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The Relationship Between Growth and Capital Structure of Chinese New Energy Enterprises

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Abstract: This paper employs balanced panel data from 89 publicly listed companies in the Chinese energy industry spanning the years 2014 to 2023. It measures firm growth using Tobin's Q ratio and assesses corporate capital structure through the debt-to-asset ratio to investigate the relationship between capital structure and growth in the Chinese energy industry. By incorporating firm listing year, firm size, and core competitiveness as control variables, and utilizing both time-fixed effects and two-way fixed effects models for empirical analysis, the study concludes that the impact of capital structure on growth evolves over time. Specifically, a negative correlation is observed between the current period's capital structure and growth, whereas a positive correlation exists between the previous period's capital structure and growth. When adjusting their capital structures, energy firms should not only focus on current risk assessments and growth evaluations but also comprehensively consider the long-term ramifications of these adjustments on their future development.

Keywords: Capital structure, Enterprise growth, Two-way fixed effects models.

1. Introduction

Capital structure refers to the value composition and proportional relationship of various types of capital in an enterprise, which can be divided into debt capital and equity capital, or short-term capital and long-term capital. Corporate growth is the ability of a company to sustain its development, reflecting its future operational efficiency and development status. Capital structure, as a crucial indicator in corporate finance, is closely intertwined with a firm's future growth capacity. Regarding the relationship between capital structure and growth among listed companies, academic research has been conducted on various types of listed firms, including those in the ChiNext, cultural, and manufacturing sectors [1-2]. However, previous literature has yet to explore this relationship within the realm of energy enterprises. Currently, China is in the era of "dual carbon" goals, and energy enterprises, as core entities in green development, have been key areas of support in China's economic development in recent years. The question of how energy enterprises should balance and optimize their capital structure to promote their healthy and stable development, thereby contributing to societal and economic progress, has become a research topic of significant contemporary value. This paper fits panel data from various enterprises using a fixed-effects model to investigate the correlation between capital structure and corporate growth, providing a directional reference for subsequent adjustments to capital strategies among energy enterprises.

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2. Research Hypothesis

Existing literature has not reached a unified conclusion regarding the relationship between capital structure and corporate growth. Some scholars argue that there is a significant positive correlation between the two, while others contend that there is a significant negative correlation. The research results of the remaining scholars indicate that the correlation between these two factors is not significant[3-5].

Due to the energy industry's typical requirements for substantial initial investments and extended capital recovery periods, when a company's current debt-to-asset ratio increases, timely recovery of initial capital and investment returns becomes challenging. Consequently, the pressure on the enterprise to repay interest intensifies, financial expenses rise, and profits decline, ultimately impacting future growth expectations. Furthermore, a higher debt-to-asset ratio signifies greater financial risk. Since a firm's overall risk encompasses both financial and operational risks, when financial risk increases, to maintain a constant overall risk level, companies often tend to reduce profits by lowering prices or taking other measures to decrease operational risk, leading to decreased corporate performance and downward adjustments to future growth expectations [6]. However, an elevated debt-to-asset ratio also provides enterprises with more disposable resources for investments in various areas. These investments, after a certain period, can positively impact corporate performance, thereby exerting a lagged positive influence on a firm's growth potential. Based on this, the following hypotheses are proposed in this paper:

H1: Under constant other conditions, there is a negative correlation between the current period's capital structure of energy enterprises and their growth potential.

H2: Under constant other conditions, there is a positive correlation between the previous period's capital structure of energy enterprises and their growth potential.

3. Model and Data

3.1. Data Sources and Sample Selection

During the data preprocessing phase, this paper screened out enterprises with missing data and ultimately selected panel data from 89 listed companies in the energy industry (covering coal, power generation, new energy, and crude oil) for the period 2014-2023. The data were sourced from the Wind Financial Terminal and annual reports of each enterprise, with primary data analysis conducted using Stata 17.0.

3.2. Descriptive Statistics of Variables

In this paper, corporate growth potential is taken as the dependent variable, and Tobin's Q ratio is used as the metric to measure corporate growth potential, calculated as $\text{Tobin}'\text{s Q} = \frac{\text{Market Value}}{\text{Total Asset}}$ [7]. Capital structure is taken as the explanatory variable, measured by the debt-to-asset ratio. Company listing year, company size, and company core competitiveness are selected as control variables. Company size is measured by the natural logarithm of the company's total assets at the end of the period, and company core competitiveness is measured by the accounts receivable turnover ratio [8-9]. The time span of the above variable data is 10 years, with each cross-section including 89 energy enterprises. The specific data characteristics are shown in Table 1. Therefore, each variable has 890 observations, indicating that this panel data is balanced.

According to Table 1, the maximum value of Tobin's Q is 6.293, the minimum value is 0.697, and the mean value is 1.07. This indicates that the overall market value of enterprises in the energy industry is higher than their replacement cost, with high market expectations for their future

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profitability and a strong investment inclination among investors. Meanwhile, the minimum value of the Asset Liability Ratio is 0.013, the maximum value is 1.112, and the mean value is 0.572. This shows that there is considerable variation in the debt-to-asset ratios within the energy industry, but the equity and debt proportions of most enterprises are relatively balanced, indicating moderate financial risk.

Table 1: Summary Statistics

VarName	Obs	Mean	SD	Min	Median	Max
Tobin's Q	890	1.220	0.493	0.687	1.070	6.293
Asset liability ratio	890	0.570	0.176	0.013	0.572	1.112
Listing year	890	18.710	6.097	1.000	19.000	34.000
Logarithmic of total assets	890	23.960	1.517	20.296	23.806	28.644
Accounts receivable turnover ratio	890	24.200	73.136	0.602	9.853	1376.176

3.3. Stationarity Test of Sequences

Due to the possibility of spurious regression when fitting non-stationary time series data, it is necessary to conduct a stationarity test on each panel sequence data to ensure the validity of the model estimation results. The most commonly used method to test data stationarity is the unit root test. By performing the unit root test on each variable separately, the final P-values are shown in Table 2. All data have passed the unit root test, indicating that each panel sequence is a stationary sequence.

Table 2: Unit Root Test

VarName	P Value
Tobin's Q	0.0000
Asset liability ratio	0.0006
Listing year	0.0000
Logarithmic of total assets	0.0002
Accounts receivable turnover ratio	0.0080

3.4. Model Building

The Hausman test results indicate a P-value of 0.000, leading to the rejection of the null hypothesis at a 5% significance level. Consequently, it is deemed appropriate to select the fixed effects model and corresponding estimation methods. In this paper, we opt to construct both time-fixed effects models and two-way fixed effects models for parameter estimation of panel data.

To validate Hypotheses 1 and 2, the following models are established in this paper: Model (1) includes only the dependent variable, the explanatory variable, and the lagged first-order explanatory variable; Model (2) incorporates control variables; Model (3) introduces time-fixed effects; and Model (4) incorporates time-individual two-way fixed effects.

$$Tobin's\ Q_{it} = \beta_0 + \beta_1 Asset\ liability\ ratio_{it} + \beta_2 Asset\ liability\ ratio_{i,t-1} + \varepsilon_{it} \quad (1)$$

$$Tobin's\ Q_{it} = \beta_0 + \beta_1 Asset\ liability\ ratio_{it} + \beta_2 Asset\ liability\ ratio_{i,t-1} + \sum Controls + \varepsilon_{it} \quad (2)$$

$$Tobin's\ Q_{it} = \beta_0 + \beta_1 Asset\ liability\ ratio_{it} + \beta_2 Asset\ liability\ ratio_{i,t-1} + \sum Controls + \lambda_t + \varepsilon_{it} \quad (3)$$

$$Tobin's\ Q_{it} = \beta_0 + \beta_1 Asset\ liability\ ratio_{it} + \beta_2 Asset\ liability\ ratio_{i,t-1} + \sum Controls + \lambda_t + \alpha_i + \varepsilon_{it} \quad (4)$$

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4. Results and Analysis

4.1. Model Results

The results of Models (1) to (4) are presented in Tables 3 to 6. According to Tables 3 to 6, regardless of whether control variables and two-way fixed effects are considered, there exists a significant negative correlation between the current capital structure of a firm and its current growth. Specifically, the higher the current asset liability ratio, the lower the company's future growth expectations, thereby confirming Hypothesis 1. Furthermore, there is a significant positive correlation between the previous capital structure of a firm and its current growth. A higher previous debt-to-asset ratio is related to a higher expected future growth of the firm, thereby confirming Hypothesis 2. After incorporating control variables and two-way fixed effects, the absolute value of the correlation coefficient between the current debt-to-asset ratio and firm growth decreases, indicating a reduced degree of correlation between the two variables.

Table 3: Model (1) Results

Tobin's Q	Coefficient	Std. err.	z	P>|z|	[95% conf.	interval]
Asset liability ratioit	-0.861	0.190	-4.520	0.000	-1.234	-0.487
Asset liability ratioi,t-1	0.484	0.184	2.620	0.009	0.122	0.845
_cons	1.419	0.084	16.810	0.000	1.254	1.585

Table 4: Model (2) Results

Tobin's Q	Coefficient	Std. err.	z	P>|z|	[95% conf.	interval]
Asset liability ratioit	-0.630	0.176	-3.590	0.000	-0.974	-0.286
Asset liability ratioi,t-1	0.517	0.168	3.070	0.002	0.187	0.847
Listing year	-0.018	0.003	-5.510	0.000	-0.024	-0.012
Logarithmic of total assets	-0.204	0.019	-10.800	0.000	-0.241	-0.167
Accounts receivable turnover ratio	0.000	0.000	0.830	0.409	0.000	0.000
_cons	6.497	0.436	14.900	0.000	5.642	7.351

Table 5: Model (3) Results

Tobin's Q	Coefficient	Std. err.	z	P>|z|	[95% conf.	interval]
Asset liability ratioit	-0.665	0.166	-4.020	0.000	-0.990	-0.341
Asset liability ratioi,t-1	0.436	0.158	2.770	0.006	0.127	0.746
Listing year	0.002	0.006	0.340	0.734	-0.010	0.015
Logarithmic of total assets	-0.174	0.020	-8.750	0.000	-0.213	-0.135
Accounts receivable turnover ratio	0.000	0.000	0.950	0.343	0.000	0.000
_cons	5.691	0.491	11.590	0.000	4.728	6.653

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Table 6: Model (4) Results

Tobin's Q	Coefficient	Std. err.	z	P>|z|	[95% conf.	interval]
Asset liability ratioit	-0.388	0.173	-2.240	0.025	-0.728	-0.048
Asset liability ratioi,t-1	0.556	0.159	3.490	0.000	0.244	0.868
Listing year	-0.020	0.009	-2.130	0.033	-0.039	-0.002
Logarithmic of total assets	-0.258	0.035	-7.410	0.000	-0.326	-0.190
Accounts receivable turnover ratio	0.000	0.000	0.800	0.421	0.000	0.000
_cons	8.014	0.915	8.750	0.000	6.220	9.808

4.2. Robustness Check

To ensure the robustness of the regression results, this paper conducts a robustness check using the variable substitution method. Specifically, this paper calculates TobinQ' as (Market Value) / (Total Asset - Net Balance of Intangible Assets - Net Goodwill) as an alternative proxy for corporate performance. Both the unit root test and Hausman test are conducted on the data, and the regression results after substitution are largely consistent with those before substitution, indicating a high degree of robustness in the paper's conclusions.

5. Conclusion

Based on data from 89 listed energy companies spanning from 2014 to 2023, this paper explores the relationship between capital structure and corporate growth. The research findings reveal a lagged effect of capital structure, transitioning from a negative to a positive correlation over time. There exists a negative correlation between a firm's current capital structure and its growth, while a positive correlation is observed between the previous capital structure and current growth. Factors such as the year of a firm's Initial Public Offering, firm size, core competitiveness, and two-way fixed effects influence the correlation between current capital structure and growth, resulting in a weakened correlation when these factors are considered. This suggests that when adjusting capital structure, energy firms should not only focus on current risk and growth assessments but also fully consider the future implications of capital structure on the firm, choosing appropriate financial strategies. This paper uses Tobin's Q to measure corporate growth, which is convenient but more suitable for regions with mature capital markets. Given that China's capital market is still in need of improvement, and the stock prices of listed companies do not fully reflect their intrinsic value, future research could consider using multiple indicators for factor analysis to develop a comprehensive evaluation metric for measuring corporate growth.

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