# An Empirical Study on the Relationship between Capital Structure and Firm Performance: A Case Study of Listed Manufacturing Enterprises in Hebei Province

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Abstract: The financial data of Hebei Province's listed manufacturing enterprises from 2013 to 2022 is used in this paper to build a multiple linear regression model, and two-way fixed effect regression is used to examine the relationship between capital structure and corporate performance of these enterprises. The findings indicate that the retained earnings ratio and the gearing Hebei **Province's** ratio of listed manufacturing enterprises have 9 significant positive correlation with corporate performance, while the current liability ratio and the current liability ratio have a positive correlation. Based on this, this paper proposes two methods to maintain a reasonable asset-liability ratio and current liability ratio, optimize the capital structure of listed manufacturing enterprises in Hebei Province, and raise the enterprise's own capital as well as the ratio of retained earnings in profit distribution.

Keywords: Hebei Province; Manufacturing Industry; Capital Structure; Firm Performance

# 1. Introduction

The foundation of our country's prosperity and the basis of a powerful nation is the manufacturing sector. According to the survey data of Hebei Provincial Bureau of Statistics, it can be seen that in 2023. The province's industrial businesses exceeding the specified size generated a total profit of 116.60 billion yuan, and the total profit of the manufacturing industry was 79.70 billion yuan, accounting for 68.35%. It is clear that the expansion of the manufacturing industry has a significant impact on the economic development of Hebei Province. Furthermore, Hebei Province has a large number of medium-sized, small, and micro businesses in the manufacturing sector. In the manufacturing sector, medium-sized, small, and micro businesses play a critical role upholding livelihoods, stabilizing in employment, and fostering development. The Hebei Province's listed manufacturing businesses serve as industry pioneers and serve as role models and leaders for the province's medium-sized, small, and micro manufacturing enterprises. Therefore. examining the connection between listed manufacturing businesses' capital structure and performance in Hebei Province can also serve as a helpful guide for other manufacturing enterprises looking to improve their own capital structure. With an emphasis on listed manufacturing enterprises specifically, the goal of this research is to examine the relationship between capital structure and corporate performance of listed manufacturing businesses in Hebei Province.

# 2. Literature Review and Research Hypothesis

# 2.1 Literature Review

Ever since the MM theory was proposed in 1958, a number of Chinese academics have studied capital structure and company performance in great detail. Chinese academics have often used a variety of research methodologies, unified research conclusions, and categories of research objects when studying the relationship between capital structure and business performance. Research on the relationship between capital structure and enterprise performance of main board, science and innovation board enterprises, manufacturing, new energy, logistics, and other industries, as well as private enterprises, listed enterprises, small and medium-sized enterprises, and so on, are among the specific research object categories that domestic scholars have identified for this topic.

In terms of research methodology, regression analysis is the mainstream research method used by scholars in China for empirical analysis, but the specific regression methods of scholars are diverse. For example, Li and Jiang (2001) empirically analyzed the correlation between capital structure and corporate performance by using cross-sectional regression analysis and TSCS analysis and finally concluded that they are negatively correlated [1]. Shen (2021) used the data of pharmaceutical 155 companies in the manufacturing industry in A-share of Shanghai and Shenzhen cities in 2018 as the research sample, measured the corporate performance index by using principal component analysis, constructed a multiple regression model, and finally used the least squares method to obtain the conclusions that the equity ratio is negatively correlated with the company's performance, that the current asset ratio is positively correlated with the company's performance, and that the company's performance will be lowered with the excessively high ratio of non-current assets[2]. Wu and Wang (2024) used factor analysis and multiple regression analysis to study the correlation between capital structure and corporate performance of new energy constituent stock-listed companies and finally concluded that the gearing ratio is positively correlated with comprehensive performance [3].

In terms of research conclusions, scholars' findings are not uniform, and the current research conclusions on the correlation between capital structure and corporate performance include that capital structure is positively correlated, negatively correlated, and inverted U-shaped correlation with corporate performance. For example, Wang and Zhang (2015) used the data of 773 listed the manufacturing enterprises for five years from 2010 to 2014 as sample data, conducted multiple regression analysis, and concluded that capital structure, interest-bearing debt, and bank borrowing are all negatively correlated with enterprise performance, and interest-free debt is positively correlated with the enterprise [4]. Liu (2024) takes the 2019 to 2022 science and innovation version of listed companies as a research sample and uses regression analysis to conclude that the proportion of shares held by the first largest shareholder of the science and innovation version of enterprises, gearing ratio positively correlated with enterprise is performance, and current liabilities are negatively correlated with enterprise performance [5]. Mi, Xie and Li (2017) take small and medium-sized 546 plate manufacturing enterprises listed from 2013 to 2015 three-year period-end data as research samples, use factor analysis to derive comprehensive evaluation indexes of enterprise performance, construct a linear regression model of enterprise performance and capital structure, and concludes that enterprise performance is negatively correlated with asset-liability ratio and long-term capital liability ratio [6]. Wu and Liu (2023) take China's A-share manufacturing enterprises from 2012 to 2020 as the research sample as the research object, use multiple regression analysis to explore the results of the impact of capital structure on enterprise performance, and similarly conclude that capital structure is negatively correlated with enterprise performance [7]. Huang (2014) studied the impact of equity structure and capital structure on enterprise performance. He selected the financial data of 739 manufacturing companies listed on the main board market in 2012 for multiple regression analysis and concluded that capital structure and enterprise performance are inverted U-shaped correlation [8]. Examining the pertinent literature reveals that while domestic researchers have studied a wide range of industries and business models,

they have rarely studied the connection between capital structure and the manufacturing sector's performance. This is especially true for business performance studies in Hebei Province. Since capital structure and enterprise performance of listed manufacturing firms in Hebei Province are correlated, this study uses listed manufacturing enterprises in Hebei Province as its research sample. In order to offer fresh scholarly viewpoints and findings for the investigation into the relationship between capital structure and corporate performance, this study focuses on the capital structure and corporate listed performance of manufacturing businesses in Hebei Province.

# 2.2 Research Hypotheses

2.2.1 The effect of gearing ratio on corporate performance

Debt financing is an important way for enterprises to raise capital, which is characterized by low interest rates, tax credits, and a relatively low cost of capital. Businesses that have a reasonable amount of debt can successfully minimize their cost of capital by utilizing the tax shield effect of debt financing to their fullest potential. They can then secure funding at a reduced cost to support business expansion and enterprise value creation. However, debt financing is not applicable without limit. When the debt level exceeds a reasonable range, the phenomenon of risk premium will emerge. Creditors will seek a greater rate of return in order to safeguard their interests, which will raise the enterprise's cost of capital and compromise its performance. At the same time, high debt levels will put enterprises under greater repayment pressure, and once the enterprise's capital chain breaks, the enterprise's financial difficulties will deteriorate rapidly, posing a serious threat to its long-term healthy development. As one of the primary indications of an enterprise's capital structure, the gearing ratio may be used to assess an organization's overall debt load as well as its capacity to leverage creditor money for investment in operations. Given this, the first hypothesis put forth in this paper is as follows:

Research hypothesis H1: The gearing ratio of listed enterprises in the manufacturing industry in Hebei Province is negatively correlated with enterprise performance.

2.2.2 The impact of current liabilities on enterprise performance

Businesses must frequently refinance and repay current liabilities because they typically have a short maturity and must be paid back in less than a year. Businesses are somewhat forced to do capital turnover activities all the time as a result of this increasing pressure on their liquidity. To put it another way, the company must pay back its loans that are set to mature on time and look for fresh sources of funding on the market to meet its demands for ongoing capital operations. The intricacy of managing company cash is definitely made worse by this repeated cycle of repayment and refinancing. Additionally, the lending interest rate on short-term liabilities of businesses is typically relatively high due to the higher risk assessment that lending institutions have regarding their ability to successfully recover

funds in the short term. This means that businesses must incur higher financial expenses, which will further negatively impact business performance.

Given this, the second hypothesis put out in this paper is as listed below:

Research hypothesis H2: The current liability ratio of listed manufacturing enterprises in Hebei Province is negatively correlated with corporate performance.

2.2.3 The effect of retained earnings on enterprise performance

Retained earnings are inner sums that a business keeps and that are created from profits made in the past.

As endogenous financing for enterprises, retained earnings have important features such as low cost, low risk, and easy access. When an enterprise needs to raise funds, enterprise managers usually prefer to prioritize the use of retained earnings accumulated within the enterprise as the first choice, and then consider seeking external financing. A high level of retained earnings indicates a high level of accumulation, which is a sign of high profitability. An increase in retained earnings has the potential to fortify the business's internal economic foundation, bolster its financial stability, and boost overall performance. Businesses can only grow by accumulating more wealth for themselves in order to grow by expanding their operations and production in order to produce better value. In light of this, the third hypothesis is put out in this paper:

Research hypothesis H3: The performance of listed manufacturing companies in Hebei Province is favorably connected with their retained earnings ratio.

# 3. Research Design

# **3.1 Sample Selection and Data Source**

This article chooses the first sample data from 2013 to 2022 of listed manufacturing firms in Hebei Province, excluding the samples of ST and \*ST corporations. On the basis of the initial sample, this paper excludes the sample companies with missing values of relevant variables and Winsorize the continuous variables from 1% to 99% year by year. Additionally, this article chooses the financial data from the sample company's consolidated statement for calculating the required statistics,

as it is a better representation of the enterprise's financial situation. Finally, 28 sample companies and 280 sample observations are obtained for observation. This paper's data is sourced exclusively from the CSMAR database.

# **3.2 Design of Research Variables**

3.2.1 Design of explained variables

Currently, the mainstream indicators for measuring corporate performance include Tobin's Q, ROE, ROA, etc. Tobin's Q is the ratio of the total market value of the enterprise to the replacement cost of the company [9]. This research chooses ROE as an explanatory variable of the model and ROA as an explanatory variable of the model robustness test because it is more challenging to evaluate the entire market value and replacement cost of the company when computing Tobin's Q and because data availability is limited.

3.2.2 Design of explanatory variables

The current liability ratio, retained earnings ratio, and gearing ratio have been chosen by this study to serve as its explanatory factors. This study measures the capital structure of businesses using the asset-liability ratio. Additionally, the current liability ratio is included as an explanatory variable to investigate the relationship between the internal debt structure and the business performance of listed companies in the Hebei Province manufacturing sector. This research investigates the relationship between business performance and endogenous financing through the lens of the retained earnings ratio as an explanatory variable.

3.2.3 Design of control variables

This paper chooses to measure enterprise size using the natural logarithm of total assets, to measure equity concentration using the ratio of the first largest shareholder's shareholding, to measure corporate social responsibility using the income tax ratio, in light of the fact that there are other factors that also affect enterprise performance.

Table 1 displays the definition and justification for every variable.

# 3.3 Research Model Design

For the purpose of fixing the two-way fixedeffects regressions for individuals and years, respectively, and clustering at the individual level, this paper builds the following three

Variable	Variable	Variable	Formula		
category	symbol	name	гоппина		
Explana tory variable	ROE	ROE	ROE Return on net assets: net assets divided by net profit		
	ROA	ROA	ROA Return on total assets: profitability divided by total assets (test for robustness)		
	DAR	Asset- liability ratio	Total assets divided by total liabilities		
Explana tory variable	SD	Current liabilitie s ratio	Total assets divided by current liabilities		
	RER	Retaine d earnings ratio	Total assets divided by (undistributed earnings plus surplus reserves)		
Control variable	TOP1	The largest sharehol der's sharehol ding ratio	Shares held by the largest shareholder as a percentage of total shares		
	SIZE	Enterpri se size	The overall asset logarithm		
	ITR	Income tax rate	income tax divided by total earnings		

In order to test hypothesis 1, model 1 is constructed:

ROE<sub>it</sub>

 $\begin{array}{l} = & \alpha_0 + \alpha_1 DAR_{it} + \alpha_2 TOP1_{it} + \alpha_3 SIZE_{it} + \alpha_4 ITR_{it} + \delta_t + \\ & \mu_i + \epsilon_{it} \end{array}$ 

To test Hypothesis 2, Model 2 is developed. ROE<sub>it</sub>

 $=\beta_{0}+\beta_{1}SD_{it}+\beta_{2}TOP1_{it}+\beta_{3}SIZE_{it}+\beta_{4}ITR_{it}+\delta_{t}+\mu_{i}+\varepsilon_{it}$ (2)

To test Hypothesis 3, Model 3 was developed. ROE<sub>it</sub>

 $= \gamma_0 + \gamma_1 RER_{it} + \gamma_2 TOP1_{it} + \gamma_3 SIZE_{it} + \gamma_4 ITR_{it} + \delta_t + \mu_i$ +  $\epsilon_{it}$  (3)

Where  $ROE_{it}$  is the explanatory variable return on equity.  $DAR_{it}$ ,  $LTBR_{it}$ , and  $CL_{it}$  are the explanatory variables gearing ratio, current liabilities ratio, and retained earnings ratio, respectively.  $TOP1_{it}$ ,  $SIZE_{it}$ , and  $ITR_{it}$  are the control variables proportion of ownership by the first largest shareholder, firm size, and income tax ratio, respectively. A random perturbation term is indicated by  $\delta_t$ , a timefixed effect is represented by  $\epsilon_{it}$ , and an

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individual fixed effect is found in  $\mu_i$ . Constant terms include $\alpha_0$ ,  $\beta_0$ , and  $\gamma_0$ . The influence coefficients of the respective variables are  $\alpha_1$ ,  $\alpha_2$ ,  $\beta_1$ ,  $\beta_2$ ,  $\gamma_1$ ,  $\gamma_2$ .

#### 4 Results of the Empirical Study

#### 4.1 Descriptive Statistical Analysis

According to Table 2, the average return on net assets and return on total assets of the sample listed businesses are 6.9% and 4.5%, respectively. This indicates that the sample listed companies' overall return on net assets and return on total assets is low. There are some individual businesses with excessively high levels of current liabilities and gearing ratios, but overall the sample enterprises' levels are relatively moderate. The average values of the current liabilities and gearing ratios are 0.316 and 0.392, respectively, and the maximum values are 0.706 and 0.801, respectively. The sample firms have a reasonably moderate level of retained earnings ratio, as indicated by the mean value of 0.218 the standard deviation of 0.141. and Additionally, the data on retained earnings ratio exhibits strong stability. Higher than 30% indicates a higher level of equity concentration in the sample firms, as seen by the average value of the first largest shareholder's shareholding ratio of 32.9%. There is a greater degree of dispersion in the sample enterprises' enterprise sizes, as evidenced by the enterprise size gap being larger and the enterprise size standard deviation of 1.534, mean value of 22.618, minimum value of 19.218 and maximum value of 26.258. The income tax ratio of the sample firms fluctuates very little, as seen by the mean value of 0.182 and the standard deviation of 0.167.

Variable	Obs	Mean	Std. Dev.	Min	Max
ROE	280	0.069	0.087	-0.469	0.416
ROA	280	0.045	0.056	-0.195	0.379
DAR	280	0.392	0.198	0.029	0.801
SD	280	0.316	0.166	0.027	0.706
RER	280	0.218	0.141	-0.202	0.614
TOP1	280	0.329	0.113	0.094	0.645
SIZE	280	22.618	1.534	19.218	26.258
ITR	280	0.182	0 167	-0 724	1 1 1 9

Table 2.	Findings	from	Descriptive	Statistics
Labic 2.	Finangs	nom	Descriptive	Statistics

# 4.2 Correlation Analysis

The table displays the findings of the

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correlation analysis between the explanatory, control, and explained variables. As shown in Table 3: ① It is feasible to utilize ROA as a proxy variable for ROE for the robustness test, given the correlation between the two is significantly positive (0.926) and positive. ② With respect to DAR and SD, ROE has a considerable negative correlation, whereas its correlation with RER is significant positive. In a way, this confirms the first three hypothesis. ③ ROE is significantly positively correlated with the control variables TOP1 and ITR. ④ ROA is significantly correlated with each explanatory variable as well as TOP1 and SIZE.

The variance inflation factor is computed for each of the three models in this research to prevent multicollinearity between the variables. The variance inflation factor coefficient (VIF) of models 1, 2, and 3 has average values of 1.63, 1.35, and 1.18, respectively, and maximum values of 2.19, 1.66, and 1.26, respectively, based on the state test findings. Hence, it is evident that the data in each model do not exhibit multi-collinearity.

#### 4.3 Regression Analysis

Using Stata software to do two-way fixed effects regression with clustering at the individual level for the three multiple linear regression models respectively, Table 4 displays the regression analysis results that were obtained.

The results of model (1) show that DAR has a correlation coefficient of -0.216 and is significant at the significance level of 0.05. It shows that the gearing ratio and returns on the net worth of the sample companies have a substantial and strong negative association, supporting Hypothesis 1.

According to model (2)'s results, SD has a correlation coefficient of -0.235 and is significant at the 0.01 level, demonstrating that the current liability ratio and return on the net worth of the sample companies have a substantial and negative association, supporting the validity of hypothesis 2.

As demonstrated by model (3)'s results, RER is significant at the 0.01 level and has a correlation coefficient of 0.517. This suggests that the retained earnings ratio and return on net assets of the sample companies have a strong and positive correlation, and that the companies' performance is positively impacted by their retained earnings ratio, thereby verifying hypothesis 3.

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	ROE	ROA	DAR	SD	RER	TOP1	SIZE	II R
RO E	1							
RO A	0.926 ***	1						
	0							
DA R	- 0.184 ***	- 0.340 ***	1					
	0.002 00	0						
SD	- 0.156 ***	- 0.304 ***	0.926 ***	1				
	0.009 10	0	0					
RE R	0.609 ***	0.706 ***	- 0.557 ***	- 0.514 ***	1			
	0	0	0	0				
TO P1	0.207 ***	0.174 ***	0.096 0	$\begin{array}{c} 0.058\\0\end{array}$	0.255 ***	1		
	0.000 500	0.003 60	0.109	0.332	0			
SIZ E	- 0.050 0	- 0.200 ***	0.722 ***	0.605 ***	- 0.311 ***	0.216 ***	1	
	0.408	$\begin{array}{c} 0.000\\ 800 \end{array}$	0	0	0	0.000 300		
ITR	0.125 **	0.057 0	0.242 ***	0.224 ***	- 0.102 *	- 0.007 00	0.14 5**	1
	0.036 8	0.343	0	0.000 200	0.089 0	0.902	0.01 51	

#### **Table 3. Correlation Analysis Results**

# **4.4 Robustness Test**

This work conducts a robustness test using the method of replacing the explanatory factors to confirm the validity of the research findings. Table 3 suggests that ROA can be used as a fair substitute for ROE. The explanatory variable ROE was substituted with ROA in this study before two-way fixed-effects regression of clustering at the individual level was carried out. The robustness test results in Table 5 indicate that there is some degree of robustness in the regression results above, as the results of the explanatory variable for ROA are essentially the same as the results of the regression where the explanatory variable is ROE.

Table 4. Results of Two-Way Fixed Effects						
<b>Regression Analysis</b>						
	(1)	( <b>2</b> )	(2)			

	(1)	(2)	(3)	
	ROE	ROE	ROE	
DAR	-0.216**			
	(0.101)			
SIZE	0.009	0.011	0.008	
	(0.025)	(0.021)	(0.018)	
RER			0.517***	
			(0.071)	
TOP1	0.019	0.006	-0.039	
	(0.078)	(0.080)	(0.076)	
SD		-0.235***		
		(0.085)		
ITR	0.073***	0.071***	0.053***	
	(0.023)	(0.023)	(0.018)	
N	280	280	280	
R <sup>2</sup>	0.527	0.532	0.625	
Year	YES	YES	YES	
ID	YES	YES	YES	
F	2.692	2.893	14.399	
Table 5. Robustness Test Outcomes				

	(1)	(2)	(3)
	ROA	ROA	ROA
DAR	-0.127***		
	(0.042)		
SIZE	0.009	0.010	0.010
	(0.016)	(0.014)	(0.011)
RER			0.341***
			(0.052)
TOP1	0.011	0.004	-0.027
	(0.045)	(0.047)	(0.047)
SD		-0.137***	
		(0.040)	
ITR	0.037**	0.035**	0.024*
	(0.016)	(0.016)	(0.013)
Ν	280	280	280
$\mathbb{R}^2$	0.584	0.587	0.691
Year	YES	YES	YES
ID	YES	YES	YES
F	3.778	3.389	11.322

#### 5. Conclusions and Recommendations of the Study

#### **5.1 Research Conclusion**

The panel data of listed manufacturing enterprises in Hebei Province was chosen to be integrated as the sample data for this paper after the ST, \*ST, and enterprises with missing values were eliminated. We then conducted empirical research on the relationship between the capital structure and enterprise performance of listed manufacturing enterprises in Hebei Province. According to the findings, which are in line with the paper's hypotheses, listed manufacturing enterprises in Hebei Province have significantly negative correlations between their asset-liability and current liability ratios and corporate performance, while their retained earnings ratio has a significantly positive correlation. This suggests that while an increase in retained earnings is beneficial to the improvement of corporate performance, a higher percentage of liabilities and current obligations is not beneficial for listed manufacturing businesses in Hebei Province. A high gearing ratio may bring certain operational and financial risks for enterprises. For example, with a high gearing ratio, a firm's cash flow will be tighter when its sales revenue declines or its cost of goods sold rises. Creditors may demand higher interest rates because of the increased risk, which in turn makes it more costly for the firm to obtain funds and puts the firm in a more difficult financial position. Higher current liabilities may also lead the firm into a vicious cycle of borrowing new debts to repay old ones and cause the firm's credit rating to fall, which in turn makes it difficult to obtain loans from banks and financial institutions, further limiting access to funds. Retained earnings are the accumulated capital generated within the company, and they do not need to be considered as a financing cost compared to external financing.

#### **5.2 Recommendations**

5.2.1 Optimize the capital structure and maintain a reasonable asset-liability ratio and current-liability ratio

On the one hand, companies should consider funding against debt financing. eauity Appropriate debt financing provides a tax advantage, but excessive debt financing poses financial hazards. Equity financing can help to stabilize an enterprise's capital structure, but it may diminish the equity of the company's initial shareholders. Enterprises should determine the goal capital structure based on their real condition in order to keep enterprise risk within a tolerable range, lower the firm's capital cost, and increase the efficiency with which enterprise funds are used. On the other hand, listed manufacturing businesses in Hebei

Province should establish specific alert indicators based on their own financial status and development, as an important reference for assessing the financial health of enterprises. Regular assessments of the asset-liability ratio and current liabilities can not only assist organizations in identifying potential financial hazards in a timely way, but also in taking preventive steps to avoid the capital chain breaking down due to large liabilities.

5.2.2 Increase the ratio of retained earnings in profit distribution and increase the enterprise's own capital

The aforementioned research indicates a between positive correlation enterprise performance and the retained earnings ratio of Hebei Province's manufacturing listed companies. In other words, businesses will perform far better overall when they decide to retain a larger portion of their profits rather than giving them entirely to shareholders. Taking this into consideration, this study proposes that listed manufacturing companies in Hebei Province can suitably raise the percentage of retained earnings in profit distribution as well as the share of arbitrary surplus reserves. To improve the enterprise's internal capital accumulation, assist firms in increasing their own capital, and strengthen the enterprise's own economic power. So that the enterprise can demonstrate a stronger defense ability in the face of economic cycle fluctuations, such as the need to expand production, technological upgrading and transformation, and the implementation of strategic mergers and acquisitions to provide a solid financial backing and thus improve corporate performance.

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