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Micro-, Mezzo- and Macro-level Factors Affecting Capital Structure: Evidence from China's Listed Construction Companies

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Abstract
Purpose: The purpose of this study is to analyze the micro-, mezzo- and macro- factors affecting the capital structure of China's listed construction companies.
Design/methodology/approach: This study employs a database containing the data of 72 Chinese-listed construction companies from 2009-2018 to run regression by using ordinary least squares (OLS) analysis, while this study also analyzes the impact of macro-policies on the capital structure of construction companies with different sizes and ownerships by using difference-in-difference (DID) analysis.
Findings: This research finds a significant impact of size, growth, liquidity, industry development, and GDP growth rate on the capital structure of Chinese-listed construction companies. Moreover, there are significantly distinct effects of the credit squeeze and economic stimulus on the capital structure of construction companies with different sizes and ownership states.
Research limitations/implications: Future research can be undertaken by including different variables such as corporate governance mechanisms, executive backgrounds, inflation, and exchange rate.
Practical implications: The study and understanding of the micro- mezzo- and macro-level factors influencing the capital structure of China's listed construction companies can provide evidence for capital structure optimization of the construction companies and policies formulation of the Chinese government.
Originality/value: This study amplifies previous studies and provides new insight on the determinants of capital structure by selecting China's construction companies as research objects.

Keywords: Determinants of capital structure, micro-, mezzo- and macro-level influencing factors, construction enterprises, OLS regression analysis, difference-in-difference regression analysis.

1. Introduction

Capital structure is the composition of various financial resources that reflects the proportional relationship of a company's capital. Capital structure can usually be expressed as the debt-to-asset ratio. Capital structure can impact the value, financial health, and operational stability of a company. Therefore, investigating the factors affecting capital structure is important to a company.

In practice, companies in different countries have significantly different capital structures due to the divergences in macroeconomic conditions. Even in the same country, companies in one industry may also have significantly different capital structures from capital structures of companies in other industries due to differences in production and sales modes. And every company also has different capital structures even in the same industry due to dissimilar company characteristics. For these reasons, it is more practical to distinguish industry when analyzing the capital structure of a company. Therefore, this paper selects the companies in the construction industry as a research sample and studies the impact of macroeconomic, industrial, and firm-specific factors on capital structure of China's listed construction companies. The construction industry is an important driving force of China's economy, and its financial stability is important to the Chinese financial market. Therefore, it has great significance to study the factors influencing the capital structure of China's listed construction companies.

The construction companies with lengthy production periods usually demand more long-term loans compared with companies in other industries. The average debt ratio of listed construction companies in China (developing economy) reached 69.13 % in 2018 (S&P Capital IQ, 2020), higher than the average debt ratio of all other industries during the same period, but the average debt ratio of listed construction companies in the United States (developed economy-y) in 2018 was only 53.15% (S&P Capital IQ, 2020). We expect that in developed economies, the advanced financial and stock markets increased the financing flexibility of construction companies by providing them with more financing sources with lower financing costs, thereby reducing the economic dependence of construction companies on the banking system. However, the relatively backward financial and stock markets in China have forced construction companies to be more dependent on the banking system for financing. Whether the facts conform to our expectations? Is the capital structure of listed Chinese construction companies affected by macroeconomic conditions? The research results are provided in this research.

In addition to the impact of macroeconomic factors, capital structure may also be affected by firm characteristics. Also, taking the construction industry as an example. In 2018, the highest debt ratio among all Chinese listed construction companies was 98.32%, and the lowest debt ratio was less than 30% (S&P Capital IQ, 2020). How do the company characteristics affect the capital structure choice of Chinese listed construction listed companies? This research also investigate the impact of company features on the capital structure of Chinese listed construction companies.

The study is structured as follows: Chapter two is literature review; chapter three introduces research methodology; chapter four provides research results and discussion; chapter five is research conclusion.

2. Literature Review

The effect of firm characteristics and macroeconomic conditions have been mainly investigated among the existing studies on the factors influencing capital structure. And this study continues the related research and examines the impact of firm characteristics and macroeconomic conditions on the capital structure of Chinese listed construction companies. The reason for only using data of companies from the construction industry is numerous researches have demonstrated that corporate capital structure varies significantly across industries. Researchers have started concerning the differences in capital structures from the industry perspective since the research of Schwartz and Aronson in 1967, Schwartz and Aronson (1967) selected four industries to analyze the industrial characteristics of capital structure, the research results showed that during the 1920s-1960s, although the national economy and industrial structures had undergone tremendous changes, the capital structure's industrial characteristics of companies had remained significant. Scott (1972) found that every industry has its matching industry characteristics of corporate capital structure which is difficult to change. Scott and Martin (1975) used data from 1967 to 1972 to examine the industrial characteristics of capital structure of twelve industries (including aerospace, auto accessories, chemicals, drugs, glass products, machinery tools, mining, non-ferrous metals, oil, woodwork, retail stores, and steel-major), and the results proved that the corporate capital structure can be affected by industry category. Bowen et al. (1982) found industrial characteristics have 27.5% of the explanatory power for corporate capital structure in the United States. Ferri and Jones (1979) considered that the companies in the same industry have similar financing capacity and debt levels due to their similar requirements of raw material, labor force, and technology. Panigrahi (2013) studied the capital structure differences among 20 industries in India and found that there are systematic differences in capital structure between industries, and the differences are caused by the different funding requirements. Xie (2018) also found that the debt ratios are significantly different between different industries in China.

Fama and Jensen (1983) argued that company size is positively related to capital structure, because the cost of monitoring large companies by investors is smaller, which makes it easier for large companies to obtain loans compared with small companies. Heshmati (2001) examined the impact of company size, growth, profitability, age, product uniqueness, and non-debt tax shields on the capital structure of 2261 small and mid-size enterprise (SME) Swiss, the research found that company growth, profitability, size, and non-debt tax shields are negatively related with capital structure, however, company age showed a positive relation and product uniqueness showed no significant relation with capital structure. Özkan (2001) used similar independent variables to analyze their impact on capital structures of 390 United Kingdom companies and the results showed that capital structure decreases as the profitability and growth increases. Harjeet et al. (2008) found that the Chinese listed companies with larger size and higher growth have more long-term debt. Vo (2017) found that companies with better profitability and larger size tend to borrow more long-term debt and less short-term debt. Harris and Roark (2019) found that higher cash flow volatility can bring more debt. Yu and Sang (2019) stated that company size, growth, and capital structure are positively related.

Apart from considering the impact of company characteristics on capital structure, many researchers have investigated how macroeconomic conditions impact capital structure. Many researchers have analyzed the effect of macro-level factors on capital structure. The research results of Wald (1999), Rajan and Zingales (1995) showed that the level of corporate leverage varies significantly across countries. Booth et al. (2001) found that macroeconomic variables

(stock market value/GDP, liquid liabilities/GDP, real GDP growth rate, inflation rate, and Miller tax term) can explain the changes in capital structure in 17 countries. Graham and Harvey (2001) found that the CFOs (chief financial officers) of 1/3 of United States-based manufacturing firms took interest rate and inflation rate into account in their financing decisions. Alti (2006) confirmed that a company's amount of equity financing is related to the stock market condition, in hot issue markets, companies rather chose equity financing than debt financing thus have lower debt ratios. However, Harjeet et al. (2008) argued that the condition of the Chinese stock market does not affect the corporate debt level. Mokhova and Zinecker (2014) studied the companies in different European countries and demonstrated that macroeconomic policies can affect companies' financing behavior and mainly affect their behavior of debt finance. John and Relc (2015) found that macroeconomic uncertainty and the development of the financial sector have a significant impact on capital structure. Li et al. (2017) stated that the companies in high growth industries tend to borrow less debt.

3. Methods

3.1 Data

This study examines the micro-, mezzo- and macro-level factors influencing the capital structure of Chinese listed construction companies during 2009-2018. There were 98 Chinese construction companies listed in the stock market in 2018, however, we exclude the companies which do not have complete observation throughout 2009-2018 to solve the absent data problem. And the companies in the status of ST (Special Treatment --- the companies with three consecutive years of losses and in danger of delisting) and PT (Particular Treatment) are also excluded in this study. Therefore, 72 construction companies are chosen at length.

3.2 Modelling

(1) Baseline model

$$DCS_{i,t} = c + aMICRO_{i,t} + \beta MACRO_t + w_i + u_t + \varepsilon_{i,t} \quad (1)$$

$$DCS\_L_{i,t} = c + aMICRO_{i,t} + \beta MACRO_t + w_i + u_t + \varepsilon_{i,t} \quad (2)$$

$$DCS\_S_{i,t} = c + aMICRO_{i,t} + \beta MACRO_t + w_i + u_t + \varepsilon_{i,t} \quad (3)$$

$DCS_{i,t}$ represents the total debt ratio of company i in year t; $DCS\_L_{i,t}$ represents the long-term debt ratio of the company i in year t; $DCS\_S_{i,t}$ represents the short-term debt ratio of the company i in year t; a and β are the regression coefficients; $MICRO_{i,t}$ represents the micro-level variables (firm-specific characteristics) of the company i in year t; $MACRO_t$ represents the macro-level variables; w_i is the unobservable company effect, u_t is the unobservable time effect, and $\varepsilon_{i,t}$ is the random error term.

(2) Difference-in-differences model

This study uses DID (Difference-in-difference) to analyze the impact of macroeconomic policies on capital structure. The DID model is shown as follow：

$$DCS_{i,t} = c + aMICRO_{i,t} + \beta MACRO_t + \gamma(D_t \text{x} Group_i) + w_i + u_t + \varepsilon_{i,t} \quad (4)$$

$$DCS\_L_{i,t} = c + aMICRO_{i,t} + \beta MACRO_t + \gamma(D_t \text{x} Group_i) + w_i + u_t + \varepsilon_{i,t} \quad (5)$$

$$DCS\_S_{i,t}=c+aMICRO_{i,t}+\beta MACRO_t+\gamma(D_t \text{x} Group_i)+w_i+u_t+\varepsilon_{i,t} \quad (6)$$

DID model adds the DID variable D_t x $Group_i$ based on the model (1). D_t is the dummy variable for macroeconomic policy D at time t. $Group_i$ is the dummy variable of the company group --- treatment group and control group (the companies which are significantly affected by the policy are classified into treatment Group, and the companies which insignificantly affected by the policy are classified into control group). $Group_i$ equals 1 when company i is in the treatment group, and $Group_i$ equals 0 when company i is in the control group. γ is the dummy variable coefficient, η is the coefficient of DID variable.

3.3 Variable Calculation

This paper selects company size, growth, profitability, liquidity, non-debt tax shield, industry development, GDP growth rate, stock market development as independent variables and explores their influences on capital structure of China's listed construction companies. In addition, this paper also examines the effect of macroeconomic policies --- credit squeeze and economic stimulus on capital structure of China's listed construction companies. These factors are chosen as independent variables because they have been widely tested in a large number of existing studies (Gertle and Cilchrist, 1993; Özkan, 2001; Öztekin and Flennery, 2012; Öztekin, 2015; Zhou et al., 2016; Aderajew et al., 2018; Gungoraydinoglu and Öztekin, 2021). However, employing the China's listed construction companies as research object can help to profoundly understand the factors influencing capital structure of companies in a particular industry.

Table 1 Definition and Calculation of Variables

	Definition	Symble	Calculation
Dependent variable (Capital structure)	Debt ratio	DCS	Total debts / Total assets
	Long-term debt ratio	DCS_L	Long-term debt / Total assets
	Short-term debt ratio	DCS_S	Short-term debt / Total assets
Independent variable (Micro-level factors)	Size	LNS	ln(total assets)
	Growth	GROW	(Total assets for the current year - Total assets for the previous year) / Total assets for the previous year
	Profitablity	PROF	Net income / total assets
	Liquidity	CL	Current assets / Current Liabilities
	Non-debt tax shield	NDTS	Accumulated depreciation / Total assets
Independent variable (Mezzo-level factor)	Industry development	IND	ln(annually new contract value of the entire industry)
Independent variable (Macro-level factors)	GDP growth rate	GDPR	(GDP for the curretn year - GDP for the previous year) / GDP for the previous year
	Stock market development	STOCK	Stock market value / GDP
	Credit squeeze(D1)		In year 2010-2011=1, not in year 2010-2011=0.
	Economic stimulus(D2)		In year 2009-2015=1, not in year 2009-2015=0.
Dummy variable	Company size (Group 1)		(D1): Small cmpany=1, large company=0. (D2): Large company=1, small company=0.
	Company ownership(Group 2)		(D1): Private cmpany=1, state-owned company=0. (D2): State-owned company=1, private company=0.

4. Findings

4.1 Descriptive Statistics and Pairwise Correlation of Variables

This section provides descriptive statistics (in Table 2) and pairwise correlation (in Table 3) of all main variables in this study.

Table 2 Descriptive statistics of variables

Variable	Obs	Mean	Std.Dev	Min	Max
DCS	720	0.691	0.171	0.028	0.983
DCS_L	720	0.084	9.859	0.000	0.513
DCS_S	720	0.554	12.506	0.028	0.983
LNS	720	20.374	2.321	13.294	28.243
GROW	720	0.157	0.629	-1.133	13.239
PROF	720	0.029	0.093	-0.077	1.610
CL	720	1.591	1.892	0.091	37.020
NDTS	720	0.010	0.013	0.000	0.184
IND	720	16.678	15.558	15.958	17.122
GDPR	720	0.110	0.038	0.070	0.184
STOCK	720	0.582	0.129	0.403	0.775

It is necessary to check the collinearity between independent variables before the tests, and the collinear analysis of independent variables is shown in Table 3

Table 3 Matrix of correlations

	LNS	GROW	PROF	CL	NDTS	IND	GDPR	STOCK
LNS	1							
GROW	0.071*	1						
PROF	-0.090	-0.023	1					
CL	0.201**	-0.026	0.019	1				
NDTS	-0.094**	-0.182**	0.140***	-0.010*	1			
IND	0.184*	-0.004	-0.072	-0.020	-0.189**	1		
GDPR	-0.236	0.008	0.021*	0.014	0.090*	-0.430**	1	
STOCK	0.012	0.013	0.063*	0.041	-0.046	-0.001	-0.308**	1

According to Table 2, the correlation coefficients between independent variables are all less than 0.3, so the problem of multicollinearity is small.

4.2 Regression Results

(1) Normal Model

According to Hausman Test results, models (1) and (2) are both random effect models. The regression results are shown as follows:

Table 4 OLS regression results

		(1)		(2)		(3)
Variable	Exp. sign	DCS	Exp. sign	DCS_L	Exp. sign	DCS_S
LNS	+	0.082*	+	0.059**	+	0.027*
		(0.078)		(0.024)		(0.069)
GROW	+	0.058***	+	0.033***	+	0.090***

		(0.000)		(0.000)		(0.000)
PROF	+	0.360	+	0.253	+	0.208
		(0.023)		(0.014)		(0.021)
CL	-	-0.007*	-	-0.029	-	-0.014**
		(0.060)		(0.154)		(0.02)
NDTS	-	-0.048	-	-0.062	-	-0.051
		(0.439)		(0.317)		(0.423)
IND	+	0.072**	+	0.098**	+	0.069**
		(0.021)		(0.033)		(0.019)
GDPR	+	0.035**	+	0.024***	+	0.081***
		(0.011)		(0.000)		(0.000)
STOCK	-	-0.072*	+	0.120	-	-0.049*
		(0.89)		(0.310)		(0.060)
Constant	-	-8.546***	-	-8.793***	-	-8.727***
		(0.000)		(0.000)		(0.000)
Company effect		YES		YES		YES
Time effect		YES		YES		YES
Obs		720		720		720
R2		0.472		0.391		0.354

Table 4 shows that (1) company size is positively related to debt ratio, long-term debt ratio, and short-term debt ratio. Compared with small companies, larger companies should have easier access to resources of financing due to their greater assets, higher creditworthiness, and lower default risk, which thus enhances the debt level of large companies. (2) Companies with higher growth have more total debt, long-term debt, and short-term debt. This is probably because investors are more willing to lend money to high-growth companies, because high-growth companies can usually give higher investment returns. (3) The higher fluidity of capital bring a lower level of total debt and short-term debt to companies. Stronger liquidity usually means better solvency of a company, so the business risk and financial risk of a company with stronger liquidity are relatively low, and the company is, therefore, more likely to obtain funds from investors to increase its debt level. (4) Industry development has a positive effect on the overall debt level of China's listed construction companies. Construction companies many need to borrow large amounts of money to support their businesses to meet the market demand in a thriving market, the overall debt level thus shows a significant increase when the industry has a good development. (5) Companies usually have fewer financial constraints to acquire sufficient funds under a good macroeconomic condition, so the research result shows a positive correlation between the debt level of construction companies and the macroeconomic situation. (6) The effect of profitability, non-debt tax shield, and stock market development on company excessive debt is not significant.

(2) Difference-in-difference Model

Table 5 Difference-in-difference regression results

	(4)		(5)		(6)	
	DCS		DCS_L		DCS_S	
Variable	Ownership	Size	Ownership	Size	Ownership	Size

Credit squeeze	-0.033**	-0.019*	-0.043	-0.024**	-0.038*	-0.025*
	(0.048)	(0.075)	(0.331)	(0.020)	(0.089)	(0.093)
Economic stimulus	0.066	0.036	0.042	0.086	0.073	0.085
	(0.365)	(0.277)	(0.309)	(0.283)	(0.376)	(0.369)
Credit squeeze (private company)	-0.017		-0.009		-0.016**	
	(0.550)		(0.138)		(0.024)	
Economic stimulus (state-owned company)	0.064**		0.028**		0.079***	
	(0.022)		(0.013)		(0.000)	
Credit squeeze (small company)		-0.083		-0.098		0.072
		(0.363)		(0.563)		(0.600)
Economic stimulus (large company)		0.005*		0.043		0.016*
		(0.087)		(0.160)		(0.074)

Table 5 provides the difference-in-difference regression results which show that (1) credit squeeze has a significantly negative effect on the overall debt level of China's listed construction companies. (2) Economic stimulus has a significantly positive effect on the overall debt level of state-owned construction companies. The economic stimulus also has a significantly positive effect on the total debt ratio and the short-term debt ratio of large construction companies. (3) Credit squeeze has a significantly negative effect on short-term debt ratio of private construction companies.

5. Discussion and Conclusion

Most of the existing researches on determinants of capital structure did not distinguish the industry category between companies, because they assumed that the financing behaviors of all companies are similar, but the fact is that the financing characteristics of companies from different industries are very divergent, therefore, the capital structures and the factors affecting capital structure of companies in different industries vary greatly. Against this background, this research only examined the determinants of capital structure of China's listed construction companies intending to generate more applicable research results.

This research used both OLS and DID regression analysis to investigate the impact of micro-, mezzo- and macro factors affecting the capital structure of China's construction companies and found that company size, growth, industry development, and GDP growth rate have a positive effect on the capital structure of China's listed construction companies. The company liquidity showed a significantly negative effect on the capital structure of China's listed construction companies. However, profitability, non-debt tax shield, and stock market development showed no significant effect on the capital structure of China's listed construction companies. According to the results of difference-in-difference analysis, the economic stimulus has a significant positive impact on the capital structure of state-owned and large listed construction companies, because compared with private and small companies, state-owned and large companies have higher credit to obtain more financial resources when there is an economic

stimulus. The credit squeeze showed a significant negative impact on the short-term debt ratio of private companies.

The following suggestions are given to China's listed construction companies according to the research results: (1) The capital structure is not static but in a constantly dynamic change process, hence, construction companies should pay close attention to the changes in company characteristics, construction market development, and macroeconomic conditions which affecting capital structure to make proper company financial decisions with considering the change of these factors. (2) Chinese listed construction companies should also be attentive to the debt maturity structure and its possible impact on the company, poorly matched debt maturity structure may give rise to liquidity risk. (3) Due to the overall high debt of Chinese listed construction companies, the companies should rationally examine their funding needs, and broaden their financing channels. Firstly, Chinese listed construction companies should make reasonable development plans based on industrial development and macroeconomic conditions to avoid blindly expanding business and irrationally increasing the demand for funds. Secondly, Chinese listed construction companies should flexibly use bonds, trusts, and other financing tools to raise funds instead of heavily relying on debt, because the unitary source of financing will increase the risk of capital rupture, the capital rupture will further bring the risk of insolvency and bankruptcy.

Theoretical Implications

Although the theoretical results of factors affecting capital structure are quite well-supplied and mature, there are few studies devoted to the factors influencing the capital structure of construction companies and most of the existing studies have been conducted for all companies. However, every industry has its financial characteristics formed by the industrial characteristics, according to the previous studies, the debt maturity structure and capital structure of companies in every industry are significantly different. Therefore, it is necessary to distinguish a company's industry category when studying the capital structure and its factors influencing factors. This study has been conducted based on the previous research and examines the micro-, mezzo- and macro- factors that affect the debt maturity structure and capital structure of China's listed construction companies, this study it finds moderate support for the trade-off theory and provides new theoretical evidence for the field of capital structure research.

Practical and Social Implications

The capital structure has important effects on both the company and society. First, the capital structure can affect the capital cost and market value of a company; second, the capital structure can affect the governance structure of a company because the capital structure decides the contractual relationship between managers, shareholders, and debt holders; third, the capital structure can also affect the macroeconomic growth and stability because the financing behavior of a company can affect the capital market and the economy as a whole. That is, a rational capital structure can benefit a company and a society, and an irrational capital structure can harm a company and a society, hence, knowing the factors influencing capital structure can help a company and a society to increase management efficiency of the company and the society.

As a fast-growing economy, China has rapid urbanization which boosts the business of construction companies and makes construction companies play an increasingly important role in the national economy. To avoid internal and external financial risks and to achieve sustainable development of the company and the economy, China's construction companies

must have a rational capital structure. And the study on the capital structure of China's construction companies and the factors affecting their capital structure can help the companies to better optimize their capital structure in practice.

Limitations and Suggestions for Future Research

The factors that affect company capital structure are varied, however, this paper is unable to examine the factors comprehensively, and many factors such as corporate governance, executive background, inflation, business cycle, exchange rate, and other factors were not included in the analysis which may lead to bias in the results at some points. Therefore, future research on factors affecting the capital structure of construction companies can expand the selection range of factors. Moreover, with the continuous development of China's financial market, the innovation and emergence of new financial derivatives are bound to produce great changes to the financing methods of China's construction companies. Those changes brought by financial market development will need to be constantly tracked and studied, and their effects on the capital structure also need to be further examined.

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