' equity at the beginning of the period) × 100%
	Equity growth rate (D5)	Equity growth rate = (Growth in owners' equity ÷ Owners' equity at the beginning of the year) × 100%

Table 2. 1–9 scale of importance

Scale	Significance of importance
1	The two indicators have the same importance.
3	This index is slightly important compared with another indicator.
5	Compared with another indicator, this index is more important.
7	Compared with another indicator, this index is very important.
9	Compared with another indicator, this index is absolutely important.
2, 4, 6, 8	The importance of the effect of this indicator in pairwise judgments compared with another indicator.
1, 1/2, ..., 1/9	If row A vs. B is x, then row B vs. A is $1/x$.

to determine whether the Consistency Ratio (CR) was less than 0.1. A CR < 0.1 indicates that the judgment matrix is consistent and reasonable. If CR > 0.1, the indicators must be re-evaluated until CR < 0.1 is achieved. Through the hierarchical analysis method, the index weights were determined, as shown in **Table 3**.

Table 3. Importance judgment of first-level indicators

Indicators	Profitability (A)	Operational capacity (B)	Debt-paying ability (C)	Development capacity (D)	
Profitability (A)	1.000	5.000	3.000	7.000	$\lambda_{max} = 4.25$
Operational capacity (B)	0.200	1.000	0.333	5.000	$CI = 0.083$ $CR = 0.094$
Debt-paying ability (C)	0.333	3.000	1.000	5.000	
Development capacity (D)	0.143	0.200	0.200	1.000	

2.2.3. Level 2 index weight

The weight of secondary indicators is calculated through a similar hierarchical analysis process, with the judgment matrices for profitability, operational capacity, solvency, and development capacity. These results (**Tables 4–7**) provide detailed insights into the relative importance of each secondary indicator within their respective categories.

Table 4. Importance judgment of profitability indicators

Indicators	Net sales rate (A1)	Net interest rate of assets (A2)	Equity net interest rate (A3)	Operating profit margin (A4)	Cost/expense profit margin (A5)	
Net sales rate (A1)	1	2	3	0.2	3	
Net interest rate of assets (A2)	0.5	1	2	0.333	6	$\lambda_{max} = 5.397$
Equity net interest rate (A3)	0.333	0.5	1	0.143	5	$CI = 0.099$ $CR = 0.089$
Operating profit margin (A4)	5	3	7	1	9	
Cost/expense profit margin (A5)	0.333	0.167	0.2	0.111	1	

Table 5. Importance judgment of operating capacity indicators

Indicators	Inventory turnover rate (B1)	Accounts receivable turnover rate (B2)	Current assets turnover (B3)	Total assets turnover rate (B4)	Non-current asset turnover ratio (B5)	
Inventory turnover rate (B1)	1	3	0.2	7	2	
Accounts receivable turnover rate (B2)	0.333	1	0.167	5	0.5	
Current assets turnover (B3)	5	6	1	9	7	$\lambda_{max} = 5.365$ $CI = 0.091$ $CR = 0.081$
Total assets turnover rate (B4)	0.143	0.2	0.111	1	0.167	
Non-current asset turnover ratio (B5)	0.5	2	0.143	6	1	

Table 6. Importance judgment of solvency indicators

Indicators	Current ratio (C1)	Quick ratio (C2)	Cash ratio (C3)	Asset-to-liability ratio (C4)	Equity ratio (C5)	Equity multiplier (C6)	
Current ratio (C1)	1	2	0.2	7	0.333	2	
Quick ratio (C2)	0.5	1	0.167	5	0.25	3	
Cash ratio (C3)	5	6	1	9	0.5	7	$\lambda_{max} = 5.365$
Asset-to-liability ratio (C4)	0.143	0.2	0.111	1	0.111	0.5	CI = 0.091
Equity ratio (C5)	3	4	2	9	1	5	CR = 0.081
Equity multiplier (C6)	0.5	0.333	0.143	2	0.2	1	

Table 7. Importance judgment of development capacity indicators

Indicators	Operating income growth rate (D1)	Total asset growth rate (D2)	Operating profit growth rate (D3)	Capital preservation rate (D4)	Equity growth rate (D5)	
Operating income growth rate (D1)	1	0.5	0.333	0.5	2	
Total asset growth rate (D2)	2	1	0.5	0.5	0.333	
Operating profit growth rate (D3)	3	2	1	2	5	$\lambda_{max} = 4.865$ CI = 0.092 CR = 0.083
Capital preservation rate (D4)	2	2	0.5	1	3	
Equity growth rate (D5)	0.5	3	0.2	0.333	1	

2.3. Calculation of the weights of the integrated evaluation indicators

Upon completing the establishment of each judgment matrix and calculating the index weights for the target layer, criterion layer, and index layer, and after passing the consistency test, the comprehensive evaluation indicators are ranked by their total weights. **Table 8** presents the results of the weight ranking for the integrated evaluation indicators.

Table 8. Comprehensive evaluation indicators rank by weight

Level 1 indicators	Level 1 index weight	Level 2 indicators	Level 2 index weight	Index interpretation	Comprehensive weight
Profitability (A)	54.768%	Net sales rate (A1)	18.074%	Net sales rate = (Net profit ÷ Sales revenue) × 100%	9.899%
		Net interest rate of assets (A2)	16.156%	Net interest rate on assets = (Net profit ÷ Total assets) × 100%	8.848%
		Equity net interest rate (A3)	9.711%	Equity net interest rate = (Net profit ÷ Shareholders' equity) × 100%	5.319%
		Operating profit margin (A4)	52.250%	Operating profit margin = (Operating profit ÷ Operating income) × 100%	28.616%
		Cost/expense profit margin (A5)	3.810%	Cost/expense profit margin = (Total profit ÷ Total cost and expense) × 100%	2.087%

Table 8 (Continued)

Level 1 indicators	Level 1 index weight	Level 2 indicators	Level 2 index weight	Index interpretation	Comprehensive weight
Operation capacity (B)	14.483%	Inventory turnover rate (B1)	19.003%	Inventory turnover = Sales revenue ÷ Inventory	2.752%
		Accounts receivable turnover rate (B2)	9.161%	Accounts receivable turnover = Sales revenue ÷ Accounts receivable	1.327%
		Current assets turnover (B3)	56.065%	Current assets turnover rate = Sales revenue ÷ Current assets	8.120%
		Total assets turnover rate (B4)	3.135%	Total asset turnover = Sales revenue ÷ Total assets	0.454%
		Non-current asset turnover ratio (B5)	12.636%	Non-current asset turnover = Sales revenue ÷ Non-current assets	1.830%
Debt-paying ability (C)	25.583%	Current ratio (C1)	12.684%	Current ratio = Total current assets ÷ Total current liabilities	3.245%
		Quick ratio (C2)	9.788%	Quick ratio = (Total current assets − Inventory) ÷ Total current liabilities	2.504%
		Cash ratio (C3)	34.540%	Cash ratio = (Monetary funds + Short-term investments) ÷ Total current liabilities	8.836%
		Asset-to-liability ratio (C4)	2.721%	Asset-to-liability ratio = (Total liabilities ÷ Total assets) × 100%	0.696%
		Equity ratio (C5)	35.073%	Equity ratio = Shareholders' equity ÷ Total liabilities	8.973%
		Equity multiplier (C6)	5.193%	Equity multiplier = Total assets ÷ Shareholders' equity	1.329%
Development capacity (D)	5.166%	Operating income growth rate (D1)	17.32%	Operating income growth rate = (Growth in operating income ÷ Last year's operating income) × 100%	0.895%
		Total asset growth rate (D2)	12.10%	Total asset growth rate = (Growth in total assets ÷ Total assets at the beginning of the year) × 100%	0.625%
		Operating profit growth rate (D3)	48.51%	Operating profit growth rate = (Growth in operating profit ÷ Last year's total operating profit) × 100%	2.506%
		Capital preservation rate (D4)	4.74%	Capital preservation and appreciation rate = (Owners' equity at the end of the period ÷ Owners' equity at the beginning of the period) × 100%	0.245%
		Equity growth rate (D5)	17.33%	Equity growth rate = (Growth in owners' equity ÷ Owners' equity at the beginning of the year) × 100%	0.895%

3. Discussion and conclusion

In the risk evaluation system, the weight allocation of first-level indicators directly reflects the importance enterprises place on different capabilities within the operation process. Profitability dominates with a weight of 54.768%, highlighting the core focus of enterprises on pursuing economic benefits. The weights for operating capacity, debt repayment capacity, and development capacity are 14.483%, 25.583%, and 5.166%, respectively, forming the basic framework for enterprise risk assessment [3].

Firstly, enterprises should continue to optimize their profit models and enhance profitability, as this is key to reducing overall risk. Through technological innovation, market expansion, and cost control, key indicators such as the net interest rate on sales and net interest rate on assets should be continuously improved, ensuring that enterprises maintain a competitive edge in a fiercely competitive market [4]. Secondly, the improvement of operating capacity should not be overlooked. Enterprises should focus on enhancing the inventory turnover rate

and accounts receivable turnover rate by optimizing inventory management and strengthening the recovery of accounts receivable. This will improve the liquidity of capital and reduce operational risks. In terms of solvency, enterprises should maintain a reasonable debt structure and ensure sufficient cash flow to meet both short-term and long-term debt obligations. By strengthening cash flow management, optimizing financing structures, and improving key indicators such as the current ratio and quick ratio, enterprises can reduce financial risks.

Although the weight assigned to development capacity is relatively small, it remains a crucial driver of long-term growth. Enterprises should prioritize investments in research and development to enhance product competitiveness and focus on talent development and team building to lay a solid foundation for sustainable growth [5].

In conclusion, during the risk assessment process, enterprises should comprehensively consider factors such as profitability, operational capacity, solvency, and development potential. Continuous optimization of the risk management system is essential to ensure the steady development of the enterprise.

Disclosure statement

The author declares no conflict of interest.

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