

A Study on the Relationship between the Capital Structure and Financial Performance of Listed Companies in the Power Industry: Taking Guangzhou Hengyun Enterprises Holding Ltd. (000531) as an Example

Feiyang Xie*

Department of Accounting, School of Management, Jinan University, Guangzhou, 510000, China

*Corresponding author: Feiyang Xie, ORCID: 0009-0003-7382-8909

Abstract

This study examines listed companies in China's power sector, utilizing panel data from Guangzhou Hengyun Enterprises Holding Ltd. (000531), a state-controlled enterprise in the industry, covering the decade from 2015--2024. Multiple linear regression analysis is used to empirically investigate the relationship between capital structure (with the debt-to-asset ratio as the core indicator) and financial performance (measured by the return on equity and gross profit margin). The findings reveal a negative correlation between the debt-to-asset ratio and the financial performance of listed power companies. Finally, considering the capital-intensive nature and strong policy orientation of the power sector, this study proposes recommendations for optimizing capital structure and enhancing financial performance. These insights provide a reference for financing decisions and operational management during the transformation period of similar regional power enterprises.

Keywords

capital structure, financial performance, listed companies, power industry

1. Introduction

Energy serves as the cornerstone of national economic development. As a core component of the energy system, the stable operation and efficient development of the power industry directly impact national energy security and high-quality socioeconomic progress. In recent years, driven by dual carbon goals, China's power sector has undergone profound transformation. Traditional thermal power enterprises face dual pressures from clean energy retrofits and renewable energy substitution while simultaneously grappling with intensified competition and cost volatility stemming from power market reforms. These changes impose heightened demands on capital allocation efficiency and financial health within power companies. Capital structure, as the core of corporate financing decisions, directly impacts financing costs, governance efficiency, and risk resilience, thereby influencing financial performance. While extensive research exists on this relationship both domestically and internationally, the conclusions vary, and specialized studies on power enterprises in specific regions or transition phases remain underdeveloped. As a key municipal power enterprise in Guangzhou, Guangzhou Hengyun Enterprises Holding Ltd. has established a distinctive competitive landscape during industry transformation. Leveraging its significant regional monopoly in district heating, leading to a new

energy transition strategy, and pioneering exploration of energy storage services, the company presents a diversified capital structure characterized by “traditional thermal power as the foundation, new energy investment for scale expansion, and financial investments for empowerment.” This provides a representative case study for examining the alignment between capital structure and financial performance in local power enterprises undergoing transformation.

2. Overview of Capital Structure and Financial Performance

2.1 The Concept of Capital Structure

Capital structure is a core concept in corporate financial management, referring to the composition and proportional relationships of an enterprise's long-term capital. It focuses primarily on the combination of long-term debt capital and equity capital (short-term liabilities are typically managed under working capital and fall outside its core scope). Equity capital, as “owner equity,” encompasses paid-in capital (or share capital), capital reserves, retained earnings, and undistributed profits. It carries no repayment obligation but incurs higher costs. Long-term debt capital, as “borrowed capital,” includes long-term loans, bonds payable, and similar instruments. While requiring scheduled principal and interest payments, its interest expenses are tax deductible (offering a tax shield effect), yet it increases debt repayment pressure and financial risk for the enterprise (Qian, 2015). In practice, companies balance financing costs, financial risk, and governance efficiency by adjusting the ratio between these two components (commonly measured via indicators such as the debt-to-equity ratio and equity multiplier). This directly impacts their capital allocation capabilities, profitability, and resilience against risks, with its rationality being crucial to the enterprise's sustainable operations and long-term development.

2.2 Essence of Financial Performance

Financial performance represents the comprehensive reflection of financial outcomes and operational efficiency achieved by an enterprise through resource allocation, business activities, and investment decisions within a specific operating cycle. It serves as the core indicator system for measuring an enterprise's financial health, profitability, solvency, operational capability, and growth potential. From specific dimensions, its core measurement areas include profitability (e.g., net profit, gross profit margin, return on equity), reflecting the enterprise's ability to generate profits; solvency (e.g., debt-to-equity ratio, current ratio), demonstrating the enterprise's risk resilience in repaying maturing debts; operational capability (e.g., accounts receivable turnover, inventory turnover), measuring the efficiency of asset utilization and management; and growth potential (e.g., revenue growth rate, net profit growth rate), which indicate a company's future expansion capacity and sustainability (Yang, 2022). Financial performance serves not only as a barometer of a company's operational outcomes but also as a critical basis for investors to evaluate investment value, creditors to assess credit risk, and management to formulate strategic decisions. Its quality directly determines a company's survival and development prospects in market competition.

3. Overview of the Power Industry and Basic Information Provided by Guangzhou Hengyun Enterprise Holdings Co., Ltd.

3.1 Overview of the Electric Power Industry

The power industry is a foundational sector vital to the national economy and people's livelihoods, serving as the cornerstone of the nation's energy infrastructure. Its energy mix encompasses multiple sources, including thermal power, hydropower, wind power, solar power, and nuclear power. While thermal power remains dominant, the number of clean energy sources is growing rapidly. By the end of 2023, renewable energy accounted for 52% of the installed power generation capacity. In terms of scale, China's total installed power generation capacity reached 2.92 billion kilowatts in 2023, with electricity generation reaching 9.5 trillion kilowatt-hours and total national electricity consumption reaching 9.22 trillion kilowatt-hours. These figures demonstrate both massive-scale and stable growth trends. Within the industry chain, the upstream sector encompasses power equipment manufacturing and design; the midstream sector involves power generation,

transmission, distribution, and retail; and the downstream sector connects to various end-use terminals, forming a complete and tightly integrated industrial ecosystem. Moving forward, the power sector will advance decisively toward a future dominated by new energy sources, characterized by clean and low-carbon operations, and driven by intelligent and efficient technologies. It will continue to deliver robust momentum for economic and social development.

3.2 Basic Information on Guangzhou Hengyun Enterprises Holding Ltd. Company

Guangzhou Hengyun Enterprises Holding Ltd. (000531) is a key state-owned energy enterprise in Guangzhou, ranking among Guangdong's top 500 enterprises and China's top 500 energy companies. The company was established in 1987 and was listed on the Shenzhen Stock Exchange in 1994. Its business scope encompasses power generation, heating, new energy, and finance. By 2025, the company had an installed capacity of 2.54 million kilowatts, including 1.08 million kilowatts of coal-fired power, 962,000 kilowatts of gas-fired power, and 620 MW of photovoltaic power under construction. Additionally, the company holds an 11.69% stake in Yuexiu Capital and indirectly owns 13.29% of the Guangzhou AMC. In the first quarter of 2025, the company's net profit reached between RMB 80 million and RMB 108 million, representing a year-to-year increase of 155% to 244%.

4. Literature Review and Research Hypotheses

On the basis of existing research findings, empirical studies from multiple literature sources support a negative correlation between corporate capital structure and financial performance. The empirical study on the interactive relationship between capital structure and corporate performance of listed companies concludes through empirical analysis that capital structure and corporate performance are negatively correlated (Xiao, 2005). As a firm's debt level increases, it faces greater solvency risk, prompting creditors to demand higher rates of return. Simultaneously, equity investors seek higher returns to compensate for increased investment risk, leading to higher financing costs and weakened solvency. This undermines the firm's future development and consequently reduces its performance. "An Empirical Study on the Relationship Between Capital Structure and Corporate Performance: A Case Study of Listed New Energy Companies" examined listed companies in China's energy sector. A negative correlation was found between capital structure and corporate performance. When corporate profitability is high, companies tend to prioritize internal financing over debt financing according to the pecking order theory, further illustrating the inverse relationship between debt ratios and corporate performance (Liao, 2022).

Therefore, the following hypothesis is proposed: Holding other conditions constant, an increase in the proportion of debt in the capital structure of listed companies in the power industry will lead to a decline in financial performance, indicating a negative correlation between corporate capital structure and financial performance.

5. Variable Design and Model Construction

5.1 Variable Design

5.1.1 Dependent Variable

The return on equity (ROE) is a key metric for measuring a company's ability to generate profits via shareholders' invested capital. This indicator directly reflects the return level on shareholders' equity; a higher value typically signifies stronger profitability efficiency. It serves as an important reference for investors to evaluate a company's earning capacity and compare the investment value of different enterprises.

The gross profit margin (GPM) is a key metric for measuring the core profitability of a company's products or services. It reflects the proportion of remaining profit after deducting direct costs (such as raw materials and direct labor) from sales revenue. Its value directly reflects the added value of products, the company's pricing power, and its level of cost control. A higher gross profit margin typically indicates stronger product competitiveness or more efficient cost management.

Therefore, this paper employs return on equity (ROE) and gross profit margin (GPM) to measure corporate financial performance (Chen and Meng, 2014).

5.1.2 Explanatory Variables

The debt-to-asset ratio (DAR) is one of the core indicators for measuring a company's capital structure. It directly reflects the proportion of total liabilities relative to total assets, illustrating the balance between debt and equity in the company's funding sources. This metric reveals both a company's debt repayment capacity and the stability of its capital structure: a moderate debt-to-asset ratio indicates prudent use of financial leverage to expand operations, whereas an excessively high ratio may increase debt repayment risk, and an excessively low ratio may suggest inefficient capital utilization. By analyzing the debt-to-asset ratio, one can not only assess the rationality of a company's capital structure but also evaluate its financial risk tolerance and the aggressiveness of its business strategy relative to industry averages. It serves as a crucial basis for understanding corporate financing decisions and financial health.

Therefore, this paper employs the debt-to-asset ratio (DAR) to measure a firm's capital structure (Xu and Wang, 2024).

5.1.3 Control Variables

In addition to capital structure, several other factors influence a company's financial performance. The current ratio (CR) reflects a company's short-term debt-paying ability, whereas firm size (ES) is measured via the natural logarithm of total assets to control for the effects of operational capacity and economies of scale on financial performance.

Since this paper is a single-firm study, firm size (ES) and the current ratio (CR) across different periods are employed as control variables.

Table 1: Variable Design

Variable Name		Variable Symbol	Variable Measurement Method
Dependent Variable	Return on Equity	ROE	(Net Profit/Average Net Assets) * 100%
	Gross Profit Margin	GPM	(Operating Revenue - Cost of Goods Sold)/Operating Revenue * 100%
Explanatory Variable	Debt-to-Asset Ratio	DAR	Total Liabilities/Total Assets * 100%
Control Variable	Current Ratio	CR	Current Assets/Current Liabilities * 100%
	Enterprise Scale	ES	Logarithm of Total Assets for Each Year

As shown in Table 1, this is the variable design for the current study.

5.2 Model Construction

To conduct an in-depth analysis of the relationship between capital structure and financial performance while accounting for the potential influence of firm size and the current ratio on this relationship, we constructed the following multiple linear regression model:

$$Y = \beta_0 + \beta_1 \times \text{DAR} + \beta_2 \times \text{ES} + \beta_3 \times \text{CR} + U$$

Among these, Y represents the dependent variables, namely, return on equity (ROE) and the gross profit margin (GPM), which measure a company's financial performance; DAR is the explanatory variable, i.e., the debt-to-asset ratio, which represents the company's capital structure; ES and CR are control variables, which represent the company size and current ratio, respectively; β_0 is the intercept term; β_1 , β_2 , and β_3 are the regression coefficients to be estimated; and U is the random error term, which follows a normal distribution.

6. Empirical Analysis

6.1 Data Sources and Sample Selection

This study selected financial data from Guangzhou Hengyun Enterprises Holding Ltd. Company from 2005--2024, identified 20 research samples, and examined the relationship between their capital structure and financial relationships. All the data were sourced from Sina Finance.

6.2 Descriptive Statistics for the Entire Sample

Table 2: Descriptive Statistics for the Entire Sample

Variable Name	Sample Size	Average	Standard deviation	Maximum	Minimum
Debt-to-Asset Ratio	20	60.26%	0.062642	70.25%	46.76%
Return on Equity	20	9.81%	0.077452	25.63%	-4.17%
Gross Profit Margin	20	21.71%	0.098415	32.66%	-1.39%
Current Ratio	20	39.23%	0.276913	83.55%	-47.58%
Enterprise Scale	20	22.87	0.504793	23.70	21.93

As shown in Table 2, the enterprise's average debt-to-asset ratio was 60.26%, with a standard deviation of 0.062642, ranging from a maximum of 70.25% to a minimum of 46.76%. This finding indicates that while its capital structure fluctuated across different years, it remained relatively stable overall. The average return on equity (ROE) was 9.81%, with a standard deviation of 0.077452, ranging from a high of 25.63% to a low of -4.17%. This reflects significant annual variations in shareholder returns, with fluctuations between profitability and losses. The average gross profit margin was 21.71%, with a standard deviation of 0.098415, ranging from -1.39% to 32.66%, indicating substantial annual fluctuations in core business profitability, with cost pressures observed in certain years. The current ratio averaged 39.23%, with a standard deviation of 0.276913, and recorded negative values as low as -47.58% and peaks as high as 83.55%, indicating severe annual volatility in short-term debt repayment capacity and risks of tight short-term cash flow. The enterprise scale averaged 22.87, with a standard deviation of 0.504793, fluctuating within the range of 21.93-23.70. Overall, it exhibited a gradual contraction trend with minimal annual variation. These data reveal significant fluctuations in a company's financial performance across different years—particularly in profitability and short-term solvency—while its capital structure and scale remain relatively stable.

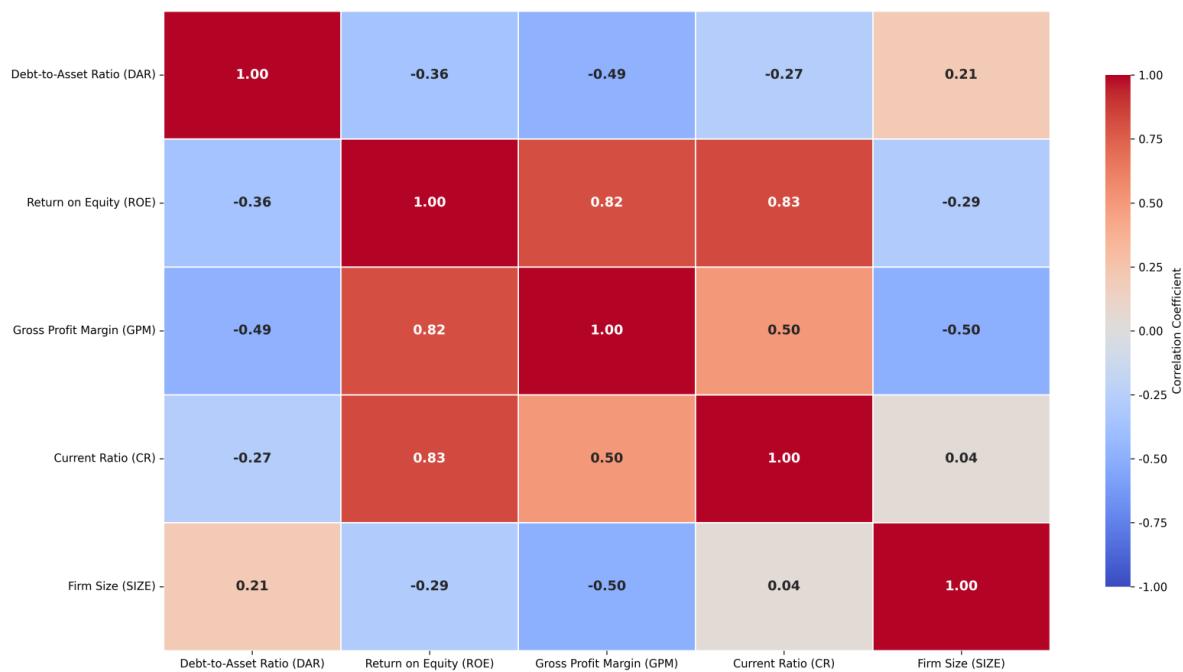
6.3 Correlation Analysis

The correlation coefficient matrix among variables is calculated to analyze the degree of linear correlation between them. The correlation coefficients range from -1 to 1. The closer the absolute value is to 1, the stronger the correlation; the closer it is to 0, the weaker the correlation. A positive correlation indicates that two variables change in the same direction, whereas a negative correlation indicates that they change in opposite directions.

Table 3: Pearson correlation coefficient matrix analysis

Variable	Debt-to-Asset Ratio	Return on Equity	Gross Profit Margin	Current Ratio	Enterprise Scale
Debt-to-Asset Ratio	1	-0.36	-0.49	-0.27	0.21
Return on Equity	-0.36	1	0.82	0.83	-0.29
Gross Profit Margin	-0.49	0.82	1	0.5	-0.51
Current Ratio	-0.27	0.83	0.5	1	0.04
Enterprise Scale	0.21	-0.29	-0.51	0.04	1

Figure 1: Heatmap analysis of Pearson correlation coefficients
Correlation Heatmap of Capital Structure and Financial Performance Indicators



Note: Colors closer to warm tones (e.g., red) indicate stronger positive correlations, whereas colors closer to cool tones (e.g., blue) indicate stronger negative correlations.

As shown in Table 3 and Figure 1, the debt-to-asset ratio clearly has a negative correlation with return on equity (ROE), the gross profit margin, and the current ratio. This indicates that a higher debt-to-asset ratio may, to some extent, reduce ROE, the gross profit margin, and the current ratio. The correlation with gross profit margin and ROE is particularly strong, suggesting that an increase in the proportion of debt within the capital structure has a relatively significant negative effect on corporate financial performance.

6.4 Regression Analysis

To validate the overall explanatory power of the relationship between capital structure and financial performance, this study constructs multiple linear regression models using panel data spanning 20 years for individual firms. With the debt-to-asset ratio as the core explanatory variable and the current ratio and firm size as control variables, the models predict return on equity and gross profit margin, respectively. The analysis focuses on evaluating the overall significance of these models.

Table 4: Overall significance test results

Dependent Variable	F-Statistic	Probability Value (P value)	Significance Level ($\alpha=0.05$)	Conclusion
Return on Equity	21.05	0.00000842	Significant ($P<0.01$)	Model as a whole is significant
Gross Profit Margin	7.727	0.00206	Significant ($P<0.01$)	Model as a whole is significant

As shown in Table 4, the F statistic tests the null hypothesis that “all explanatory variable coefficients are equal to zero.” The p values for both models are significantly less than 0.01, indicating that at the 1% significance level, the null hypothesis can be rejected. This confirms that the debt-to-equity ratio, current ratio, and firm size collectively exert a significant explanatory effect on financial performance (return on equity and gross profit margin). This implies that fluctuations in corporate financial performance are not determined by a single factor but rather result from the combined effects of capital structure, short-term solvency, and scale characteristics. This finding validates the theoretical logic that “multiple factors influence financial performance.”

6.5 Analysis of Regression Model Fit Quality

The coefficient of determination (R^2) serves as a core metric for assessing a regression model's ability to explain the variance in the dependent variable. Its value ranges from $[0, 1]$, with values closer to 1 indicating superior model fit. On the basis of 20 years of panel data from a single firm, regression models were constructed with the debt-to-asset ratio as the explanatory variable and the current ratio and firm size as control variables. The goodness-of-fit analysis for the two explained variables—return on equity and gross profit margin—is as follows:

Table 5: Goodness-of-fit results

Dependent Variable	R^2 (Coefficient of Determination)	Adjusted R^2 (Adjusted Coefficient of Determination)
Return on Equity	0.798	0.760
Gross Profit Margin	0.592	0.515

As shown in Table 5, the adjusted R^2 values for the two models are 0.760 and 0.515, respectively. This finding indicates that the combined effect of the three variables—the debt-to-equity ratio, current ratio, and firm size—effectively explains the fluctuations in the firm's return on equity and gross profit margin across different years. This result aligns with the theoretical logic that the return on shareholders' equity is jointly influenced by capital structure, short-term solvency, and scale effects, suggesting that the model provides an optimal fit for financial performance.

7. Research Findings and Recommendations

7.1 Conclusion

This study uses 20 years of financial data from a single enterprise as its sample. It employs return on net assets (ROE) and gross profit margin as financial performance metrics, with the debt-to-equity ratio serving as a proxy variable for capital structure. The current ratio and firm size are introduced as control variables. Through correlation analysis and regression analysis, the relationship between capital structure and financial performance is explored. The results indicate a negative correlation between capital structure and financial performance. Correlation analysis reveals that rising debt levels (the debt-to-asset ratio) tend to accompany declining financial performance (ROE and gross profit margin), suggesting that increased debt may suppress corporate profitability. Considering practical operational logic, a high debt-to-asset ratio may increase financial risk and financing costs, indirectly pressuring core business profitability (gross profit margins) and shareholder equity returns (returns on equity). This finding partially supports the view that excessive reliance on debt financing may hinder improvements in corporate financial performance, highlighting the critical importance of maintaining a reasonable debt proportion within the capital structure for sustaining stable performance.

7.2 Recommendations

On the basis of research findings indicating a negative correlation between capital structure and financial performance, enterprises should reasonably control debt levels, avoid excessive reliance on debt financing, and dynamically optimize capital structure by aligning with their profitability and debt-servicing capabilities to balance leverage effects and financial risks. Concurrently, they must strengthen capital management to ensure that debt funds flow into high-yield core businesses, establish robust risk early warning mechanisms to address repayment pressures, and prevent short-term liquidity issues from exacerbating performance volatility. Furthermore, companies must enhance earnings quality by optimizing business structures, strictly controlling costs, and improving market competitiveness. This approach fundamentally mitigates the negative impact of debt on performance, achieving a virtuous cycle between capital structure and financial performance.

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Conflicts of Interest

The authors declare no conflict of interest.

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