

Empirical Study on Influencing Factors of Capital Structure of Chinese Petrochemical and Petroleum Listed Companies

Yanming Zhang¹, Guiying Jia, Huixia Fu, and Xinzhu Feng

Northeast Petroleum University Daqing, China

Email: dqzhngyanming@126.com, jgy-gaosansi@163.com, dqfuhuixia@126.com, sabrinafxz@163.com

Abstract—The capital structure problems of current some petroleum and petrochemical listed company are high of asset-liability ratio and ownership concentration. Selecting 2010-2012 data as a sample and using factor analysis and multiple stepwise regression analysis, empirical results show that cash flow capacity factor F1 and growth factor F4 are negatively related to Asset-liability ratio; Size factor F2 and Asset-liability ratio are related. Based on the result of empirical analysis, optimizing the petrochemical listed company's capital structure should pay attention to cash flow capacity and size and growth of petroleum and petrochemical companies.

Index Terms—petroleum and petrochemical listed companies, capital structure, influencing factors

I. INTRODUCTION

Petroleum and petrochemical industry is an important China's energy industry, it has significant industry characteristics compared to other industries. With the gradual deepening of economic globalization and a competitive market environment, [1] Petroleum and petrochemical industry listed company have been an asset-liability ratio of high and low capital use efficiency for a long time as a result of unreasonable capital structure issues, leading to the waste of resources and mis-allocation of funds, and it also affects the speed of development for enterprises. China's petroleum and petrochemical enterprises focus on how to work out a reasonable capital structure of listed companies, in order to achieve the maximization of corporate value. Therefore, it is of great significance to explore the influencing factors of petroleum and petrochemical company's capital structure in China.

II. PETROLEUM AND PETROCHEMICAL INDUSTRIES LISTED STATUS OF THE COMPANY'S CAPITAL STRUCTURE

A. Assets and Liabilities

Petroleum and petrochemical industries of listed companies have a high asset-liability ratio, the overall level of the country's industrial enterprises above designated size considerably. From 2007 to 2011, petroleum and petrochemical industries and enterprises and industrial enterprises above designated size comparison table gearing ratio shown in Table I: Country's industrial enterprises above designated size (2007 to 2010 for the main business income of 500 million yuan and above industrial enterprises above designated size industrial enterprises; as the main business income of 20 million yuan and above industrial enterprises above-scale industrial enterprises from 2011) asset-liability ratio has been relatively stable, and change little. With the asset-liability average ratio of oil and gas exploration industry in these five years being 43.186%, asset-liability ratio has maintained an upward trend, but has not yet reached the average level of industrial enterprises above designated size. With the asset-liability average ratio of oil and gas exploration in these five years being 43.186%, asset-liability ratio has maintained an upward trend, but has not reached the average level of the country's industrial enterprises above designated size. The asset-liability average ratio of petroleum processing and coking industry companies has been around 60.972%, which means slight fluctuations. We choose rubber and plastic products industry because both of them belong to the petrochemical industry, and it can be seen from Table I, the gearing ratio of rubber products and plastic products industry in five years. Although the rubber products industry asset-liability ratio maintains a downward trend, the asset-liability ratio of industrial enterprises above designated size is slightly lower than the average level of industrial enterprises above designated size of the plastic products industry, but the difference is not significant.

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Heilongjiang Provincial Department of Education planning issues (GBC1212014) financial reporting and regulatory environment XBRL oil companies under study

TABLE I. STATEMENT OF CHANGES IN ASSET-LIABILITY RATIO

Years	National scale Industrial enterprises (%)	Oil and Gas Mining industry (%)	oil processing Coking Industry (%)	Rubber Products (%)	Plastic Products (%)
2007	57.46	38.63	56.58	60.83	58.47
2008	57.71	39.14	61.91	59.08	54.96
2009	57.88	45.83	62.42	57.75	53.59
2010	57.41	43.69	60.92	52.22	52.98
2011	58.1	48.64	63.03	55.86	52.49
Mean	57.77112	43.186	60.972	57.148	54.498

* Values from the National Bureau of Statistics website, drawn by hand finishing.

B. Ownership Concentration

The proportion of listed companies in China's petroleum and petrochemical largest shareholder statistics is shown in Table II: In 2011.

TABLE II. PROPORTION OF THE LARGEST SHAREHOLDER DISTRIBUTION TABLE

Proportion	0-20	20-40	40-60	60-80	80-100
Number	5	11	8	4	0
Weights	0.1785	0.3929	0.2857	0.1429	0

After analyzing the ratio of the largest shareholder and distribution, we could calculate the proportion of listed companies in China's petroleum and petrochemical largest shareholders which are on the average of 40 percent over the total stake level of the second, third, fourth, five shareholders. We can see the largest shareholder of China's petroleum and petrochemical listed company is a holding of shareholders. Therefore, the largest shareholder of the company can be daily productive and do business activities. Many problems have a decisive impact on financial decisions and corporate governance.

TABLE III. THE PROPORTION OF THE TOP FIVE SHAREHOLDERS

Proportion	0-20	20-40	40-60	60-80	80-100
Number	2	4	11	6	5
Weights	0.0714	0.1429	0.3929	0.2143	0.1785

From the table we find that about 39% of the largest shareholder holds more than 40% mastering the control of the company. The ratio of the largest shareholder majority concentrates in the 20%-60%, accounting for 67.86% of the samples. We know most of petroleum and petrochemical largest shareholders in a relatively controlling position.

III. EMPIRICAL ANALYSES

A. Select Samples

In this paper, CITIC industry classification is based on Shanghai and Shenzhen in order to select the oil and petrochemical-based 28 annual financial reports of listed

companies as samples of data. When we are selecting samples, the following principles: (1) the study period is in 2010-2012, so we should choose listed companies with a relatively long life. listed companies for late financial situation is less stable. (2) excluding ST listed companies ,these companies are losing money all year round. They could face bankruptcy and study the impact of an abnormal result. (3) Excluding financial data coverage was incomplete, the presence or absence of financial indicators of listed companies has extreme values data from the GTA database.

B. Select the Dependent Variable

This study is the company's capital structure, [2] and asset-liability ratio is selected to be interpreted as a variable to reflect the level of corporate debt. As a long-term corporate credit risk and good long-term financial position of one measure reflects the ability of creditors to provide capital as well as the ratio of total capital to raise funds for future business, economic strength and safety of assets of enterprises creditors is an important indicator.

C. Select the Independent Variable

According to the relevant theories of capital structure analysis, [3] respectively, from the scale of an enterprise , the company's growth , non-debt tax shield, tax effects , profitability, asset-backed , cash flow , asset management operations , solvency have an impact on these nine areas We select financial indicators of capital structure to select the specific indicators shown in Table:

TABLE IV. VARIABLE DESIGN TABLE

Variable	Variable name	Factors	Variable formula
Y	Asset-liability ratio		Liabilities / Assets
X ₁	Asset size	Asset size	Natural logarithm of total assets
X ₂	Main business income scale	Asset size	The natural logarithm of the main business income
X ₃	Total asset growth	Growth	(End of period Total assets - beginning of period total assets) / Beginning of period total assets
X ₄	Capital accumulation rate	Growth	(Ending equity - beginning equity) / beginning equity
X ₅	The growth rate of fixed assets	Growth	(End of fixed assets - beginning of fixed assets) / Beginning of fixed assets
X ₆	NDTS	NDTS	Depreciation / Total Assets
X ₇	Tax Effect	Tax Effect	Income tax expense / profit before tax
X ₈	Total assets Net margin	Profitability	Net Income / Total Assets
X ₉	ROE	Profitability	Net profit / Total Equity
X ₁₀	Operating margin	Profitability	(Operating income - Operating cost) / Operating income
X ₁₁	Sales margin	Profitability	Net profit / Operating income
X ₁₂	The proportion of tangible assets	Asset Specificity	(Inventories + fixed assets) / Total Assets
X ₁₃	Current Ratio	Cash flow capacity	Current Assets / Current Liabilities
X ₁₄	Quick Ratio	Cash flow capacity	(Current assets - Inventories) / Current Liabilities
X ₁₅	Total assets	Asset	Operating income / total assets

	turnover	manageme nt capabilitie s	Closing balance
X ₁₆	Fixed asset turnover	Asset manageme nt capabilitie s	Operating income / fixed assets
X ₁₇	Direct holding ratio	Sharehold ing Structure	Number of holding shares directly / Total equity
X ₁₈	Solvency	Solvency	Profit before interest, taxes, amortization / liabilities

D. Hypothesis

Hypothesis I: Cash flow ability is negatively correlated with capital structure. When the company's cash flow is sufficient, the companies do not explain the lack of funds and therefore, will reduce its liabilities.

Suppose I: Company size and capital structure are positively correlated. In general, firm size reflects the enterprise's comprehensive strength. The larger the company's strength, the stronger, strong anti-risk ability is, and the stronger its ability to borrow. [4] Meanwhile, a large diversified company has large scale economies and more encumbered assets, financing easier for the debt.

Hypothesis III: Profitability and capital structure are negatively correlated. Pecking order theory that in the case of asymmetric information, general corporate financing order is the first internal financing, debt financing and then exogenous and finally external equity financing. [5] Strong profitability of the company, retained earnings and more, thus exogenous financing needs will be reduced.

Hypothesis IV: Growth and Capital Structure positively correlated. High-growth companies tend to lack of funds, these companies retained earnings on its own is not enough, and it is difficult to meet their own development needs, strong demand for external funds.

Hypothesis V: Asset-backed and operations and capital structure positively correlated. [6] Enterprises are for the secured assets, the stronger operational capacity indicates that if the ability of the credit is stronger, corporate month have an easy access to debt.

Hypothesis VI: Tax effect positively is correlated with capital structure. For the debt financing role of a tax credit, [7] companies face higher income tax rate. This effect is more obvious, and more companies tend to debt financing.

E. Applicability of Factor Analysis Test

The results of the sample data KMO test and Bartlett's puerility test are as follows:

Test results show that, KMO value of 0.509 is suitable for factor analysis. BARTLETT significantly through test, P value = 0.00, less than 0.05, rejecting the null hypothesis correlation coefficient matrix is so comprehensive that judgment can be used for factor analysis.

F. Structure Factor Variables

Male factors variance is high, [8] and most of them are more than 85% , indicating the predictor as the square of the multiple correlation of these factors to maximize the extraction of the information of the original variables, i.e., the composition can effectively extract the original variables described ,and do minor damage to the information. Using principal component analysis to extract factors, we should extracts the principle eigenvalues greater than 1, and six factors can explain 82.015% of the variation in the original variables .

TABLE V. KMO AND BARTLETT TEST RESULTS

KMO and Bartlett Inspection	
The appropriate sum of Kaiser-Meyer-Olkin	.509
Bartlett	1671.860
Bartlett df	153
Bartlett Sig.	.000

As shown in Table V, eighteen values of six components were 4.661,3.238,2.52,1.916,1.289, greater than 1; characteristic value of each factor, and the percentage of the sum of the eighteen values, which are the components of variance revealing the percentage of total variance, respectively, 25.893%, 17.991%, 13.998%, 10.643% , 7.159% , 6.332%. This cumulative percentage of 6 total factors reached 82.015%. i.e., six factors can explain this. 82.015% is the variability of the original variables. Strong factors are in front of the explanatory variables, and its impact factor is behind the weak. Through the analysis, and it ultimately determines the main ingredient extracted from six factors. To the large extent, six factors reduce the complexity of the original data, and only less than 20 % of the information is lost.

G. Factor Loading Matrix

Orthogonal rotated factors about loading matrix are shown in Table VI:

TABLE VI. THE TOTAL VARIANCE EXPLAINED

	The initial eigenvalues			Extracting square and load			Rotating the square and loaded		
	Total	percentage of variance / %	Cumulative percentage / %	Total	percentage of variance / %	Cumulative percentage / %	Total	percentage of variance / %	Cumulative percentage / %
1	4.661	25.893	25.893	4.661	25.893	25.893	3.114	17.301	17.301
2	3.238	17.991	43.884	3.238	17.991	43.884	2.869	15.936	33.238

3	2.520	13.998	57.882	2.520	13.998	57.882	2.688	14.935	48.173
4	1.916	10.643	68.524	1.916	10.643	68.524	2.193	12.186	60.359
5	1.289	7.159	75.683	1.289	7.159	75.683	2.166	12.032	72.391
6	1.140	6.332	82.015	1.140	6.332	82.015	1.732	9.624	82.015
7	.751	4.171	86.186						
8	.659	3.659	89.846						
9	.493	2.741	92.587						
10	.438	2.431	95.018						
11	.289	1.604	96.622						
12	.239	1.330	97.953						
13	.170	.946	98.898						
14	.115	.638	99.536						
15	.048	.265	99.802						
16	.031	.173	99.974						
17	.003	.016	99.990						
18	.002	.010	100.000						

TABLE VII. COMPONENT MATRIX

Zscore		Component					
		1	2	3	4	5	6
Current Ratio	Zscore(X ₁₃)	.921	-.083	-.073	.157	.049	.118
Quick Ratio	Zscore(X ₁₄)	.914	-.095	-.049	.204	.101	.150
Solvency	Zscore(X ₁₈)	.768	-.080	.271	-.025	.000	-.077
Asset size	Zscore(X ₂)	-.102	.936	-.078	-.152	-.176	-.110
Asset-liability ratio	Zscore(X ₁)	-.184	.924	-.031	-.060	.119	-.023
Direct controlling NDTs	Zscore(X ₁₇)	-.009	.812	.280	.034	.032	.107
	Zscore(X ₆)	.069	.503	-.208	-.353	-.015	-.415
Total assets	Zscore(X ₈)	.075	.029	.957	.073	-.012	-.061
Net profit ROE	Zscore(X ₉)	-.081	.151	.917	.101	-.041	.031
Sales margin	Zscore(X ₁₁)	.185	-.200	.647	.191	.526	.148
Rate of capital	Zscore(X ₄)	.116	-.099	.135	.949	.092	.023
Total asset growth	Zscore(X ₃)	.156	-.086	.096	.937	.137	.149
Operating margin	Zscore(X ₁₀)	.165	-.198	.437	.256	.679	.204
The proportion of Total Assets	Zscore(X ₁₂)	.189	.164	-.231	.029	.673	.040
Turnover	Zscore(X ₁₅)	.486	.203	-.174	-.231	-.672	-.196
Fixed Assets	Zscore(X ₁₆)	.604	-.118	-.038	.049	-.636	-.120
Turnover	Zscore(X ₅)	-.077	.000	-.018	-.004	.162	.832
The growth rate of fixed Tax Effect	Zscore(X ₇)	.193	-.035	.016	.142	.074	.810

Given in the table after the rotation, factors and the correlation matrix of the original variables are in a descending order. The extracted common factors are as follows.

Common factor F1 is on the current ratio X₁₃. X₁₄ quick ratio the larger the absolute value of the correlation

coefficient with its load values were 0.921 and 0.914, these two indicators are reflected in the company's liquidity, naming after the common factor F₂ as cash flow factor.

Common factor F₂ is in asset size X₁, X₂ main business revenue load values have a larger scale, reaching 0.936 and 0.924. Respectively, these two indicators reflect the size of the company, so the common factor F₂ is named as company size factor.

Common factor F₃ is in total assets and net profit margin ROE X₈ X₉ maximum load, the load values are 0.957 and 0.917 respectively. These two indicators reflect the profitability of the company's assets, naming it as the common factor F₄ asset profitability factor.

Total asset of common factor F₄ and capital accumulation rate X₄, X₃ growth was significantly related to the load on its variable values which were 0.949 and 0.937. These two indicators reflect the company's liquidity, naming them as the common factor F₂ growth factor.

Common factor F₅ and tangible assets ratio X₁₂, total asset turnover X₁₅, X₁₆ significantly related to fixed asset turnover, the load values were 0.673, 0.672 and 0.636. Respectively, these two indicators reflect the ability of the enterprise asset-backed and corporate assets operational capacity, and there will be common factor F₅ named asset-backed and operational capacity factor.

Common factor in the tax effects X₇ F₆ load reached 0.81, because the common factor F₆ is named tax effector.

H. Construct Multivariate Linear Regression Models

Extracting the common factor score value as a new variable with the capital structure that is asset-liability ratio, using stepwise regression, multiple linear regression analysis, cash flow factor common factor F₁ first entered to the regression model, adjusted R² increased to 0.236, indicating common factors F₁ to enter the cash flow factor, the variability of 23.6% produced by the dependent variable Y capital structure can be

explained by common factor F1 cash flow factor .The common factor F2 company size factor second enter to the model adjusted R² further increased to 40% , and finally with the common factor growth factor F4 to enter, Model Adjusted R² stay in 43.3%. Show: From the relative level point of view, the regression equation dependent variable Y can be reduced to 43.3 % of the variance fluctuations. From the point of view, the

standard deviation of the dependent variable was reduced to 0.17 after the reunification. DW test is used to test the random variable first-order linear autocorrelation method. When DW values near 2, indicating no auto-correlation between variables. DW test value = 2.317, indicating that there is no common factor between self-related phenomena.

TABLE VIII. ASSET-LIABILITY RATIO MODEL SUMMARY

M	R	R ²	Adjustment (R ²)	Standard estimates Error	Change Statistics					DW	F
					R ²	F	df1	df2	Sig. F		
1	.496	.246	.236	.197892559	.246	25.768	1	79	.000		25.768
2	.644	.415	.400	.175394167	.169	22.567	1	78	.000		27.685
3	.674	.455	.433	.170485858	.039	5.556	1	77	.021	2.317	21.386

From the table, it can be seen, F = 21.386, significant SIG (P value) = 0.000 (< 0.05) , indicating a significant overall regression equation, indicating significant regression model, the regression equation explained a relatively strong significance. Regression coefficient test value P value less than 0.05, indicating that the regression coefficients through significant test, between the independent variables and the dependent variable was significantly correlated. VIF = 1, so the model does not exist. Common factor is F1, F2, and F4 through test. Regression equation:

$$Y = 0.333 - 0.112F_1 + 0.093F_2 - 0.045F_4$$

Through the above factor analysis and multiple regression analysis, we can draw the following conclusions:

I. Common Factor F1

Cash flow capability and asset-liability ratio negatively are correlated to accept the null hypothesis. The correlation coefficient of the three factors by the highest is reaching 0.112. This shows that the ability to affect the cash flows of petroleum and petrochemical capital structure of listed companies in the most important factor. Because the company has sufficient funds to invest, expand production, it will reduce debt, thereby reducing its gearing ratio.

J. Common Factor F2

Company size factor and asset-liability ratio are positively correlated to accept the null hypothesis. A correlation coefficient is 0.093. Description of the size and capital structure of listed companies showed changes in the same direction.

K. Common Factor F4

That common factor F4 growth is negatively correlated with the asset-liability ratio. Cash flow capacity is the impact on the capital structure of listed companies petrochemical and the least important factor. Its value is-

0.045. Although this factor significant test is passed, the sign of the regression coefficients original hypothesis is opposite. Theoretically, capability with high growth companies often needs a lot of funds to meet the needs of its rapid development. Liability should be relatively more. [9] Moreover, China's petroleum and petrochemical listed companies are mostly state-owned enterprises restructured and subsidized by the government so much. State-owned shares overweight, so debt may be relatively less.

L. Common Factor F3, F5, F6

Those significant tests failed, indicating that the three listed companies in the face of China Petroleum and Petrochemical no effect. Conclusion rejects the null hypothesis.

IV. CONCLUSIONS AND RECOMMENDATIONS

A. Emphases on Cash Flow Ability

Cash flow is important to the operation and development of the company. Plenty of stable free cash flow production means companies are performing well, debt service and the ability to resist financial risk, investment, debt servicing, dividend capital adequacy, more opportunities for future development. High percentage of China's petroleum and petrochemical company current liabilities, note the booming petroleum and petrochemical companies need a lot of money, and the results of empirical research studies show that cash flow capacity factor of China's petroleum and petrochemical listed company's most significant influence, therefore, should focus on petroleum and petrochemical listed company's cash flow.

B. Focus on Company's Size

The larger enterprises are more likely to get needed money through debt financing. Therefore, it should be combined with its own scale of listed companies in China's petroleum and petrochemical industry when

selecting and identifying sources of funding. Small scale enterprises of petrochemical listed company can choose more internal financing and equity financing methods and larger enterprises listed real estate company can choose a higher proportion of debt financing. In addition, the liability structure of listed companies in China's petroleum and petrochemical is unreasonable. High proportion of current liabilities, which is not conducive to the stable development of the company, results in businesses at a disadvantage in the market competition. Therefore, combined with their size at the same time, rational selection and arrangement proportion of current liabilities are right.

C. Focus on Corporate Growth Empirical

[10] Analysis showed that the growth of China's petroleum and petrochemical listed company's capital structure has little effect, indicating that the enterprise did not realize the importance of strengthening the capital structure management, only passively to coordinate the funding of enterprises. Thus the capital structure of listed companies in China's petroleum and petrochemical enterprises should set up strategic management concept from the macro aspect to the micro aspect to consider multiple factors affecting the capital structure of enterprises. On the other hand, from the point of view of optimizing equity structure and high growth enterprises, you can choose by way of issuing convertible bonds to meet their financing needs.

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Yanming Zhang was born in Tonghe County, Heilongjiang Province, China in December 1972. Now she is a professor in Northeast Petroleum University and Dr. of Petroleum Economics and Management Institute, deputy director of the Department of Accounting School of Economics and Management. Her research direction includes enterprise value, performance evaluation, capital structure, social responsibility. Her address is northeast Petroleum University, Daqing, Heilongjiang Province.

Guiying Jia, Mudanjiang City, Heilongjiang Province, China. In 1987, Postgraduate Student of Northeast Petroleum University. The research direction: Financial Management. Address is northeast Petroleum University, Daqing, Heilongjiang Province.

Huixia Fu, Luoyang City, Henan province, China in 1977, Northeast Petroleum University professor, research direction: regional economics address: northeast Petroleum University, Daqing, Heilongjiang Province.

Xinzhu Feng, postgraduate student of Northeast Petroleum University. Research direction: Accounting address: Daqing Oilfield co., LTD, Daqing, Heilongjiang Province.