



The Relationship Between Capital Structure and Profitability in Pharmaceutical Manufacturing Industry

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Abstract. Since the 19th CPC National Congress, the Chinese government has deepened the reform of pharmaceutical enterprises and established a high-quality and efficient medical service system. Meanwhile, pharmaceutical and medical companies have also made important contributions during the pandemic. According to the date from XIANGXIN securities, vaccines, in vitro diagnostics, and biologics were the three fastest growing areas of net profit for pharmaceutical companies compared to the same period. The pharmaceutical manufacturing industry not only provides a large number of basic health services across the country, but also continues to make breakthroughs in drug research and development and technological innovation. Therefore, it is very necessary to analyze the profitability of listed pharmaceutical enterprises. The specialties of pharmaceutical industry includes high investment, high yield, high risk and long cycle, which determines that the pharmaceutical industry faces the problem of financing difficulties for a long time. Domestic literatures on the pharmaceutical industry mostly focus on improving the external environment of enterprises and increasing financial support, ignoring the influence of the internal capital structure of enterprises on financing. Whether a reasonable capital structure inside an enterprise can effectively improve its financing difficulties and what factors are more effective are worth our in-depth study.

Keywords: capital structure · pharmaceutical industry · manufacturing industry · profitability

1 Introduction

1.1 Capital Structure

Domestic scholars have also made a lot of exploration on the problem of corporate capital structure. Hu [6] divided enterprises into value-increasing type and value-declining type. Hu [6] discussed the relationship between capital structure and enterprise value or profitability of Chinese enterprises respectively. Hu [6] believed that when equity capital increased absolutely, improving enterprise value will be improved because of increasing debt financing, otherwise it would lead to bad financial situation of enterprises. In

addition, most of listed companies' asset-liability ratio in pharmaceutical industry is less than 50% [15]. From the research of Western scholars, it is better for a company to have a 60% asset-liability ratio. However, China's listed pharmaceutical companies are far from that goal. The data from Modern Information Network show that the average asset-liability ratio of most listed companies in China is below 35%, indicating that the debt level of China's pharmaceutical industry is low and the capital structure does not play a good role of tax leverage. From another perspective, this result indicates that China's pharmaceutical industry has a great debt potential, because the debt ratio is low and the tax credit effect has a lot of room to play [16]. The internal sources are the income generated by the assets owned by the enterprise, such as depreciation expense of fixed assets, undistributed profit, etc. The external financing is exogenous, including bond financing and equity financing, and most listed companies in the pharmaceutical industry prefer external financing [16]. Most enterprises have financial support from the outside, but this will increase the risk of the company's operation, because the condition of the enterprise is affected by many factors. If the enterprise has too much equity financing and debt financing, it will be unable to actively respond to the changes brought about by market competition. Without considering other factors, the cash flow of companies with higher debt ratios will increase due to the tax avoidance effect. According to the asset appraisal theory, the value of a company depends on the discounted value of future cash flows [4]. Obviously, the higher the profitability, the more disposable cash flow. The above conclusions are also universally applicable in China's capital market.

In addition, national policy is one of the main factors affecting the capital structure of listed companies in China's pharmaceutical industry [17]. The structure of the capital market, the soundness of the financial system and the market environment of listed companies are all controlled by the macro policy background. D According to the previous market trend, it can be found that the country will pay more attention to the financing policies of the capital structure. At present, the whole development trend of the pharmaceutical industry is mainly characterized by weak profitability. The symbol of this situation includes excessive reliance on external financing and neglect of internal financing, which leads to the low asset-liability ratio of enterprises. Most enterprises are not capable of making a decent profit and even face the risk of bankruptcy.

The influence of capital structure on enterprise profitability has been widely proved from different angles. Xiao Zuoping [18] studied the capital structure from the perspective of dynamic characteristic factors. Xiao [18] believed that transaction cost was an important influencing factor, and asset tangibility and scale were positively correlated with financial leverage, while growth and asset liquidity were negatively correlated with them. Berger [1] believes that the increase of corporate debt ratio can reduce the agency costs related to external equity. Due to the views of reasonable tax avoidance, based on the view of reasonable tax avoidance, Minnick and Noga [10] found that if the compensation sensitivity of corporate executives is high, they will pay attention to long-term reasonable tax avoidance, which is conducive to improving corporate profitability.

1.2 Profitability

Profitability is an important index for managers to evaluate the development of enterprises. If the company has a stronger profitability, it will have the better the development trend of the enterprise and the wider the development prospect. The analysis of profitability can better determine the competitive position and advantages of enterprises, so that managers can adjust their competitive strategies and have more opportunities to gain more shares in the market [8]. An enterprise's profit can be expressed by profitability, which is also known as the capital or capital appreciation capacity of the enterprise and is usually expressed as the amount and level of earnings of the enterprise in a certain period [2]. Operators can analyze profitability to find problems in the operation and management of the company. Analyzing the company's profitability is a method to analyze the deeper company's profit rate. Profitability includes total profit, net profit, sales revenue and so on.

Profitability is also the basis for the survival and development of enterprises in the fierce market competition. Therefore, how to improve the profitability of enterprises is an important issue in the theoretical and practical circles. There are many factors affecting the profitability of enterprises, including macro and micro factors [9]. At the macro level, macroeconomic policies, product market competition and other factors will affect profitability. The micro level mainly includes some factors such as corporate governance and corporate characteristics. Many scholars have carried out theoretical and empirical analysis on the factors affecting the profitability of enterprises. For example, monetary policy at the macro level [11], exchange rate adjustment (Wang, 2008), the micro level about social responsibility [5], innovation ability [12], and management characteristics [20].

There are six indicators to measure the profitability of an enterprise [19]. For example, when the cost and expense of an enterprise are controlled, the profitability of the enterprise will naturally be positively affected. Moreover, for financing sources, too much reliance on external financing will reduce the profitability of enterprises. Thus, when managers begin to integrate the financing structure, they should consider both internal and external factors to reduce the financing risk of enterprises. In this way, it can reduce financing risks of enterprises. Also, the financing problems can be solved by adopting internal financing. Profitability is equal to the operating capacity [17]. At present, many enterprises in the industry have weak operating capacity and slow capital turnover, which is not conducive to the management of enterprise capital structure. Obviously, as an important indicator, corporate profitability will reflect the current financial status and development prospects of listed companies in China's pharmaceutical industry.

2 Research Objective

In recent years, managers pay increasing attention to the relationship between capital structure and profitability. With the listing of more and more pharmaceutical companies, high-quality assets capitalization should be reformed, and pharmaceutical industry's shareholding should be accelerate, which promotes the optimization and adjustment of the capital structure of pharmaceutical enterprises. This study focuses on the relationship between the capital structure and profitability of listed companies in the pharmaceutical

manufacturing industry, and studies whether there is an optimized capital structure to maximize profitability. Profitability plays a very important role in the national economy. It is hoped that the study of this paper will be helpful for Chinese pharmaceutical enterprises to improve corporate governance, adjust capital structure and optimize profitability.

3 Research Questions

This paper mainly discusses the relationship between profitability and capital structure in the pharmaceutical manufacturing industry.

4 Research Hypotheses

- H1- There is a significant positive relationship between ratio of debt to equity and return on equity-TTM.
- H2- There is a significant positive relationship between ratio of debt to equity and EBIT-TTM.
- H3- There is a significant positive relationship between ratio of debt to equity and Net Profit Margin-TTM.
- H4- There is a significant negative association between ratio of debt to equity and ratio of debt to long-term capital.
- H5- There is a significant negative relationship between ratio of debt to long-term capital and return on equity-TTM.
- H6- There is a significant negative relationship between ratio of debt to long-term capital and EBIT-TTM.
- H7- There is a significant positive relationship between ratio of debt to long-term capital and Net Profit Margin-TTM.

5 Methodology

This paper mainly adopts the method of correlation analysis to analyze the data and test the hypotheses. At the same time, the data results can provide more usable comments for further research.

5.1 Research Type

5.1.1 Methods

This study is designed in a natural environment, and all the data of variables are collected in the natural environment, so this study is a field study.

5.1.2 Methodological Implications

Regression analysis is a statistical analysis method that can determine the quantitative relationship of interdependence between two or more variables [4]. It can fit a series of influencing factors and outcomes into a synthetic equation and apply this equation to other similar events to predict.

This paper used these two methods to analyze the data in 2019 and 2020. The results of two years are obtained through comparative analysis, and more accurate conclusions can be drawn by comparing the results of these two years.

5.1.3 Sampling Selection

This paper selects the data of listed pharmaceutical manufacturing companies in 2021 for the research. All the data come from CSMAR. According to the 2012 industry classification of China Securities Regulatory Commission, the project chooses the pharmaceutical industry in the manufacturing industry to carry out the research. The sample size of data in 2021 is more than 1900.

5.2 Research Model

This paper uses correlation analysis to identify the relationship between capital structure and profitability. The independent variable is profitability, and dependent variable is capital structure. The model is showing as:

$$P = f(\text{CS}).$$

P = profitability.

CS = capital structure.

In this research, profitability is measured as return on equity – TTM, EBIT – TTM and Net Profit Margin – TTM. Capital structure is calculated by ratio of debt to equity and ratio of debt to long-term capital.

5.3 Research Procedure

5.3.1 Correlation Analysis

Table 1 indicates the relationship between dependent variables and independent variables. It is found that the correlation between each independent variable and dependent variable is negative, except that the correlation between debt-equity ratio and return on equity is positive (Table 2).

Table 1. Correlation Analysis for the Key Variables (Table Credit: Original)

Correlations		Ratio of Debt to Equity	Ratio of Debt to Long-term Capital	Return on Equity - TTM	EBIT - TTM	Net Profit Margin - TTM
Ratio of Debt to Equity	Pearson Correlation	1	-.125**	.079**	0.043	0.005
	Sig. (2-tailed)		0.000	0.001	0.057	0.819
	N	2089	2089	1908	1981	1906
Ratio of Debt to Long-term Capital	Pearson Correlation	-.125**	1	-.382**	-.324**	0.011
	Sig. (2-tailed)	0.000		0.000	0.000	0.625
	N	2089	2089	1908	1981	1906
Return on Equity - TTM	Pearson Correlation	.079**	-.382**	1	.658**	0.011
	Sig. (2-tailed)	0.001	0.000		0.000	0.645
	N	1908	1908	1908	1908	1837
EBIT - TTM	Pearson Correlation	0.043	-.324**	.658**	1	0.011
	Sig. (2-tailed)	0.057	0.000	0.000		0.645
	N	1981	1981	1908	1981	1906
Net Profit Margin - TTM	Pearson Correlation	0.005	0.011	0.011	0.011	1
	Sig. (2-tailed)	0.819	0.625	0.645	0.645	
	N	1906	1906	1837	1906	1906

** . Correlation is significant at the 0.01 level (2-tailed).

6 Conclusion and Recommendations

Debt-to-equity ratio is positively correlated with roe, so enterprises may use more debt financing. However, there are significant negative correlations between debt-equity ratio and debt-long-term capital ratio, debt-long-term capital ratio and return on equity - TTM, debt-long-term capital ratio and eBIT -TTM. The R value are -0.125, -0.382, and -0.324 respectively. The results show the profitability of companies will decrease when companies increase their debt finance.

Table 2. Results of Hypotheses testing. (Table Credit: Original)

NO.	Hypotheses	Results
1	There is a significant positive relationship between Ratio of debt to equity and Return on equity-TTM	Accepted
2	There is a significant positive relationship between Ratio of debt to equity and EBIT-TTM	Rejected
3	There is a significant positive relationship between Ratio of debt to equity and Net Profit Margin-TTM	Rejected
4	There is a significant negative association between Ratio of debt to equity and Ratio of debt to long-term capital.	Accepted
5	There is a significant negative relationship between Ratio of debt to long-term capital and return on equity-TTM	Accepted
6	There is a significant negative relationship between Ratio of debt to long-term capital and EBIT-TTM	Accepted
7	There is a significant positive relationship between Ratio of debt to long-term capital and Net Profit Margin-TTM	Rejected

The above empirical analysis shows that optimizing capital structure and promoting reasonable debt is of great significance to the development of pharmaceutical industry. The manager should make a prudent decision to remain the profitability. Accordingly, the pharmaceutical manufacturing industry has the characteristics of high risk and high investment, and the diversification of financing has become the inevitable choice. On the one hand, the empirical results of this paper show that the asset-liability ratio and net profit are positively correlated. On the other hand, bank loan ratio is negatively related to the financing efficiency [15]. If the bank loan ratio is within a certain range, the higher debt ratio may cause enterprises to fall into financial crisis due to the pressure of debt repayment.

6.1 Limitation

In this project, the selection of specific indicators is relatively simple, and the influence relationship of other indicators is rarely involved. Hence, other researchers can choose more specific indicators in the future study. Meanwhile, the sample data in this paper are from the industry classification of the 2012 edition of the China Securities Regulatory Commission (CSRC), mainly focusing on the pharmaceutical manufacturing industry in the manufacturing industry. Researchers can choose more data to compare the pharmaceutical manufacturing industry in China with that in other countries. The pharmaceutical manufacturing industry in developed countries is more comprehensive in this respect has been a more comprehensive understanding of the industry. To this end, researchers can identify shortcomings of Chinese pharmaceutical companies and make more specific recommendations for Chinese companies and the government. In addition, because different industries have different capital structures, future researchers

can compare different industries and find out the similarities and differences between them.

References

1. Baranoff E, Sager T. (2003). The Relations among organizational and distribution forms and capital and asset risk structures in the life insurance industry [J]. *Journal of Risk and Insurance*. 2003(70):375-400.
2. Deng, J. (2020). Profitability analysis of pharmaceutical industry. *Finance*.
3. Hao, B. (2017). Study on the correlation between capital structure and profitability of small and medium-sized enterprises. Sweeping over the Management.
4. Jensen, M. (1976). "Theory of the Firm: Managerial Behavior, Agency Cost and Ownership Structure". *Journal of Financial Economics*. 3(04): 305-360.
5. Li, P. (2018). Based on the TCM health care industry operation, profit and development analysis. 10.19885.
6. Li K. (2020). *A study on the impact of capital structure on profitability of infrastructure investment companies*. 1816(2020):04-0064-06.
7. Lu, H. (2021). Relationship between Capital Structure and Enterprise Value of Listed Pharmaceutical and Medical Companies. *ANLIFENXIANG*.
8. Modigliani F, Miller M H. (1958). The cost of capital, corporation finance, and the theory of investment[J]. *American Economic Review*. 1958 (48):261-297.
9. Tang, Y. (2021). How to effectively improve profitability of enterprises in leather. *China Leather*. 10. 13536.
10. Sun, H. (2013). Analysis of the impact of capital structure on profitability of listed companies. *China's Collective Economy*.
11. Wu, N. (2019). *Study on the influence of capital structure on financing efficiency*. 10.16144.
12. Wang, H. (2018). Analysis and Suggestions on Current Capital Structure of Listed Companies in Pharmaceutical Industry. *The Capital Luck Camp*.
13. Wang, X. (2020). *An Empirical Study on the Effect of Working Capital Structure of Forestry Listed Companies on Business Performance*. 10.13691.
14. Zhai, F. (2017). *Study on the impact of financing structure on profitability of pharmaceutical listed companies in Jiangsu Province*. 10.19311
15. Zhou, J. (2020). Analysis on the impact of commercial bank capital structure on profitability. *Investment and Entrepreneurship*. 2003(4):33-36,42.
16. Zhao, T. (2019). Analysis and research of product profitability based on value chain. 5812 (2021) 06-0015-05.
17. Zhao, S. (2019). Research on the current situation and optimization countermeasures of capital structure of listed companies in pharmaceutical industry in China. *Times Finance*.
18. Zheng, W. (2013). Performance evaluation of financial indicators of listed companies in pharmaceutical industry. *Finance and Accounting Research*.
19. Zhang, X. (2018). The analysis of capital structure and profitability of listed companies. *ONE HUNDRED*.
20. Zhang, Y. (2019). Empirical Study on the Relationship between Capital Structure and Corporate Performance of Listed Companies of Pharmaceutical Industry. *JOURNAL OF ZHONGGUO UNIVERSITY OF TECHNOLOGY*. 1671-6906(2018)03.
21. Zhang, X. (2011). An Empirical Study of the profitability and capital structure of listed companies of the pharmaceutical industry. *Observation*.

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