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Capital Structure and Firm Performance: Evidence from China's New Energy Industry

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Abstract: Over the past decade, China's new energy industry has taken a leading position all over the world. To promote the healthy development of China's new energy industry, this paper takes 89 China's new energy listed companies between 2012 and 2021 as a sample and uses panel and OLS regression to study the impact of capital structure of China's new energy listed companies on corporate performance. The results of this paper show that in China's new energy industry, the asset-liability ratio is negatively associated with company performance, the equity concentration ratio is negatively related to firm performance, and the equity checks and balances is positively correlated with firm performance. China's new energy listed companies should optimize the debt and equity structure, reasonably control the debt, and strengthen the equity checks and balances to promote the stable development of the industry.

Keywords: capital structure, firm performance, China's new energy industry, corporate finance

1. Introduction

Entering the second decade of the 21st Century, China's economy has grown rapidly, and all industries in China have made remarkable development achievements. However, in recent years, climate warming and environmental pollution have become common concerns around the world, and China's energy structure adjustment and economic transition are imperative. Wang Q. and Yi H. use the propensity matching score method to construct a unique measurement model, finding that there is a positive relation between China's strategy of vigorously developing new energy and sustainable economic growth [1]. Therefore, China's new energy industry has gained rare development opportunities with a large amount of financial support, and has developed rapidly in a very short period. Based on China's individual new energy consumption data and GDP from 2004 to 2017, Huang Z. and Huang L. argue that China's individual new energy consumption is beneficial to China's economic growth [2]. Meanwhile, the rapid development of China's new energy industry has spawned diversified financing needs of listed companies, but the source and structure of capital may have an impact on firm performance. Unfortunately, there is a research gap and blank about the impact of capital structure of China's new energy listed companies on firm performance, and few researchers have studied this issue, so this paper may fill the research gap and contribute to the research on this issue. Therefore, this paper uses panel data regression to further

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study the relation between capital structure of China's new energy listed companies and firm performance. By this way, this paper can not only provide references for China's new energy listed companies to optimize their capital structure but also provide inspiration for regulators to guide the healthy development of China's new energy industry and investors' investment choices.

2. Literature Review and Hypothesis Development

2.1. Literature Review

Discussions about capital structure have never stopped since Professor Modigliani F. and Miller M.H. first proposed the famous MM theory in 1958. The earliest MM theory supports that the capital structure and cost of an enterprise would not affect the firm performance without considering taxes, so there would be no perfect capital structure. However, Modigliani F. and Miller M.H. soon realize that there was no perfect capital market without taxes. Modigliani F. and Miller M.H. revise their original model, and their empirical results suggest that debt is positively related to corporate performance [3]. After that, scholars regard the balance theory, pecking order theory, and agency theory as supplements to MM theory. However, it is worth noting that due to the different macroeconomic and industrial backgrounds, no existing theory can explain the impact of capital structure on firm performance independently [4]. Meanwhile, lots of empirical researches show that capital structure influences corporate performance. Ayaz M. et al. study Malaysian listed companies from 2005 to 2016 and argue that among Malaysian listed companies, financial leverage is positively associated with firm performance [5]. Mathur N. et al. use panel and OLS regression to study the data of BSE500 listed pharmaceuticals in India, indicating that the debt ratio is negatively associated with firm performance [6]. Xiong J.P. uses data of China's automobile listed companies, suggesting that the relation between asset-liability ratio and firm performance is an inverted U-shaped curve [7].

2.2. Hypothesis Development

This paper argues that the reason why there are different conclusions of the above scholars about the relation between capital structure and firm performance is that their researches have different national and industrial backgrounds, as well as different classifications and indicators of capital structure. Therefore, this paper divides the capital structure into debt structure and equity structure, selecting four indicators to explore the impact of capital structure of China's new energy listed companies on firm performance.

In the debt structure, Liu G.S. et al. take 218 Chinese new energy automobile listed companies as the sample, finding that a high asset-liability ratio is harmful to firm performance [8]. This paper argues that although new energy enterprises do need a lot of funds to carry out project construction, the high asset-liability ratio will not only increase the interest expenditure of enterprises but also put pressure on the decision-making of the management, which is not conducive to the normal production and operation of the company. This paper proposes hypothesis 1: the asset-liability ratio of China's new energy listed companies is negatively associated with company performance.

Based on data of China’s media listed companies between 2001 and 2006, Yao D.Q. finds that the increase in the current debt ratio will reduce the firm performance [9]. This paper argues that due to the low cost of short-term funds, China's new energy listed companies have a large demand for financing and rely heavily on short-term funds, but the excessive current debt ratio will increase financial risk. This paper proposes hypothesis 2: the current debt ratio of China's new energy listed companies is negatively associated with firm performance.

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In the ownership structure, Zhang Y. suggests that the relation between ownership concentration and firm performance in China's pharmaceutical industry is negative [10]. Based on the data of China's sports industry between 2009 and 2012, Wang Z. H. finds the largest shareholder's shareholding ratio is negatively associated with firm performance [11]. This paper argues that the largest shareholder holds too many shares, that is, the shares are excessively concentrated, and it is difficult for other shareholders to constrain them when the largest shareholder harms others' interest. This paper proposes hypothesis 3: the ownership concentration is negatively related to the performance of China's new listed companies.

Jia Y. and Qiu Y. use the OLS regression method to study 55 listed companies in China's pharmaceutical industry, showing that high equity checks and balances increase firm performance [12]. This paper argues that the large shareholders except controlling shareholders have a high proportion of shares, which can play a role of external supervision and contribute to the improvement of firm governance. This paper proposes hypothesis 4: the equity balance is positively associated with firm performance in China's new energy industry.

3. Methodology

3.1. Variable selection

Firm performance measures mainly include return on total assets, Tobin's Q and return on equity. This paper selects return on total assets to represent the firm performance, which is recorded as ROA. In the debt structure, this paper employs the asset-liability ratio and current debt ratio as representatives, which are recorded as DAR and CDR respectively. In the ownership structure, this paper chooses equity concentration ratio and equity checks and balances as representatives, which are recorded as Z and CR10 respectively. Equity concentration refers to the largest shareholder's shareholding ratio, while equity checks and balances refer to the top ten shareholders' shareholding ratio. This paper chooses the growth rate of revenue that can measure the growth of the company as the control variable, which is recorded as GROW.

3.2. Benchmark model

This paper estimates the relation between capital structure of China's new energy listed companies and company performance by the following model:

$$FP = \alpha + \beta_1 DAR + \beta_2 CDR + \beta_3 Z + \beta_4 CR_{10} + \varepsilon \quad (1)$$

Where FP is the firm performance, β is the coefficient, DAR is the asset-liability ration, CDR is the current debt ratio, Z is the equity concentration ratio, and CR10 is the equity checks and balances.

3.3. Data source and sample

According to the industry classification of Shenyin Wanguo 2021, China's new energy industry is referred to power equipment industry including electrical equipment, power supply equipment, photovoltaic equipment, wind power equipment, grid equipment, and batteries. The initial sample of this paper includes all China's new energy listed companies between 2012 and 2021. Based on period selected in this paper, this paper deletes the companies in China's new energy industry listed after 2012, with missing values, and with abnormal trading status. The final sample of this paper contains 89 listed companies with 890 firm-year observations in China's new energy industry. All

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financial and accounting data such as capital structure, company performance, and revenue growth rate in this paper are obtained from Wind and CSMAR databases.

4. Empirical tests and discussion

4.1. Descriptive statistic

Before conducting descriptive statistics on all variables, this paper uses the econometric software Stata to shrink the tail (Winsorize2) of the data, which can reduce the impact of extreme values. Table 1 shows the results of descriptive statistics after tail shrinking (Winsorize2) on all variables. The median of firm performance agency selected in this paper (ROA) is 0.028, suggesting that China's new energy listed companies have strong profitability and good asset operation capability. The mean of asset-liability ratio (DAR) is 0.481, which supports that China's new energy listed companies have high asset-liability ratio and high financial leverage, and should pay attention to the corresponding financial risks while making rational use of creditor funds. The median of current debt ratio (CDR) is 0.874 and the mean of current debt ratio (CDR) is 0.839, suggesting that listed companies in China's new energy industry have high current debt ratio and may face greater repayment pressure in the short term. The median and mean of equity concentration ratio (Z) are 0.295 and 0.316 respectively, showing that the largest shareholder holds lots of shares, and the largest shareholders believe that China's new energy industry has profound prospects. However, if the largest shareholders make decisions that are harmful to the development of the company with their interests, the interests of other shareholders may be vulnerable to damage. The mean and median of equity checks and balances (CR10) are 0.536 and 0.532, respectively, which implies that the top ten shareholders of China's new energy listed companies hold more shares. In other words, the top ten shareholders except the largest shareholder have sufficient voice and voting rights in the company, so they can play a role in monitoring and restricting the behavior of the largest shareholder. The median of growth rates of revenue (GROW) is 0.109 and the mean of growth rates of revenue (GROW) is 0.272, supporting that China's new energy industry develops rapidly and return for investors to invest in this industry is also high. At the same time, the standard deviation of the revenue growth rate is 2.156, the maximum is 58.842, and the minimum is -0.864, showing that the revenue growth rate in China's new energy industry is quite different, and the profitability in this industry is quite different.

Table 1: Descriptive statistics.

	[1]	[2]	[3]	[4]	[5]	[6]
	N	Mean	SD	Min	Median	Max
ROA	890	0.024	0.095	-2.008	0.028	0.863
DAR	890	0.481	0.198	0.058	0.492	2.861
CDR	890	0.839	0.135	0.242	0.874	1.000
Z	890	0.316	0.159	0.034	0.295	0.852
CR_{10}	890	0.536	0.145	0.133	0.532	0.892
GROW	890	0.272	2.156	-0.864	0.109	58.842

4.2. Main results

Table 2 shows the OLS regression results of benchmark model in this paper. In the debt structure, the coefficient of the asset-liability ratio (DAR) is -0.3673, which is negative and statistically significant ($p<0.01$), indicating that the relation between asset-liability ratio and firm performance

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in China's new energy industry is negative, namely excessive asset-liability ratio of China's new energy listed companies reduces firm performance. Therefore, Hypothesis 1 is verified. Meanwhile, this also means firm performance will decrease by about 0.0349 (-0.3673 * 0.095) for each standard deviation increase of asset-liability ratio of China's new energy listed companies. Unfortunately, the relation between the current debt ratio (CDR) of China's new energy listed companies and firm performance is not significant, so hypothesis 2 of this paper has not been verified. In the ownership structure, the results based on firm performance, reveal a negative and significant ($p<0.05$) coefficient on the ownership concentration (Z), suggesting that a higher the ownership concentration reduces the company's performance in China's new energy industry listed companies. Therefore, hypothesis 3 of this paper is verified. The coefficient of equity checks and balances (CR10) is 0.1314, which is positive and statistically significant ($p<0.01$), indicating that equity checks and balances are positively associated with the performance of China's new energy listed companies, that is, more shares held by the top ten shareholders of China's new energy listed companies increase firm performance.

According to the results in Table 2, this paper obtain the following regression equation:

$$FP = -0.3673DAR - 0.1270Z + 0.1314CR_{10} + 0.1980 \quad (2)$$

Table 2: Main results.

	[1]	[2]	[3]	[4]
ROA	Coefficient	Std. Err.	t	P
DAR	-0.3673	0.0230	-15.97	0.000
CDR	-0.0322	0.0306	-1.05	0.294
Z	-0.1270	0.0528	-2.41	0.016
CR_{10}	0.1314	0.0425	3.09	0.002
Intercept	0.1980	0.0352	5.63	0.000

4.3. Robustness test

In order to eliminate the impact of missing variables on the relation between capital structure of China's new energy listed companies and firm performance, this paper adds the growth rate of revenue to the benchmark model and conducts OLS regression again. Table 3 shows the results of the robustness test. The above relationships in main results and the significance is also not changed. Therefore, the robustness test results are consistent with the main results of this paper, supporting the main results of this paper are robust.

Table 3: Robustness test.

	[1]	[2]	[3]	[4]
ROA	Coefficient	Std. Err.	t	P
DAR	-0.3806	0.0229	-16.62	0.000
CDR	-0.0242	0.0303	-0.80	0.424
Z	-0.1399	0.0522	-2.68	0.008
CR_{10}	0.1059	0.0422	2.51	0.012
GROW	0.0060	0.0013	4.62	0.000
Intercept	0.2138	0.0349	6.13	0.000

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5. Conclusion

Based on the data of China's new energy listed companies between 2012 and 2021, this paper finds that in China's new energy industry, a higher asset-liability ratio reduces firm performance, a higher equity concentration is harmful to firm performance, the equity checks and balances is positively related to firm performance, and there is no significant correlation between current debt ratio and firm performance. This paper also puts the following suggestions for China's new energy listed companies, regulatory authorities, and investors. Firstly, listed companies should control the asset-liability ratio and optimize the structure of liabilities. At the same time, external investors should be introduced to improve the equity checks and balances. Secondly, the regulatory authorities should strengthen the supervision of companies with high equity concentration to prevent the largest shareholders from harming the interests of other shareholders. Finally, investors should carefully invest in companies with high asset-liability ratio, high equity concentration, and low equity checks and balances to protect their interests. The limitation of this paper is that there is no study on the subdivision of China's new energy listed companies. China's wind power and photovoltaic industry start earlier and develop more maturely, but power batteries are in the ascendant, which may have an impact on the results of this paper.

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