Empirical research on the bio-pharmaceutical listed companies' capital structure and corporate performance

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ABSTRACT

The concept of capital structure and corporate performance are first defined. Then the status and characteristics of the bio-pharmaceutical listed companies' capital structure is analyzed by using descriptive statistical methods. It is found that a low level of overall asset-liability ratio, irrational debt structure are the characteristics of the capital structure of the bio-pharmaceutical listed companies from Shanghai stock exchange in China. And then a comprehensive evaluation of corporate performance of the bio-pharmaceutical listed companies is gotten by using Factor Analysis Method. Next the relationship between capital structure and corporate performance is studied empirically. At last, some suggestions are presented to optimize the capital structure of the bio-pharmaceutical listed companies in China to improve corporate performance.

Keywords: bio-pharmaceutical listed companies; capital structure; corporate performance; empirical analysis
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INTRODUCTION

The influence of capital structure on corporate performance is an important subject of financial theory research at home and abroad. Capital structure not only direct relates to the company's financial situation, governance structure and agency cost, but also affects the company's operating performance and sustainable development. The relationship between capital structure and corporate performance of listed companies has been empirical studied largely by scholars at home and abroad in recent years. It is found that there are significant differences among the capital structure of different industries. Industry is the important factor not only affects capital structure but also affects the relationship of capital structure and corporate performance. [1] With the rapid development of China's economy, population aging tendency and increased health consciousness, bio-pharmaceutical has become strategic emerging industry in China. In order to promote the healthy and sustainable development of bio-pharmaceutical industry, the relationship between capital structure and corporate performance of the bio-pharmaceutical listed companies from Shanghai stock exchange in China is studied empirically and some suggestions are presented. Therefore, it has great practical importance to do this kind of research.

EXPERIMENTAL SECTION

1. Definition of capital structure and corporate performance
1.1 Definition of capital structure
Capital structure is the composition of all sorts of capital and proportion relationship, which is the result of the enterprise a certain period of financing combination. Asset-liability ratio and liquidity ratio are selected to measure the capital structure in this paper.

1.2 Definition of corporate performance
The concept of corporate performance is controversial and not form consensus in the theory circle at present. There are two comprehensions of the corporate performance: one is refers to the management efficiency of a company in a certain period. The second is refers to both management efficiency and operator performance of a company during a certain operation period. The corporate performance in this paper is only refers to the company's financial performance. And it is evaluated comprehensively from four dimensions which are company's profitability, debt paying ability, operating ability and development ability.

2. Analysis of the capital structure situation of bio-pharmaceutical listed companies
2.1 Sample selection and data sources
This paper takes the bio-pharmaceutical companies as the research object, selecting listed companies as sample from the Shanghai Stock Exchange, eliminating the company having incomplete information or having a record of ST or PT and the effective sample is 51. The data about capital structure and corporate performance of these samples are observed from years of 2008 to 2010. All data are from the Shanghai Stock Exchange (HTTP://WWW.SSE.com.cn) and the Cninf (HTTP://WWW.Cninf.com.cn/), processed by SPSS 17.0 and Excel.

2.2 Characteristics of the capital structure of bio-pharmaceutical listed companies
2.2.1 Low level of overall asset-liability ratio

Table 1 describes the asset-liability ratio of bio-pharmaceutical listed companies

Item	2008	2009	2010	Mean value
Asset-liability ratio	44.53%	42.81%	41.83%	43.05%

Table 2 the interval distribution of asset-liability ratio in 2010

Range of asset-liability ratio	0-10%	10%-30%	30-50%	50%-70%	70%-90%
Frequency	5	15	19	9	3

As it is shown in table 1 and 2 that the average level of asset-liability ratio of bio-pharmaceutical listed companies is 43.05% and the ratio has the trend of gradual decline. It is generally believed that the company's asset-liability ratio should be maintained at about 50%. About 76% of the bio-pharmaceutical listed companies' asset-liability ratio is less than 50%, most of them from 10% to 30%, only 23% listed company's asset-liability ratio more than 50%. This suggests that the bio-pharmaceutical listed companies did not make full use of financial leverage.

2.2.2 Irrational debt structure

Table 3 describes the debt structure of bio-pharmaceutical listed companies

Debt structure	2008	2009	2010	Mean value
Current debt ratio	87.99%	86.38%	84.17%	86.18%
Long-term debt ratio	12.01%	13.62%	15.83%	13.82%

Debt structure is another important aspect of capital structure. In order to meet the needs of company's operating funds with different properties, the company should have a reasonable debt maturity structure, short-term, medium-term and long-term liabilities should maintain a proper proportion. Though the cost of current debt is lower, it brings a bigger financial risk to the company. The reasonable ratio of current debt to total debt is 50%. But as it is shown in table 3 that bio-pharmaceutical listed companies have an extremely high current debt ratio, the average ratio of three years is 86.18%. High current debt will increase the short-term debt paying pressure of bio-pharmaceutical listed companies. The average ratio of long-term debt to total debt is only 13.82%, which indicate that bio-pharmaceutical listed companies prefer short-term debt financing and make less use of Long-term debt financing.

2.3 Empirical research on the bio-pharmaceutical listed companies' capital structure and corporate performance
2.3.1 Variable design
(1) The dependent variable
Corporate performance as dependent variable is evaluated comprehensively from four dimensions which are company's profitability, debt paying ability, operating ability and development ability. The specific description variables shown in table 4 are chosen from the Ministry of Finance statistics evaluation department of China. [2]

Table 4 the variable description of corporate performance indicators

Index type	Index name	Symbol	Formula
Company's profitability	Earnings per share	X_1	X_1 = net profit / equity
	Ratio of return on total assets	X_2	X_2 = (total profit + interest expense) / average total assets
	Net profit ratio	X_3	X_3 = net profit / revenue from principal operations
Operating ability	Asset turnover ratio	X_4	X_4 = sales income / average assets
	Accounts receivable turnover ratio	X_5	X_5 = sales income / average accounts receivable
	Inventory turnover ratio	X_6	X_6 = cost of sales / average inventory
Debt paying ability	Asset-liability ratio	X_7	X_7 = total debt / total assets
	Current debt ratio	X_8	X_8 = current Assets / current Liabilities
	Quick ratio	X_9	X_9 = quick assets / current liabilities
Development ability	Operating profit growth ratio	X_{10}	X_{10} = operating profit increase in current / operating profit at first
	Total asset growth ratio	X_{11}	X_{11} = assets increase in current / total assets at first

Next Factor Analysis Method is used to calculate the comprehensive corporate performance (Y). Limited by space, only the analysis and calculation results are given here. Firstly do KMO and Bartlett's test, the KMO is 0.640, more than criterion 0.6, so factor analysis can be done. Bartlett sphere test value is 429.754 (the significance level of 0), through the test of significance. Secondly both the Eigenvalues-one rule and the Scree test indicated the existence of four factors that explained 80.95 percent of the variance among the eleven variables. Then a common factor analysis was carried out using squared multiple correlations as initial estimates of commonality. The orthogonal solution used a varimax rotation. Define the four common factors: debt paying ability (Y_1), profitability (Y_2), development ability (Y_3), operating ability (Y_4). And according component score coefficient matrix get the comprehensive score model of corporate performance:

$$Y = (0.2566Y_1 + 0.2114Y_2 + 0.1852Y_3 + 0.1563Y_4) / 0.8095$$

(2) The explaining variable
The specific variables to describe capital structure are shown in table 5.

Table 5 the variable description of capital structure indicators

Variable name	Symbol	Formula
Asset-liability ratio	DAR	DAR = total debt / total assets
Current debt ratio	CDR	CDR = current Assets / current Liabilities

(3) The control variable
Corporate performance is not only affected by capital structure but also other factors of the company itself. The company size (SIZE) is selected as control variable, which expressed by the natural logarithm of the company's total assets at the end of year.

2.3.2 Research hypothesis
Hypothesis 1: Asset-liability ratio and corporate performance of bio-pharmaceutical listed companies are positively related.

The MM theory (tax) believes that debt interest is tax deductible, so company can reduce the cost of capital to improve the value of the company by increasing the debt financing ratio. [3] According to the Ross's signal theory, the company to increase its proportion of debt financing is a reflection of its good operating performance, so the company's assets-liability ratio and company performance are positively related. [4]

Hypothesis 2: Current debt ratio and corporate performance of bio-pharmaceutical listed companies are negatively related.

It is indicated that bio-pharmaceutical listed companies prefer short-term debt financing from the analysis above. On one hand short-term financing reduces the cost of financing; on the other hand it also brings a lot of drawback to the company. Short-term debt only can be used for the daily operations and cannot be used to technological innovation or product research to create more profits for the company. [5] High current debt also increases the financial risk.

Hypothesis 3: Company size and corporate performance of bio-pharmaceutical listed companies are positively related.

According to the western economics theory, in a certain range, expanding company size is to produce economies of scale. Meanwhile the bigger company size is the stronger anti-risk ability is. [6]

Build the regression model with DAR, CDR and SIZE:

$$Y=b_0+b_1DAR+b_2CDR+b_3SIZE+\mu$$

RESULTS AND DISCUSSION

1.Descriptive statistical analysis of the sample companies

Table 6 variable descriptive statistics

Variable name	Symbol	Mean value	Standard deviation	Maximum	Minimum
Corporate performance	Y	6.6912	4.9205	22.5817	-0.67056
Asset-liability ratio	DAR	43.05	20.0840	87	7.49
Current debt ratio	CDR	86.18	16.88814	100	42.29
Company size	SIZE	21.5870096	.92708993	23.55	19.21

It is shown in table 6 that mean value of corporate performance is 6.6912, which declares that most of the listed companies in bio-pharmaceutical industry have a positive corporate performance score. And the standard deviation of corporate performance is 4.9205, maximum is 22.5817 and the minimum is -0.67056, explain that the corporate performance level between enterprises has some difference.

2. Correlation and regression analysis

Before regression analysis, test the correlation between each variable. The result shows that the correlation coefficient between independent variables is very small which there no multicollinearity is.

Table 7 Model Summary

Model	R	R Squared	Adjusted R Squared	Std. Error of the Estimate
1	.826[a]	.682	.673	.3489821

a.   Predictors: (Constant), DAR, CDR, SIZE

Table 8 ANOVA

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.620	3	.056	50.158	.001a
	Residual	3.355	47	.018		
	Total	3.975	50			

Table 9 Coefficients [a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-2.888	.307		1.888	.012
	DAR	.1148	.013	.008	2.0853	.036
	CDR	-.0186	.006	-.097	-0.441	.448
	SIZE	.9231	.112	.142	1.940	.001

a. Dependent Variable: Y

It is shown in table 7-9 that R-Squared is 0.682, adjusted R-Squared is 0.673, which indicated that that about 68% corporate performance is explained by explaining variables. The regression coefficient between DAR and corporate performance is significant positive (0.1148, p=0.036<0.05). Therefore, the hypothesis 1 is established. The regression coefficient between CDR and corporate performance is negative (-0.0186), but non-significant (p=0.448>0.1), verifying the hypothesis 2. The regression coefficient between SIZE and corporate performance is significant positive (0.9231, p=0.001<0.01). The hypothesis 3 is established.

CONCLUSION

1. Research conclusions
(1) The asset-liability ratio and corporate performance of bio-pharmaceutical listed companies are significant positive related. To some extent the corporate performance of bio-pharmaceutical listed companies improved with the increase of asset-liability ratio, which is consistent to the conclusion of debt financing to improve corporate performance in MM theory.

(2) The current debt ratio and corporate performance of bio-pharmaceutical listed companies are negatively related, but the significance is not strong. Because the current debt ratios of most sample companies are high and the

differences between the companies are small.

(3) The company size and corporate performance of bio-pharmaceutical listed companies are significant positive related. It is suggested that there is obvious scale effect in bio-pharmaceutical listed companies. Big company has a better performance than small company.

2. Policy suggestions
(1) Moderate increase asset liability ratio of bio-pharmaceutical listed companies
To a certain extent bio-pharmaceutical listed companies in China have made use of financial leverage effect of debt, but the level of asset-liability ratio is still on the low side. In order to make better use of financial leverage effect and make the capital structure more perfect, bio-pharmaceutical listed companies should according to their actual situation moderately improve the debt ratio and improve the company's corporate performance.

(2) Moderate decrease the current debt ratio of bio-pharmaceutical listed companies
Most of the bio-pharmaceutical listed companies in China have a higher current debt ratio. But too much current debt will lead to high pressure of paying debt and also make the company pay more attention to the current situation ignoring the company's long-term interests, which could eventually lead to corporate performance decline. [7] The development cycle of bio-pharmaceutical products is at least more than one year, usually 3 years to 5 years even more. In the process of development, a lot of money is needed to invest in time. Any time the capital chain rupture has adverse effects to the project operation. Current debt can solve the short capital requirements, but in terms of the continuity of project operation, the role of it always appears insignificant. So bio-pharmaceutical listed companies in China should moderate decrease the current debt ratio to reduce financial risk and at the same time increase the long-term debt ratio.

(3) Promote the scale development of bio-pharmaceutical listed companies
Bio-pharmaceutical listed companies in the future development should focus on to achieve industrial upgrading, improve industrial concentration and to enhance their innovation capability and market competitiveness. Bio-pharmaceutical listed companies can get scale economy through company mergers and acquisitions, restructuring and so on.

REFERENCES

[1] Guo Pengfei; Sun Peiyuan, *Economic Research Journal*, **2003**, (5), 66-93.
[2] The Ministry of Finance statistics evaluation department of China. Company's performances evaluate, 1st Edition, Economic Science Press, Beijing, **1999**, 23-26.
[3] Mille M.H., *Journal of Finance*, **1977**, (32), 261 -275.
[4] Ross.S., *Bell Journal of Economics*, **1977**, (8), 23-40.
[5] Myers S.C, Majluf N.S., *Journal and Financial Economics*, **1984**, (13), 133-145.
[6] Modigliani Franco, M. Miller., *American Economic Review*, **1958**, (48), 261-297.
[7] Jensen M.C., Meckling W.H., *Journal of Financial Economics*, **1976**, (3), 305-360.