The Study of Influencing Factors of Capital Stucture: Empirical Analysis Based on The Financial Data of China's SSE Listed Companies in 2018

Zhiqi Wang[1, a], Xinyi Wei[1, b]
wzq14708034467@163.com *Zhiqi Wang, weixinyi2018@outlook.com *Xinyi We

Department of economics, Jinan University, 855 Xingye Dadao East, Panyu District, Guangzhou City, Guangdong Province, China

Abstract: Capital structure affects plenty of aspects of a company. Inspired by the differences in influencing factors and influencing mechanisms, which are positively or negatively related, we use the financial data of China's SSE listed firms in 2018 to study the influencing factors of capital structure in Chinese listed companies. After data cleaning, we did the Gaussian General Linear Regression and obtained the ANOVA and estimators. After deleting some variables with extremely large variables, we used the Best Subset Selection method with minimum SSR and minimum Mallows' Cp value criterion to select the most related explanatory variables. Finally, we found several factors which have the biggest influence on capital structure. Then we interpreted every explanatory variable and analyzed the possible reasons why they are different from the results in developed countries.

Keywords: Capital structure, Debt-Equity Ratio

1 Introduction

Capital structure refers to the composition content and proportion of the company's capital, it is mainly composed of debt capital and equity capital. Capital structure has a direct impact on a company's profitability, operating capacity, and debt-paying ability. The choice and optimization of capital structure can effectively enhance enterprise value.

Given the characteristics of the market, we take China's A-share listed companies as the research object, we initially choose some factors considered highly related to a company's capital structure. Then we build a linear regression model with the chosen factors and data, and through the statistic results, we found some factors less related to capital structure than others. After statistic analysis, we bring out some possible reasons that some factors are highly related and others are not.

2 Capital structure determinants (Theoretical)

Capital structure theory: theoretically, a company's choice of its capital structure mainly depends on the following factors:

A. Taxation: Since the financing choice of a company is likely to bring a tax shield effect, the

MSIEID 2022, December 09-11, Chongqing, People's Republic of China

DOI 10.4108/eai.9-12-2022.2327610

type of tax and the level of tax rate may have a great impact on the choice of its capital structure. If the corporate tax rate is higher than the bond tax rate, the company is likely to choose to finance.

B. Company asset type: a company with a larger proportion of fixed assets and a smaller proportion of intangible assets is more suitable for liabilities.

C. Company size: Compared with small companies, large companies with a good reputation are more likely to integrate capital at a relatively low cost, while small companies are relatively difficult to borrow and have higher costs. Even if they succeed in the financing, they may face many protective provisions.

D. Concentration of control right: if the control right of an enterprise is relatively concentrated, financing methods such as issuing new shares may lead to dilution of equity, and the possibility of the dispute over control right will affect the financing method of an enterprise, thus directly affecting the capital structure.

E. Enterprise income stability: for companies with large profit and income fluctuations, a high borrowing rate may cause greater bankruptcy risk, so they will be more cautious in financing.

F. Corporate Profitability: Theoretically speaking, companies with strong profitability face a smaller bankruptcy risk, so they have a larger debt space.

G. Cost of capital: a large cost of capital will aggravate the risk of financial distress. According to the trade-off theory, if the risk of capital distress exceeds the tax avoidance effect of interest, debt will be an unwise choice.

H. Current assets: a company with a higher current ratio has a strong ability to realize its assets and pay its debts in the short term, so it has a large space to borrow.

The formula of variables x2 is inspired by the calculation of x1 (Wang&Yang 2002), to make this variables' factorization, we take the logarithm of the tax shield. Meanwhile, based on the single variable principle, the tax rate used here is the corporate income tax rate.

3 Notations

Notations	Variables	Formula
Y	**Financial leverage**	$\frac{Debt}{Equity}$
X1	**Size of the firm**	$\ln(Total\ Asset)$
X2	**Tax shied**	$\ln(t_c \times Total\ Debt)$
X3	**Return on asset (ROA)**	$\frac{Net\ Income}{Total\ Asset}$
X4	**Return on equity (ROE)**	$\frac{Net\ Income}{Total\ Equity}$
X5	**Current ratio**	$\frac{Current\ Asset}{Current\ Liability}$
X6	**Cost of capital: R_{WACC}**	$\frac{S}{B+S} R_S + \frac{B}{B+S} R_B \times (1 - t_c)$
X7	**Dividend payout ratio**	$\frac{Dividend}{Income}$

X8	**Tangible asset ratio**	$\frac{Tangible\ Asset}{Total\ Asset}$
X9	**Intangible asset ratio**	$\frac{Intangible\ Asset}{Total\ Asset}$
X10	**Proportion of the largest shareholder**	$\frac{\text{Number of shares held by the largest shareholders}}{\text{Number of total shares}}$

4 Data Selection

Appeal to verify the theory and its influence on enterprise capital structure influence factor of correlation degree, according to the particularity of market and time, we choose all listed companies on SSE and the respective data in 2018. Since the financial structure of financial and non-financial companies is significantly different, non-financial companies are selected as the research samples. All financial companies are removed. Also, we remove the firms which stocks are special treated (ST). We used 1444 listed companies and relevant financial data to do the analysis.

5 Regression

Since we have 10 explanatory variables and one dependent variable, the regression model used is the Generalized Linear Model (GLM), the range of data in each category varies, thus we used Gaussian GLM. The following pictures (Tables 1 and 2) are the results of regression and the ANOVA (analysis of variance)

Table 1: Result if 1st regression

	Df	**Deviance**	**Resid.Df**	**Resid.Dev**
Null			1359	121742.10
X1	1	240.07	1358	121502.03
X2	1	2285.49	1357	119216.54
X3	1	752.25	1356	118464.28
X4	1	98.23	1355	118366.05
X5	1	30.58	1354	118335.47
X6	1	77.95	1353	118257.52
X7	1	24.24	1362	118233.28
X8	1	105.47	1351	118.127.71
X9	1	0.33	1350	118127.39
Xi	1	170.81	1349	117956.57

Table 1: ANOVA (1st)

	Estimate	**Std.Error**	**t value**	**Pr(>|t|)**
(Intercept)	-0.39	2.77	-1.14	0.89
X1	-1.60	0.66	-2.41	0.02
X2	1.60	0.55	2.90	0.00

X3	-5.96	2.81	-2.12	0.03
X4	-0.64	0.63	-1.01	0.31
X5	0.09	0.11	0.76	0.45
X6	-13.40	14.58	-0.92	0.36
X7	-0.20	0.46	-0.44	0.66
X8	1.71	1.53	1.12	0.26
X9	0.35	3.53	0.10	0.92
Xi	-2.38	1.70	-1.40	0.16

The estimations of the GGLM are shown in the above figures. It is represented that the standard errors of x3, x6 are extremely large, which means that some irrelevant explanatory variables are included in this model. This corollary can also be implied by the significance analysis:

```
(Intercept)
x1          *
x2          **
x3          *
x4
x5
x6
x7
x8
x9
xi
---
Signif. codes:
0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

Figure 1: significance level

From the economic meaning of each variable, every factor seems quite relative to the dependent variables. While from the data, it is false.

In this part, we used the Best Subset Selection method and Mallows' Cp as criteria to find the most relevant explanatory variables.

The basic idea of best subset selection is simple:

• For p characteristics, from k=1 to k=p

• Select k arbitrarily from p features, building C (p, k) models, and choose the best one (based on minimal SSR or maximal);

• Choose an optimal model from p optimal models (based on cross-validation error, Cp, BIC, Adjusted or other criteria).

• Change the value of p and repeat these steps.

The criteria of (p, k) models are minimum SSR while the criteria of the optimal from p models are Mallows' Cp. Following these steps, the results in Table 3 and Figure 2 are obtained:

Table 3: Best Subset Selection

	X1	X2	X3	X4	X5	X6	X7	X8	X9	xi	adjR2	Cp	BIC
1(1)			*								0.02	13.45	-8.07
2(1)		*	*								0.02	7.72	-8.55
3(1)	*	*	*								0,02	2.81	-8.26
4(1)	*	*	*							*	0.03	2.78	-3.07
5(1)	*	*	*	*						*	0.03	3.66	3.01
6(1)	*	*	*	*				*		*	0.03	4.60	9.16
7(1)	*	*	*	*		*		*		*	0.03	5.70	15.47
8(1)	*	*	*	*	*	*		*		*	0.03	7.20	22.18

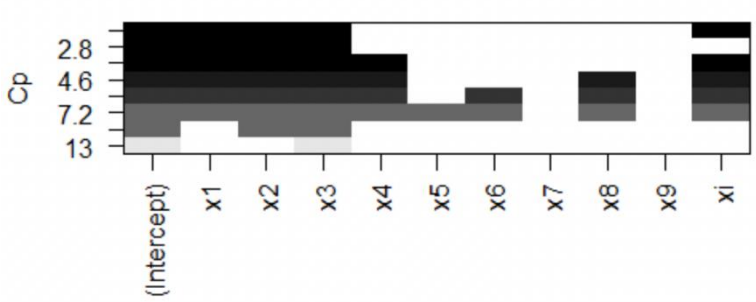

Figure 2: the optimal selection

Based on the minimum Cp value principle and combined with Figure 2, it is easy to recognize that the best subset is (x1, x2, x3, xi) since it minimized the Cp. Also from Table 3, the BIC of this subset is low. As a result, we can conclude that based on the two criteria, the best combination of explanatory variables is (x1, x2, x3, xi).

6 Regression again

After finding out the best explanatory variables, we do the regression analysis again based on the new combination of variables. The regression results are shown as follows (Table 4 and 5):

Table 4: estimations of 2nd regression

	Df	Deviance	Resid.Df	Resid.Dev
NULL			1359	121742.10
X1	1	240.07	1358	121502.03

X2	1	2285.49	1357	119216.54
X3	1	752.25	1356	118464.28
xi	1	176.83	1355	118187.45

Table 5: ANOVA (2nd)

	Estimate	Std.erroe	T value	Pr(>|t|)
(Intercept)	-0.83	2.25	-0.37	0.71
X1	-1.49	0.59	-2.51	0.01
X2	1.52	0.46	3.27	0.00
X3	-7.06	2.57	-2.75	0.01
xi	-2.42	1.70	-1.42	0.15

Compare with the estimations of the first regression, it can be easily seen that the standard errors of all the explanatory variables in the new subset decreased, and the p-value decrease, which represents that all the variables are significant to the regression model.

$$\frac{D}{E} = -0.83 - 1.49 \times firm\ size + 1.52 \times tax\ shield - 7.06 \times ROA - 2.42 \times proportion\ of\ the\ largest\ shareholder.$$

7 Conclusion

In the above capital structure determinants, the firm size matters the most, then the tax shield, the ROA ratio, and the proportion of the largest shareholder. The factors which matter little like ROE, tangible asset ratio and intangible asset ratio, dividend payout ratio, and current ratio are deleted in our final result.

8 Analysis

8.1 Firm size (The natural log of the total asset):

There are two main measurements of firm size: market value and total asset. The correlated coefficient of total asset is bigger than that of market value. Total asset is negatively correlated with corporate financing leverage. This result is opposite to our theory, the reason might be that large-scale companies are more inclined to conduct equity financing rather than debt financing. This result is different from the research conclusion of Titman & Weseles (1988) [1] et al., but it does reflect the situation of companies' capital structure selection in the specific environment of the Chinese market. Since the stock listing of Chinese companies now adopts the approval system, whether the company can obtain the listing qualification largely depends on whether it can obtain the administrative approval and obtain the listing quota. And the Chinese government defined the position of the securities market as "raising a large amount of

money to support the reform of state-owned enterprises", rather than simply emphasize the securities market financing function, so the shareholding system reforming of large state-owned enterprises is the main focus of government, they are more likely to get listed "quotas". This characteristic is likely to lead to the negative correlation between company size and corporate lending o. This phenomenon is consistent with Singh and Hamid's (1992) [2] 's explanation of the particularity of the capital structure of developing countries: "the process of economic marketization and a financial opening degree in each country has a significant impact on the capital structure".

8.2 Tax shied (The natural log of tax rate multiple debts):

This variable is positively correlated with the corporate loan ratio, which is consistent with our theoretical results. Since the tax of the interest can be avoided while a tax of dividends can not, the tax shield effect indicates that a higher tax shield can effectively increase the overall value of the company. Therefore, companies with a better tax shield effect are more inclined to have higher financial leverage and prefer bond financing compared with equity financing.

8.3 Profitability (ROA: Net income divide Total asset):

There are two main measurements of profitability: ROA and ROE (ROE: Net income divide total equity). The correlated coefficient of ROA is bigger than that of ROE. Both of them are negatively related to corporate financing leverage. This result is opposite to our theory that more profitable companies have more probability to borrow, the reason might be that profitable companies has better capital decisions such that they are more cautious in debt financing.

8.4 Degree of ownership concentration (Proportion of the largest shareholder):

The factor is measured by the percentage of the shares held by the largest stockholder, and the result is consistent with our theory. Agency problems in China's securities market occupy a certain position in the basic structure of the decision, but it is not the most important influence factor. Because China's listed company management division of labor is relatively fuzzy, the majority of the shares are held by internal directors, board of directors of the lack of entrepreneur market mechanism, insider control is not only from the shareholders, and not bound by the market. The insiders completely out of control can control the company, they can choose according to his will or value orientation and arrange the financing structure, financing ways, making the listed companies be able to get the shareholders' money at low cost, but not efficiently use this money. They are not bound by the shareholders, and not bound by the market, which inevitably leads to a strong preference for equity financing. Also, there is a lack of incentives for management. The incentive effect of debt financing on corporate governance is mainly reflected by increasing the debt ratio can increase the equity ratio of the operator and the manager, to encourage the operator and the manager to work hard when the investment of the operator remains unchanged, The empirical study of Lv Changjiang and Wang Kemin (2002) [3] shows that the asset-liability ratio is significantly negatively correlated with the proportion of management equity, which is illustrated by the fact that with the increase of management equity, the interests of management and shareholders are gradually consistent. However, the management and managers of listed companies in China have no shares or the shareholding ratio is very low, so the influence brought by this effect is weakened to a large

extent. Management does not want to lose control of the business. The ratio of equity financing and debt financing directly determines the distribution and transfer of corporate control right between shareholders and creditors. The restraints of debt financing on operators are mainly reflected in that debt financing will reduce the investment ability of enterprises, control almost unlimited investment impulse of managers, and protect the interests of investors. Debt financing has obvious restraints on listed companies' violation of the interests of shareholders, especially minority shareholders: (1) Controlling the phenomenon that major shareholders occupy the funds of listed companies. (2) To control excessive fund-raising. (3) Controlling blind investment (Liu Ming, Yuan Guoliang, 1999 [4]). Yang Xingquan (2002) [5] analyzed the asset-liability ratio of listed companies from 1999 to 2000 and believed that the financing signal transmission effect did not exist in China. Equity financing, as the cheapest financing method, would not affect managers' control over enterprises but would be more conducive to managers' control over enterprises than debt financing. On the other hand, ownership concentration is less important than other influencing factors on corporate capital structure, so its correlation coefficient is relatively small.

8.5 Excluded variables:

Variables in the model were excluded from the return of the process, because the standard deviation of their correlation coefficient is too large, by the subset algorithm, the optimal relevant model has four variables, the irrelevance of the rest of the factors (like capital cost and the ratio of tangible assets to intangible assets) may be due to in the same market environment and more strict regulations, the company cost of capital differ little. Maybe for financial enterprises, the cost of capital is more likely to have a bigger difference, but because we ruled out this part of the data when doing the selection, the difference is relatively small, which makes it hard to get a valid conclusion. Also, the ratio of tangible assets to intangible assets may have little influence on the solvency of enterprises in this market, so it correlation parameter of capital structure is also small.

9 Model improvements

A. Companies in different industries are affected by different factors to different degrees. During model optimization, a virtual industry variable can be set for different industries according to the industry classification standard of the Shenzhen Stock Exchange.

B. This model only takes the D/E ratio as the dependent variable to conduct A regression study on the correlation degree of all influencing factors, and only considers the financial leverage of the company, without making A specific classification analysis on the borrowing or financing methods of the company. A more detailed classification can be used for internal funds, external creditor's rights, External equity, and other financing methods to further study the influence factors.

References

[1] Wang Juan, Yang Fenglin, A New Research of Determinants of Listing-Companies' Capital Structure in China, Studies if International Finance[J], 2002 No.8, 45-52

[2] Singh., A., 1995a. Corporate financial patterns in industrializing economies: A Comparative International Study. IFC Technical Paper, International Finance Corporation, Washington, DC
[3] Shannon Li, Zhi Liu, Journal of Accounting Research, 2003, 000(008):31-35. Titman, S. and R. Wessels, 1988, The Determinants of Capital Structure Choice, Journal of Finance 43
[4] Changjiang Lv, and Kemin Wang, 2002, Study on the interaction mechanism of listed company structure, dividend distribution, and management equity ratio. Accounting Research
[5] Xingquan Yang, 2002, Analysis of governance effect of the financing structure of listed companies in China,