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Research on financial performance evaluation and optimization path based on multiple regression analysis

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Abstract Modern enterprises face a complex and changing market environment, and financial performance, as an important manifestation of the enterprise's operating results, its assessment and optimization are crucial to the sustainable development of the enterprise. This study constructs a financial performance assessment model based on multiple regression analysis and data envelopment analysis (DEA) to analyze the financial data of Enterprise A from 2015 to 2024. Multiple linear time series regression model is used to analyze the impact of investment level, technological innovation, financing constraints, executive team characteristics, and shareholding ratio of major shareholders on financial performance; C²R model and BC² model are used to assess the technical efficiency and scale efficiency of the enterprise; and 4-dimensional 16-indicator evaluation system containing solvency, operating ability, profitability, and development ability is constructed. The results of the study show that the characteristics of the enterprise's executive team and technological innovation have a positive effect on financial performance, and the investment level, financing constraints and the proportion of major shareholders' shareholding have a negative effect on financial performance; Enterprise A is ranked No. 1 in terms of comprehensive score among 11 enterprises in the same industry, with the profitability factor score of 1.814 ranked No. 1; the value of the comprehensive efficiency in 60% of the years during the period of 2015-2024 is No. 1 and The performance is excellent; however, it ranks 11th with a score of -1.279 for the operating ability factor and 7th with a score of -0.209 for the growth ability factor, with obvious shortcomings. The conclusion of the study shows that enterprises should improve their financial performance by adjusting capital structure, enhancing operating efficiency and optimizing cost-to-income ratio, which provides a scientific basis for the formulation of corporate financial strategies.

Index Terms Financial performance assessment, multiple regression analysis, data envelopment analysis, investment level, technological innovation, financing constraints

I. Introduction

Enterprises play a vital role in modern society, and the assessment of their financial performance has always attracted much attention. As enterprises are facing changes in their accounting systems, this has led to a series of problems in the handling of accounting matters in some enterprises. For example, the financial statements of some business units are not transparent enough, and there may be problems of untruthful or misrepresentation of financial information, making it difficult to provide clear financial information to external stakeholders [1], [2]. This opacity brings troubles to external investors, government regulators and the public, making it difficult for external investors to accurately assess the financial status of business units, for government regulators to effectively supervise financial management, and for the public to understand the use of funds [3]-[5]. In addition, due to the imperfection of the accounting system and the lagging management system, some enterprise units may have wasted, retained or improperly used funds [6], [7]. Such problems are mainly reflected in the irrational allocation of funds, inefficient financial management processes, and defective internal control mechanisms and supervision mechanisms [8]. This situation not only leads to the waste of resources, but also may pose a threat to the long-term sustainable development of business units [9].

Therefore, in today's competitive business environment, enterprises need to effectively manage and evaluate performance in order to maintain a competitive advantage and achieve sustainable development, and performance assessment is an important method to help enterprises achieve this goal [10], [11]. Performance evaluation is a quantitative assessment of enterprise performance, which can help enterprises better understand their own development status, so as to adjust their business strategies and goals in a timely manner [12]. Based on this, by establishing an accurate and comprehensive enterprise financial performance analysis and optimization model, it can enable the management to understand the details of business operations more clearly, quickly capture market trends, and then make forward-looking strategic decisions [13]-[15].

In the context of economic globalization and increasingly fierce market competition, the assessment and optimization of enterprise financial performance has become the focus of attention of enterprise managers. Financial performance, as a comprehensive manifestation of the enterprise's operating results in a certain period of time, not only reflects the enterprise's profitability, solvency and operating ability, but also is an important basis for investors, creditors and other stakeholders to evaluate the value of the enterprise. However, traditional financial performance evaluation methods are often limited to a single indicator or simple ratio analysis, which is difficult to comprehensively and objectively reflect the real financial situation of enterprises. Therefore, it is of great significance to construct a scientific and reasonable financial performance evaluation system, analyze its influencing factors in depth, and put forward corresponding optimization paths to enhance the level of corporate financial management and strengthen the core competitiveness of enterprises. The current academic research on financial performance evaluation mainly focuses on the construction of the index system, the selection of evaluation methods and the analysis of influencing factors. As a mature statistical method, multiple regression analysis can effectively identify the degree of influence of multiple independent variables on the dependent variable, which provides a powerful tool for quantitative analysis of financial performance influencing factors. Data envelopment analysis, as a nonparametric efficiency evaluation method to assess the relative efficiency of decision-making units by constructing a production frontier surface, is widely used in financial performance evaluation. Combining the two methods can identify the key influencing factors as well as assess the relative efficiency of the enterprise's financial performance, providing more comprehensive decision support for the enterprise to formulate financial strategies. This study chooses Enterprise A as the research object, based on its financial data from 2015-2024, and uses multiple regression analysis to explore the impact of investment level, technological innovation, financing constraints, executive team characteristics, and the proportion of major shareholders' shareholding on financial performance. At the same time, a financial performance evaluation system containing 16 indicators in four dimensions of solvency, operating ability, profitability and development ability is constructed, and data envelopment analysis is used to evaluate the financial performance of the enterprise horizontally and vertically, and to identify the strengths and weaknesses of the enterprise's financial performance. On this basis, the projective analysis is used to find out the direction of improvement and put forward the optimization path of financial strategy suitable for the development of the enterprise, so as to provide reference for similar enterprises.

II. Analysis of factors affecting financial performance based on multiple regression analysis

II. A.Financial performance

Financial performance is the performance of the enterprise's operating results in a certain period of time [16], through the analysis of the enterprise's financial performance, prompting enterprise managers, decision makers and other stakeholders can be a comprehensive and timely understanding of the enterprise's past business activities. Financial performance can make a comprehensive analysis of the enterprise's solvency, operating ability, profitability, development ability, and make a scientific and accurate judgment of the current situation of the enterprise's operation, and provide guidance for the enterprise to formulate medium- and long-term goals.

Through the analysis of solvency, operating ability, profitability and development ability, the enterprise can comprehensively measure the effect of cost control, resource utilization and remuneration of shareholders' equity, which will have an important impact on the strategic decision-making and operation management of the enterprise. This chapter mainly analyzes the factors influencing the financial performance of enterprises by analyzing the financial indicators of solvency, operating capacity, profitability and development capacity.

II. B.Modeling of factors influencing corporate financial performance

II. B. 1) Variable Selection and Data Sources

In this paper, we use the data of A listed firms from 20015 to 2024, with their financial performance as the explanatory variable, investment level, technological innovation, financing constraints, executive team characteristics, and the proportion of major shareholders' ownership as the explanatory variables, and each variable is quarterly data. The data of the firms are obtained from the annual, semi-annual and quarterly reports of the firms and the Cathay Pacific database (CSMAR). Missing data are filled in using the mean value method to ensure the validity of the results. Specific measures and data sources are described below:

(1) Investment level (INV). In this paper, the ratio of the enterprise's investment expenditures to total assets at the beginning of the period is used as a proxy variable to measure the enterprise's investment level. Here investment expenditure uses the difference between the cash paid by the enterprise to construct fixed assets, intangible assets and other long-term assets, minus the net cash recovered from the disposal of these assets in each quarter.

(2) Technological Innovation (RD). There are usually two types of indicators to measure technological innovation of enterprises, and sub-assessment of technological innovation of enterprises usually involves two dimensions:

R&D investment and patent output. In view of the fact that R&D expenditures are self-disclosed information, this study chooses the number of patent applications to reflect the degree of technological innovation of enterprises. It should be noted that it usually takes a long time from application to authorization and the number of patent applications is less affected by the subjective factors of patent licensing agencies, so this paper chooses the number of patent applications rather than the number of patents granted.

(3) Executive Team Characteristics. First, we define executives as the board of directors, the supervisory board and the senior managers disclosed in the annual, semi-annual and quarterly reports of enterprises. In this paper, we select the gender of executive team (MGEND) to measure the characteristics of the firm's executive team. Where executive team gender refers to all executives of the firm during the quarter.

(4) Financing constraint (SA). Because its calculation is not easily and directly related to financing constraints and helps to reduce endogenous problems, among the many indicators to measure financing constraints, this study chooses the SA indicator to analyze the financing constraint status of enterprises. The formula for financing constraints is: $-0.745\times SIZE+0.045\times SIZE^2-0.034\times AGE^2$, where $SIZE$ is the natural logarithm of the total assets of the enterprise, and AGE denotes the length of the time since the enterprise's establishment, and the calculated indicator The larger the absolute value, the lower the degree of financing constraints.

(5) Major Shareholder Shareholding Ratio (TOP1). This paper selects the ratio of the number of shares held by the first largest shareholder to the total number of share capital to analyze the shareholding structure of enterprises. The ratio of shares held by the first largest shareholder of the enterprise (TOP 1) is used as a proxy variable for the explanatory variable of the ratio of shares held by the largest shareholder, which reflects the degree of concentration of equity.

II. B. 2) Model setup

This paper selects the annual data of enterprise A from 2015 to 2024 as the research sample, and constructs the multiple linear time series regression model using time series data, aiming to analyze the impact of various factors on the enterprise's financial performance in depth by establishing the quantitative correlation model between financial performance and various related influencing factors. Equation (1) is the specific model:

$$CF_t=\alpha_0+\alpha_1 INV_t+\alpha_2 RD_t+\alpha_3 MGEND_t+\alpha_4 SA_t+\alpha_5 TOP1_t+\varepsilon_t \tag{1}$$

where CF denotes the financial performance of firm A, $\alpha_1,\alpha_2,...\alpha_5$ are the regression coefficients of the influencing factors, α_0 is the constant term, t denotes the time cross section, and ε_t is the residual term.

II. C.Findings

Because of the limited space, this paper gives a brief description of the research results. This paper takes the measured financial performance of enterprise A from 2015 to 2024 as the explanatory variables, and takes investment level, technological innovation, financing constraints, executive team characteristics, and the proportion of major shareholders' shareholding as the explanatory variables, and according to the results of the empirical analysis, the characteristics of the enterprise's executive team (MGEND) and technological innovation (RD) play a positive role in the financial performance of enterprise A. At the same time, the level of the enterprise's investment (INV), financing constraints (SA) and major shareholders' shareholding (TOP1) all play a negative role in the financial performance of Enterprise A.

III. Financial performance assessment based on DEA modeling

III. A. DEA model construction for corporate financial performance assessment

III. A. 1) C^2R model

The DEA model is mainly based on a set of multiple input and output indicators to analyze the effective production frontiers of the enterprise [17], [18], and then implement the enterprise's multi-objective comprehensive effect assessment. In the practical application of the model, it will be assumed that there are a total of decision-making units n, where each decision-making unit will have m types of inputs and s types of outputs, in this paper, X_{ijo} and Y_{njo} are used to denote the first i type of inputs and the first r type of outputs, respectively. The production possible set of DEA model is as follows production possible set is denoted as follows:

$$T=\left\{(X,Y)\,|\,\sum_{j=1}^{n}X_j\lambda\le X,\sum_{j=1}^{n}Y_j\lambda_j\ge Y,\lambda_j\ge 0,\lambda_j=1,2,...,n\right\} \tag{2}$$

Based on the assumptions given in the previous section and the set of production possibilities, we are able to obtain the C^2R model of the DEA model, denoted as follows:

$$\theta^* = \min\left[\theta - \varepsilon\left(\sum_{i=1}^{m} S_i^- + \sum_{r=1}^{s} S_r^+\right)\right] \tag{3}$$

$$st.\begin{cases} \sum_{j=1}^{n} X_{ij}\lambda_j + S_i^- = \theta X_{ijo}, i = 1,2,...,m \\ \sum_{j=1}^{n} Y_{ij}\lambda_j - S_r^+ = Y_{ijo}, r = 1,2,...,s \\ \theta, \lambda, S_i^-, S_r^+ \geq 0 \\ j = 1,2,...,n \end{cases} \tag{4}$$

where S_r^+ and S_i^- denote the slack variables, and ε implies Archimedean infinitesimals, which typically take the value of 10-6. The main economic implication of the formula is that λ_i is responsible for connecting the effective points to form the effective frontier. The non-zero slack variables are denoted as excess S^{0+} or deficiency S^{0-}, which allows the effective surface to extend horizontally or vertically to form the envelope. In the above equation, θ means the projection of the DMU from the envelope.

The C^2R model can be used to better assess the size and technical validity of the DMUs of the enterprise's decision-making units when the optimal solutions are as follows:

(1) $\theta^* = 1, S^{0-} = 0, S^{0+} = 0$, then it means that the decision unit j_0 is DEA valid, that is, the technology and size are in the simultaneous validity.

(2) $\theta^* = 1$, while there exists at least some $S^{0-} > 0$ or $S^{0+} > 0$, which implies that the decision unit j_0 is in a weakly DEA-effective state, i.e., technology and scale are not in simultaneous effectiveness in this case.

(3) $\theta^* < 1$, which implies that the decision unit j_0 belongs to the non-DEA effective in this case.

III. A. 2) BC² model

When the firm's size reward is constant, then we can obtain another variant of the DEA model, the BC^2 model, which can be used to assess the relative technical effectiveness of the decision-making unit DMUs. The input and output data corresponding to the firm's n DMU decision units are expressed as follows:

$$X_j = \begin{bmatrix} X_{1j} \\ X_{2j} \\ ... \\ X_{nj} \end{bmatrix}, Y_j = \begin{bmatrix} Y_{1j} \\ Y_{2j} \\ ... \\ Y_{sj} \end{bmatrix}, (j = 1,2...,n) \tag{5}$$

where $x_j \in E^m, y_j \in E^s, x_j > 0, y_j \succ 0, j = 1,2,...,n$, then the BC^2 model can be expressed as:

$$(P_{BC^2})\begin{cases} \max(\mu^T y_0 + \mu_0) = V_p \\ s.t. w^r x_j - \mu^r y_j - \mu_0 \geq 0, j = 1,2,...,n \\ w^r x_0 = 1 \\ w \geq 0, \mu \geq 0 \end{cases} \tag{6}$$

The pairwise planning representation of the above model is as follows:

$$(D_{BC^2})\begin{cases} \min\theta = V_D \\ s.t. \sum_{j=1}^{n} x_j\lambda_j + s^- = \theta x_0 \\ \sum_{j=1}^{n} y_j\lambda_j - s^+ = y_0 \\ \sum_{j=1}^{n} \lambda_j = 1 \\ s^- \geq 0, s^+ \geq 0, \lambda_j \geq 0, j = 1,2,...,n \end{cases} \tag{7}$$

The introduction of Archimedean infinitesimals ε leads to the following linear programming problem:

$$(\overline{p}_{\varepsilon})\begin{cases}\max(\mu^T y_0+\mu_0)=V_{P_0}\\ s.t.w^T x_j-\mu^T y_j-\mu_0\geq 0, j=1,2,...,n\\ w^T x_0=1\\ w\geq \varepsilon\overline{e}\\ \mu\geq \varepsilon e.\end{cases} \tag{8}$$

The dual plan $(\overline{p}_{\varepsilon})$ of $(\overline{D}_{\varepsilon})$ is as follows:

$$(\overline{D}_{\varepsilon})\begin{cases}\min\theta-\varepsilon(\hat{e}^T s^-+e^T s^+)\\ s.t.\sum_{j=1}^{n}x_j\lambda_j+s^-=\theta x_0\\ \sum_{j=1}^{n}y_j\lambda_j-s^+=y_0\\ \sum_{j=1}^{n}\lambda_j=1\\ s^-\geq 0, s^+\geq 0, \lambda_j\geq 0, j=1,2,...,n\end{cases} \tag{9}$$

where $\hat{e}^T=(1,1,...,1)\in E^m, e^T=(1,1,...,1)\in E^S$.

Validity in the sense of the BC^2 model represents pure technical validity, while validity in the sense of C^2R is both technical and scale validity.

III. A. 3) Gain-of-scale analysis

Denote the effectiveness of the BC^2R model by θ^*, expressed as the combination (product) of technical effectiveness and scale effectiveness. Using δ Song to denote the technical effectiveness under the BC^2 model, we are thus able to obtain $\theta^*=\delta^*\times S^*$. In this equation, S^* represents pure scale validity.

With this decomposition, we are able to obtain the basis on which the returns to scale can be judged, as follows:

(1) If $S^*=1$, this means that the DMU decision unit is a constant return to scale.

(2) If $S^*=1$, $\sum x_j^*\prec 1$ this implies that the DMU decision unit is increasing returns to scale.

(3) If $S^*=1$, $\sum x_j^*\succ 1$ this implies that the DMU decision unit is diminishing returns to scale. $\sum x_j^*$ is the weight corresponding to the DMU decision unit j input-output indicator under the C^2R model.

III. A. 4) Projection analysis

Through the projection analysis [19], we can better find the non-DEA effective units into DEA effective units, the input needs to be improved in the improvement of the perfect place and strive to achieve the desired goal, so that better for the future to improve the efficiency of day-to-day production, business management to provide effective reference information.

Sources of projection analysis and related theorems:

Theorem: $DMU_{jo}(x_o,y_o)$ is set to (x_o,y_o), then the optimal solution of the planning problem C^2R by the optimal solution of the planning problem C^2R, λ,S,S^+,θ, is composed of $(\hat{x}_o,\hat{y}_o)$:

$$\hat{x}_o=\theta x_0-S^- \tag{10}$$

$$\hat{y}_o=y_o+S^+ \tag{11}$$

In this section, we are able to see that it is effective relative to the original n DMUs. In other words, through the projection analysis, we are able to clearly see the gap between the present value and the target value of each performance assessment indicator of the enterprise.

III. B. Design of Financial Performance Evaluation Indicator System

III. B. 1) Debt service capacity indicators

The solvency indicators in this paper contain current ratio, quick ratio, cash ratio, and gearing ratio. Short-term solvency is mainly manifested in current ratio, quick interest rate and cash ratio. Current ratio is the ratio of current assets to current liabilities, reflecting the ability of the enterprise's current assets into cash to repay current liabilities. Quick ratio is the ratio of quick assets and current liabilities, which can more accurately reflect the liquidity of assets

and short-term solvency than the current ratio. Cash ratio is the ratio of cash assets to current liabilities, cash ratio is too high to reflect the low profitability of cash assets held by the enterprise, the enterprise cash assets are inefficiently utilized, increasing the opportunity cost of cash assets. Gearing ratio is the ratio of total liabilities to total company assets, the lower the gearing ratio indicates that the enterprise long-term solvency is stronger, the enterprise owner through less capital investment, the formation of a larger scale of operation, through the role of financial leverage to obtain more investment income.

III. B. 2) Operational capacity indicators

The operating capacity of an enterprise includes accounts receivable turnover, inventory turnover, current assets turnover, and total assets turnover. Accounts receivable turnover ratio is the ratio of net income from credit sales of products to the average balance of accounts receivable within a certain period of time, and accounts receivable turnover ratio reflects the ability to realize accounts receivable and management efficiency of the enterprise. Inventory turnover is the ratio of cost of goods sold to the average balance of inventory within a certain period of time, reflecting the operational efficiency of the enterprise's inventory. Current asset turnover is the ratio of sales revenue to the average balance of current assets within a certain period, reflecting the turnover speed of current assets. Total asset turnover is the ratio of sales revenue to the average balance of total assets within a certain period of time, reflecting the utilization efficiency of all assets of the enterprise. In short, the operating capacity of an enterprise is the embodiment of the company's ability to allocate and utilize resources, reflecting the management efficiency of the enterprise's assets.

III. B. 3) Profitability indicators

In this paper, the main business profit margin and net sales margin are chosen to measure the business profit effect. Cost-expense margin reflects the relationship between the net profit realized by the enterprise and the management of costs and expenses. Total return on assets is used to assess the utilization efficiency of the enterprise's assets, to evaluate the relative performance in the same industry by comparing with other enterprises, and to help investors or managers to judge the enterprise's investment value and operating effectiveness.

III. B. 4) Development capacity indicators

The development capacity of an enterprise includes the growth rate of main business income, the growth rate of net profit, the growth rate of total assets and the growth rate of net assets. The growth rate of main business income is the ratio of the current period's income growth to the previous period's income, reflecting the development level and growth of the enterprise. Net profit growth rate refers to the current period of net profit growth and the ratio of net profit in the previous period, reflecting the growth of corporate net profit, net profit growth rate faster reflecting the current period of the enterprise to achieve better business results, to help investors predict the future profitability of the enterprise trend and development potential. Total assets growth rate is the ratio of the total assets growth of the enterprise in the current period to the total assets of the previous period, reflecting the development of the enterprise scale. Net assets growth rate is the ratio of net assets growth in the current period to net assets in the previous period, reflecting the growth rate of net assets.

Table 1: Financial performance evaluation index system

	Factor	Index
Input	Solvency capacity	Current ratio (X1)
		Quick ratio (X2)
		Cash ratio (X3)
		Asset liability ratio (X4)
	Operation capacity	Inventory turnover rate (X5)
		Accounts receivable turnover rate (X6)
		Current asset turnover rate (X7)
		Total asset turnover rate (X8)
Output	Profitability capacity	Main business profit margin (Y1)
		Net profit margin on sales (Y2)
		Ratio of profits to cost (Y3)
		Return on total assets (Y4)
	Development capacity	Net profit growth rate (Y5)
		Growth rate of main business income (Y6)
		Net asset growth rate (Y7)
		Total asset growth rate (Y8)

To summarize, the financial indicators of solvency and operating capacity are taken as input initial indicators, and the financial indicators of profitability and development capacity are taken as output initial indicators, and the financial performance evaluation index system is shown in Table 1.

IV. Empirical analysis of corporate financial performance assessment

IV. A. Horizontal assessment results

The corporate financial performance evaluation factors are extracted and analyzed to obtain five male factors: solvency factor (F1), profitability factor (F2), operating capacity factor (F3), growth capacity factor (F4), and asset income capacity factor (F5). Based on the scores of the five factors, a linear weighted average is performed based on the variance contribution of each factor to obtain a composite scoring function F.

Ten enterprises in the same industry (numbered B~K) were screened for cross-sectional assessment with enterprise A, the subject of this paper. The values of the 16 indicators for 2024 selected by the screened 11 enterprises are brought into the calculation to obtain the score of each public factor as well as the comprehensive score, the higher the score of each public factor (F1, F2, F3, F4, F5), the stronger the enterprise's ability corresponding to the public factor, and the higher the comprehensive score F, the stronger the enterprise's comprehensive financial ability, the financial performance score of the sample companies in the industry is shown in Table 2 shows.

Table 2: 2024 industry financial performance score sheet

Company	F1	F2	F3	F4	F5	F
A	0.854	1.814	-1.279	-0.209	-1.115	0.364
B	3.342	-0.756	-0.322	-0.172	-0.242	0.631
C	0.299	-0.375	-1.133	-0.293	0.169	-0.253
D	-0.073	0.795	0.902	-0.279	-0.346	0.312
E	0.068	-0.142	0.257	-0.247	-0.667	-0.080
F	-0.778	0.784	-0.386	0.056	-0.234	-0.091
G	-0.935	-0.959	-0.808	-0.285	-0.438	-0.769
H	-0.597	0.567	-0.034	0.046	-0.045	-0.017
I	-0.067	0.207	-0.146	-0.152	0.023	-0.009
J	-0.386	-0.356	1.326	0.068	-0.028	0.042
K	-0.115	0.499	0.398	0.207	-0.168	0.192

Then Excel was used to rank the scores of each public factor and the composite score of the 11 sample companies. The higher the ranking of the public factor (F1, F2, F3, F4, F5), the stronger the company's ability on that public factor, and the higher the ranking of the composite score F, the stronger the company's overall financial ability.The ranking of the financial performance scores of the sample companies in the industry in 2024 is shown in Table 3.

As shown in Table 2 and 3: First, according to the ranking of solvency factor (F1) score, four companies in the sample companies have positive scores, and listed companies should make full use of financial leverage to improve their operational performance and overall competition. Secondly, according to the ranking of profitability factor (F2) score, A, D as well as F are located in the top three in the industry, indicating that these three have better profitability. Among them, the first-ranked enterprise A scores 1.019 points higher than the second-ranked Yili stock, which proves that the profitability of enterprise A is in the leading position in the industry. According to the statistics in the table, 6 of the 11 sample enterprises have positive profitability factor scores, which is more than half of the enterprises, and 5 enterprises have negative scores, which means that the overall profitability level of the industry is better. Third, the operating capacity factor (F3) mainly reflects the operating capacity of the company's business assets, there are 4 enterprises in the sample with positive operating capacity factor scores, which are located in the top three are J, D, and K. The operating efficiency of the assets of these companies varies greatly, and it is worthwhile to pay attention to the fact that enterprise A is ranked 11th in terms of operating capacity, and all of its assets have a lower operating efficiency. Fourth, in terms of the growth capacity factor (F4) and the asset income capacity factor (F5), Firm A ranks 7th and 11th in the industry, which proves that Firm A's growth capacity performs poorly in the industry. Fifthly, the scores of five public factors among the 11 companies do not reach a high level, indicating that the overall development of the industry is unbalanced.

As can be seen from Table 3, the 2024 financial performance composite score of Enterprise A ranks 1st among 11 companies, with the solvency factor (F1) ranked 2nd, the profitability factor (F2) ranked 1st, while the operating capacity factor (F3) and the asset income capacity factor (F5) ranked backward among all the companies and

located at 11th place, and the growth capacity related factor (F4) ranked also more Firm A has a high composite score because the solvency factor (F1) and profitability factor (F2) contribute the most to the composite score, and Firm A's solvency and profitability are more prominent in the industry, and although the impact of operating capacity (F3), growth capacity (F4) and asset income capacity (F5) on the composite score is small, the root cause of the problem should be identified as a basis for the financial performance of Firm A to be recognized. Although operating ability (F3), growth ability (F4) and asset income ability (F5) have a small impact on the overall score, it is still necessary to identify the root causes of the problems as a breakthrough to further improve the financial performance of Enterprise A.

Based on the ranking of the scores and the analysis of Tables 2 and 3, it is initially judged that the breakthroughs for the improvement of Enterprise A's financial performance are the public factors F3 (operating ability factor), F4 (growth ability factor) and F5 (asset income ability factor).

Table 3: Industry financial performance league table 2024

Company	F1 rank	F2 rank	F3 rank	F4 rank	F5 rank	F rank
A	2	1	11	7	11	2
B	1	10	7	6	7	1
C	3	9	10	11	1	10
D	6	2	2	9	8	3
E	4	7	4	8	10	8
F	10	3	8	3	6	9
G	11	11	9	10	9	11
H	9	4	5	4	4	7
I	5	6	6	5	2	6
J	8	8	1	2	3	5
K	7	5	3	1	5	4

IV. B. Longitudinal assessment results

IV. B. 1) Analysis of the efficiency value of an enterprise's financial performance

The efficiency value of financial performance of enterprise A during the 10 years from 2015 to 2024 is shown in Table 4.The comprehensive efficiency value of enterprise A in 2015 is distributed below 0.7, which indicates that the company's financial performance is poor in 2015.The comprehensive efficiency value of 2017, 2019, and 2022 is above 0.7, and there are also 6 years with efficiency value of 1, which means that in these 6 years, enterprise A's operating results and comprehensive condition is very good. There are 60% of the 6 years with a combined efficiency value above the average value of 0.905, which means that the overall financial performance of Company A is at a high level during this period.

There are 2 years in which the technical efficiency value of Company A reaches 0.9 but does not reach the optimal value of 1, indicating that during these 2 years, the management efficiency and resource allocation level of Company A are more satisfactory, and the best results are achieved in the state of variable returns to scale.The technical efficiency value in 2015 is 0.684, and at this time, Company A aims to improve the technical efficiency value, change the operating mode of all kinds of resources and the relevant configuration of the enterprise mode and try to adjust to a more suitable layout state.

The scale payoff is unchanged in 2016, 2018, 2020, 2021, 2023 and 2024. The state of the business at this point in time has often reached a more desirable level, and the corresponding size and allocation are more efficient, so it is possible to continue with the original layout while seeking opportunities to move to the next level.

Incremental size compensation in 2015 and 2019. In this case the company needs to make some reasonable improvements accordingly, for example, the company can further optimize the current business situation by broadening the production scale, which also includes the enhancement of production capacity, the reduction of production costs and the increase of factor inputs, so as to further improve the scale efficiency.

Diminishing returns to scale in 2017 and 2022. Under such circumstances, the Company will also need to take some measures to improve the current situation, such as by narrowing the scope of production and research and development, minimizing unnecessary expenditures, rationalizing the planning of the product mix, and increasing the investment of resources in products with a higher marginal contribution.

Table 4: Financial performance efficiency of 2015-2024

DMU	Integrated efficiency	Rank	Technical efficiency	Rank	Scale efficiency	Rank	Scale compensation
2015	0.684	10	0.695	10	0.978	7	Increasing
2016	1.000	1	1.000	1	1.000	1	Unchanged
2017	0.726	9	0.759	9	0.924	8	Decreasing
2018	1.000	1	1.000	1	1.000	1	Unchanged
2019	0.769	8	0.912	8	0.856	10	Increasing
2020	1.000	1	1.000	1	1.000	1	Unchanged
2021	1.000	1	1.000	1	1.000	1	Unchanged
2022	0.869	7	0.962	7	0.918	9	Decreasing
2023	1.000	1	1.000	1	1.000	1	Unchanged
2024	1.000	1	1.000	1	1.000	1	Unchanged

IV. B. 2) Projected value analysis of enterprise financial performance

The residual and slack variables of enterprise A for the 10-year period 2015-2024 are shown in Table 5. Among the input indicators, the input redundancy of operating capacity is not 0 in 3 years, which indicates that except for these 3 years, the development level as well as the operating capacity of enterprise A are balanced with each other in these 10 years, and the inputs and outputs of the assets are in a desirable state.The input redundancy of the solvency of enterprise A in the 10-year period of 2015-2024 is 0, which indicates that the solvency of enterprise A in this period is in line with the general expectations.

In the 4 years 2015, 2017, 2019, and 2022, the profitability slack variables are 0.256, 0.196, 0.041, and 0.047, and such values occur because of the lack of performance in these 4 years. In addition, the slack variable for development capacity is not zero in any of the 4 years, which represents a lack of development level in the 4 years, in which case it is not an ineffective means of transferring the assets that cause redundancy in solvency to development capacity. The output deficiencies corresponding to the development capacity in the remaining years are all zero, indicating that Company A's prospects for development in this period are much more favorable, and there is sufficient motivation and hope for more progress in future operations. Finally, none of the slack variables for expansion capacity in these four years are zero, suggesting that the current status of the firm's value-added and profitability in this period is less optimistic and that it is not expanding strongly enough.

Table 5: Residual variables and relaxation variables of 2015-2024

DMU	Output deficit			Input redundancy		
	Development	Profitability	Expansion	Operation	Short-term solvency	Long-term solvency
2015	0.125	0.258	0.197	0.099	0.000	0.000
2016	0.000	0.000	0.000	0.000	0.000	0.000
2017	0.088	0.196	0.437	0.000	0.000	0.000
2018	0.000	0.000	0.000	0.000	0.000	0.000
2019	0.042	0.041	0.159	0.178	0.022	0.000
2020	0.000	0.000	0.000	0.000	0.000	0.000
2021	0.000	0.000	0.000	0.000	0.000	0.000
2022	0.005	0.047	0.026	0.089	0.124	0.000
2023	0.000	0.000	0.000	0.000	0.000	0.000
2024	0.000	0.000	0.000	0.000	0.000	0.000

V. Optimization path of enterprise financial strategy

Based on the above assessment of Enterprise A's financial performance, this paper puts forward the following suggestions to optimize its financial strategy.

(1) Proper control of scale efficiency

If the scale compensation = 1, on behalf of the company's average production cost is the lowest, at this time the production scale should be in the optimal state; if the scale efficiency is less than 1, on behalf of the actual size of the company and the optimal size of the gap between the state, if the scale compensation is increasing, then the company needs to be reasonable to expand the scale of production, so that the value of scale efficiency tends to be close to 1, and vice versa, as appropriate, to reduce the scale.

(2) Mobilize the enthusiasm of employees

The company should pay attention to the staff's relevant knowledge and skills training and enhancement of psychological quality, so as to cultivate the staff's ideological awareness of the improvement of financial performance. At the same time, the employee's salary assessment content and the relevant project performance assessment indexes associated with the rewards and penalties.

(3) Focus on the cost income rate to improve the profit level

Enterprise A needs to pay full attention to the growth of its annual operating expenses and income at the same time, pay attention to the cost of earnings and operating expenses distribution is reasonable or realize a certain percentage of profits beyond the substantial increase and rapid growth, from the mutual cooperation between the two to really effectively improve their operating profitability level.

(4) Establishment of a reasonable capital structure

Enterprise A needs to establish a reasonable capital structure, and reduce the level of assets and liabilities moderately to find out unnecessary capital and costs without affecting the cash flow required for normal operation.

VI. Conclusion

By applying multiple regression analysis and data envelopment analysis methods, an in-depth assessment of Enterprise A's financial performance reveals that the enterprise generally performs well in industry competition, but there are still structural problems that need to be optimized. From the analysis of influencing factors, technological innovation and executive team characteristics positively affect the enterprise's financial performance, while investment level, financing constraints and the proportion of shares held by major shareholders show a negative effect, which provides a theoretical basis for the enterprise to formulate targeted improvement strategies. The results of the cross-sectional assessment show that the enterprise ranked 1st among 11 enterprises in the same industry with a comprehensive score of 0.364, and ranked 2nd with a solvency factor score of 0.854, demonstrating a strong comprehensive strength. However, the enterprise has obvious shortcomings in operating ability, growth ability and asset income ability, ranking last with an operating ability factor score of -1.279 and ranking 7th with a growth ability factor score of -0.209, and these weaknesses constrain the further development of the enterprise. The longitudinal assessment shows that the financial performance of the enterprise shows a good development trend, with an average integrated efficiency value of 0.905 over the 10-year period, of which 60% of the years have an integrated efficiency value of 1, which is an excellent performance. However, in 2015, 2017, 2019, and 2022, the enterprise profitability slack variables were 0.256, 0.196, 0.041, and 0.047, respectively, showing that there is still room for improvement in profitability in these years. Enterprises should further improve the level of financial performance and achieve sustainable and healthy development by rationally adjusting the scale of investment, optimizing operation management, strengthening cost control and other measures.

References

[1] Nguyen, T. T. H., Wong, W. K., Phan, G. Q., Tran, D. T. M., & Moslehpour, M. (2021). Corporate valuation spurred by information transparency in an emerging economy. Annals of Financial Economics, 16(03), 2150011.

[2] Callen, J. L., Fang, X., & Zhang, W. (2020). Protection of proprietary information and financial reporting opacity: Evidence from a natural experiment. Journal of Corporate Finance, 64, 101641.

[3] Platikanova, P., & Soonawalla, K. (2020). Who monitors opaque borrowers? Debt specialisation, institutional ownership, and information opacity. Accounting & Finance, 60(2), 1867-1904.

[4] Li, J., Li, P., & Wang, B. (2019). The liability of opaqueness: State ownership and the likelihood of deal completion in international acquisitions by Chinese firms. Strategic Management Journal, 40(2), 303-327.

[5] Nasrallah, N., & El Khoury, R. (2020, November). Proxy measure for SMEs financial performance in opaque markets. In International Conference on Business and Technology (pp. 1457-1473). Cham: Springer International Publishing.

[6] Zhao, N., Ren, J., & Chen, X. (2023). Strategic Resource Allocation in Project Management: A Fusion of ERM and Financial Insights in the Financial Sector. Journal of Commercial Biotechnology, 28(1), 177-185.

[7] Gardi, B., Hamza, P. A., Sabir, B. Y., Aziz, H. M., Sorguli, S., Abdullah, N. N., & Al-Kake, F. R. A. (2021). Investigating the effects of financial accounting reports on managerial decision making in small and medium-sized enterprises. Turkish Journal of Computer and Mathematics Education, 12(10), 2134-2142.

[8] Mazur, N., Khrystenko, L., Pásztorová, J., Zos-Kior, M., Hnatenko, I., Puzyrova, P., & Rubezhanska, V. (2021). Improvement of Controlling in the Financial Management of Enterprises. TEM journal, 10(4).

[9] Al Breiki, M., & Nobanee, H. (2019). The role of financial management in promoting sustainable business practices and development. Available at SSRN 3472404.

[10] Krištofík, P., & Novotná, M. (2018). The impact of behavioral finance on the financial performance of an enterprise. European Financial Systems, 2018, 328-333.

[11] Fu, H., Du, Y., Ding, Q., & Fu, M. (2023). Performance Evaluation of Port Enterprise Resource Integration Based on Fuzzy Comprehensive Evaluation Method. Tehnički vjesnik, 30(4), 1185-1192.

[12] Korzh, M., Gaievskyi, A., & Hurdzhyian, K. (2017). Assessment of the enterprise marketing performance. Problems and perspectives in management, (15, Iss. 4), 1-16.

[13] Ban, A. I., Ban, O. I., Bogdan, V., Popa, D. C. S., & Tuse, D. (2020). Performance evaluation model of Romanian manufacturing listed companies by fuzzy AHP and TOPSIS. Technological and Economic Development of Economy, 26(4), 808-836.
[14] Li, R., Liu, H., & Hu, Y. (2023). Financial performance evaluation and forecasting of enterprises by the combination of PCA and CNN deep learning. Frontiers of Computer Science, 17(6), 176345.
[15] Bao, T. T., Xie, X. L., & Long, P. Y. (2017). Shipping enterprise performance evaluation under uncertainty base on multiple-criteria evidential reasoning approach. Transportation research procedia, 25, 2757-2768.
[16] Béchir Ben Lahouel & Lotfi Taleb. (2025). Beyond the linear link: Threshold effects of CSR on financial performance. International Review of Economics and Finance,100,104086-104086.
[17] Lanlan Sun,Xuanxuan Zhang,Zhuming Zhao & Jianying Zhang. (2025). ESG is conducive to improving the operating efficiency of fishery enterprises -- Based on DEA model and Tobit regression analysis. Regional Studies in Marine Science,85,104158-104158.
[18] Hanjiang Dong,Xiuyuan Wang,Ziyu Cui,Jizhong Zhu,Shenglin Li & Changyuan Yu. (2025). Machine learning-enhanced Data Envelopment Analysis via multi-objective variable selection for benchmarking combined electricity distribution performance. Energy Economics,143,108226-108226.
[19] Martin Magnéli & Michael Axenhus. (2024). Trend, disparities, and projection analysis of public data on shoulder fractures in Sweden: a retrospective analysis of two hundred and sixty two thousand, four hundred and forty four fractures. International orthopaedics,48(12),1-7.