A Bayesian Approach to Determinants of Capital Structure of Listed Construction Firms in Vietnam

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Abstract. This study aims to find out the factors affecting the capital structure of construction enterprises listed in Vietnam Stock Exchange in the period from 2014 to 2019. Using secondary data from 94 construction enterprises listed, including 472 observations with Bayesian regression technique to find out the factors affecting the overall debt ratio of enterprises. Regression results show that there are 6 important factors affecting capital structure which are enterprise size (SIZE), liquidity (LIQ), profitability (ROA), corporate income tax rate (TAX), age of the company (AGE) and growth opportunity (GROW). From there, business managers can refer to the research results to make decisions on capital structure, ensuring that it is consistent with the development goals of enterprises in the construction industry.

Keywords: Capital structure · construction business · Bayesian regression · Vietnam

1 Introduction

According to the 2011–2020 socio-economic development strategy report, the construction industry is an economic sector with an important strategic position and role in the construction and development of the country, always contributing over 5% GDP per year. According to statistics from the Research Institute for Infrastructure Development and Urban Planning, from mid-2018 until now, the growth rate of the construction and construction and infrastructure sectors has increased in 2018–2019, reaching 9.2–9.5%. In 2019, up to now, the construction market has followed a completely different trajectory, although the industry growth rate is only 7.02%. However, besides the achievements of Vietnam's construction industry, enterprises have also faced many difficulties. The bad effects of the economic crisis, the Covid-19 pandemic, fluctuations in interest rates and inflation as well as the State's management policies have directly affected the Construction industry. Therefore, studying the factors affecting the capital structure of construction enterprises is very necessary and will help enterprises maximize profits and limit financial risks. Therefore, the authors study the factors affecting the capital structure of construction companies listed on the Vietnamese stock market, which is an academic contribution to help enterprises in making capital management decisions.

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2 Literature Review

2.1 The Traditional Theory of Capital Structure

David Durand (1952) is the first work on capital structure of enterprises with assumptions such as: Enterprises operate in an environment with corporate income tax, Financial markets are imperfect, and Enterprises have potential risk of financial distress due to the use of debt. When a business starts to take out debt, debt often costs less than equity. However, when the business increases the ratio of debt to equity, the level of risk also increases, forcing the owners to increase the rate of return. Thus, reducing the business value. According to this theory, there exists an optimal capital structure that maximizes firm value and helps to minimize WACC.

The main problem with the traditional view is that there is no theoretical basis for how much the cost of equity should increase as a result of the debt-equity ratio or by how much the cost of debt should increase due to risk. Therefore, M&M Theory was born on the basis of providing evidence as well as adding to the shortcomings that this view lacks (Brigham and Houston 2009).

2.2 The Modern Theory of Capital Structure (M&M Theory)

Contrary to the traditional view, two authors Modigligani and Miller (1958) have proposed a theory of the relationship between capital and firm value. To find out if the value of capital increases or decreases as the business increases or decreases borrowing. The theory is made with the following assumptions: No taxes (corporate income tax and personal income tax), No costs: transactions, financial distress and bankruptcy, all investors both individual and corporate investments have the same interest rates, and Capital Markets are perfect markets. M&M theory is stated into two important propositions: Statement (I)-Value of the enterprise and Proposition (II)-Cost of capital. The two propositions are considered in two cases, respectively: with tax and without tax.

2.3 Trade-off Theory of Capital Structure

Based on the M&M theory, the trade-off theory considers the impact of taxes and the cost of financial distress. Initiated by Kraus and Litzenberger (1973) and developed by Myers (1977) the firm should only use a certain amount of debt to maximize firm value, in contrast to the value M&M theory. The higher the company, the more it is used. The trade-off theory has shown that the target capital structure is the point at which the benefits from the tax shield can offset the costs of financial distress. However, when the debt ratio rises to a certain level, the cost of financial distress will outweigh the benefit of the tax shield from interest. From there, the company value will decrease and increase the probability of bankruptcy.

$$\text{Value of the debt firm} = \text{The value of the unlevered firm} + \text{Present value of the tax shield} - \text{Present value of the cost of financial distress}$$

Factors affecting capital structure from a structural trade-off point of view include: corporate income tax, financial distress costs, tangible fixed assets, company size and profitability.

The trade-off theory has explained the dead side of the M&M theory about the cost of financial distress of debt-ridden firms. However, there are also many things that the trade-off theory cannot explain, such as why some businesses are still successful, good business results when borrowing very little debt; or in fact, when the company's stock price is high and the firm is in need of external financing, the company is more likely to issue shares (rather than take out debt).

2.4 Pecking Order Theory

Besides the above theories, the pecking order theory developed by Stewart Myers and Nicolas Majluf (1984) goes in another direction when it says that there is no optimal capital structure, but only an order when using investments. The study divides funding sources into: internal capital (contributed capital and retained earnings) and external capital (borrowed capital and new share issuance).

According to Myers and Majluf, based on the information asymmetry between financial managers and outside investors. Managers will have more information than investors, so investors will often demand higher discounts, making the cost of raising outside capital will be higher. This leads to the formation of a funding priority order.

Although the pecking order theory explains some aspects that affect the decision to choose financing sources of enterprises, this theory still has many limitations when it does not explain the impact of taxes, bankruptcy cost, the cost of issuing securities to the enterprise's debt.

2.5 The Market Timing Theory

According to market timing theory, capital structure is the cumulative result of past efforts to time the stock market. That is, there is no optimal capital structure according to the Trade Off Theory. Research by Baker and Wurgler (2002) shows a new perspective on the problem of capital structure, when it is said that the value of enterprises depends on two factors: stock price and time to enter the market.

Thus, there are many theories of capital structure that have been presented and applied. This study focuses on applying two theories of capital structure, namely the trade-off theory of capital structure and the pecking order theory.

2.6 Comprehensive Study

Bhaduri (2002) argued that non-debt tax shields are good substitutes for tax benefits from debt, so firms with large non-debt tax shield benefits will borrow less. The study also suggests that large-scale enterprises will tend to diversify their mobilized capital sources, so they are less prone to financial crises, in other words, there is a positive relationship of enterprise size to capital structure.

Chen (2004) carried out on 77 large companies whose shares are listed on the Shanghai Stock Exchange, China. The author has based on the trade-off theory and pecking order theory to determine the factors affecting the capital structure of listed companies, including: profitability, growth ability, tangible fixed assets, financial distress costs and tax shields on the capital structure of firms. Chen's research results show that profitability and firm size have a negative impact on capital structure, while growth rate and tangible fixed assets have a positive impact on debt ratio. At the same time, according to Chen, pecking order theory explains the research results better than trade-off theory.

Wanrapee Banchuenvijit (2009) carried out on 81 companies listed on the Stock Exchange of Thailand from 2004 to 2008. With 5 factors included in the model, including profitability, firm size, the ratio of tangible fixed assets, the growth rate of assets, the volatility of operating profit. The results show that there are three factors that are statistically significant at the 1% level, namely: profitability, fixed assets have a negative relationship with the debt ratio, and firm size is positively related. in the same direction as the debt ratio.

Tran Dinh Khoi Nguyen and Ramachandran (2006) carried out, to test the factors that play an important role in the capital structure decision of 558 small and medium enterprises in the period 1998–2001. The results show that the variables of enterprise size, business risk, relationship with banks and growth rate of revenue are positively correlated with capital structure of enterprises. In contrast, profitability and asset structure have a negative effect on the debt to total assets ratio of the firm.

Dang Thi Quynh Anh and Quach Thi Hai Yen (2014) examined the impact of 10 factors affecting the capital structure of enterprises listed on the Ho Chi Minh Stock Exchange in the period 2010–2013. The research results show that the three factors that have the strongest influence on the capital structure of enterprises are the profitability ratio, the size of the enterprise and the corporate income tax rate. Profitability and tax rates have a negative impact on the financial leverage of enterprises, while the size of enterprises has a positive effect.

Nguyen Thi Nhu Quynh, Le Dinh Luan, Le Hoang Vinh (2020) analyze the factors affecting the capital structure of 148 non-financial enterprises listed on HOSE through short-term financial leverage and ratio long-term financial leverage in the period from 2011–2018. Research has shown some interesting points, in the short term, the leverage ratio is affected by the factors of profit size, asset structure and corporate liquidity. In the long run, leverage is influenced by size, profitability, asset structure, growth opportunities, and liquidity. Taxes do not affect capital structure.

It is noteworthy that the aforementioned research used frequency approaches or descriptive analyses with suitably large sample sizes to analyze capital structure in sample enterprises. Based on a dataset of 94 construction companies listed on the Vietnam Stock Exchange between 2014 and 2019, this study used Bayesian logistic regression with informative priors. The research has made the following contributions, as expected: (i) Business managers can use the research findings to inform their capital structure decisions, ensuring that they align with the objectives of businesses in the construction sector for growth; (ii) By using Bayesian MCMC simulations in informative (thoughtful) prior settings, our findings enable a generalized conclusion that, in contrast to frequentist approaches, Bayesian estimation using thoughtful priors can provide meaningful results.

3 Model and Data

3.1 General Model

$$Y_{it} = \beta_0 + \sum \beta_i X_{it} + u_{it}$$

In which: i: the i-th cross unit and t is the t-th time; Y_{it} is the dependent variable; X_{it} is the independent variable; α: coefficient of freedom, β: coefficient of regression, u_{it}: residual.

Based on empirical studies in the world and in Vietnam, the authors find that the number of variables as well as the way to measure the variable and the resulting direction of the impact of the variables (factors) on capital structure is varied across studies. However, these studies all selected a number of factors affecting the capital structure of enterprises such as firm size, asset structure, liquidity, profitability ratio, tax growth opportunities and business age. These variables all have the ability to collect data and all have economic significance, are correlated and explain the research problem. Therefore, the author has built a research model and introduced variables that affect the capital structure of listed construction companies in Vietnam on the basis of selecting the impact variable of previous empirical studies. The research model of the topic is as follows:

$$\mathbf{TLEV_{it}} = \mathbf{a} + \mathbf{b}_1\mathbf{SIZE}_{it} + \mathbf{b}_2\mathbf{TANG_{it}} + \mathbf{b}_3\mathbf{LIQ_{it}} + \mathbf{b}_4\mathbf{ROA_{it}} + \mathbf{b}_5\mathbf{GROW_{it}} + \mathbf{b}_6\mathbf{TAX_{it}} + \mathbf{b}_7\mathbf{AGE_{it}} + \mathbf{u_{it}}$$

In which:

$TLEV_{it}$: overall debt ratio of enterprise i at year t (Total debt to total assets)
$SIZE_{it}$: Size of enterprise i at year t (Natural Logarithm of Total Assets)
$TANG_{it}$: Asset structure of enterprise i at year t (The ratio of tangible fixed assets to total assets)
LIQ_{it}: Liquidity of enterprise i at year t (Ratio of current assets to current liabilities)
ROA_{it}: Profitability of enterprise i in year t (Rate of profit after tax to total assets)
$GROW_{it}$: Growth rate of enterprise i in year t (Difference of total revenue at the end of the period and total revenue at the beginning of the period over total revenue at the beginning of the period)
TAX_{it}: Actual tax rate of enterprise i in year t (Corporate income tax rate on pre $-$ tax profit of that enterprise)
AGE_{it}: Age of enterprise i at year t (Logarithm of year of study minus year of establishment)

3.2 Variables and Hypotheses

Dependent Variable (TLEV)
In this study, capital structure is determined by the total debt ratio (TLEV).

$$\text{TLEV} = (\text{Total Liabilities})/(\text{Total Assets})$$

Independent Variables
Within the scope of the study, the independent variables of the model only focus on

the factors from the internal resources of the enterprise affecting the employees, not considering the macro factors.

Enterprise Size (SIZE): Enterprise size is measured by the value of total assets of the enterprise. However, because the value of total assets is large, the topic converts the natural logarithm of total assets to reduce the value difference between the variables.

$$\text{SIZE} = \text{Log}(\text{Total Assets})$$

As stated in the theoretical basis, the size of the firm to the shareholder can be a positive relationship (according to the trade-off theory) or a negative relationship with the debt coefficient (according to the pecking order theory). But most recent studies such as Dang Thi Quynh Anh and Quach Thi Hai Yen (2014) show a positive relationship between enterprise size and debt ratio. ***The first hypothesis (H_1): Firm size has a positive relationship with debt ratio.***

Structure of Tangible Assets (TANG): Tangible fixed asset is a variable reflecting the structure of assets of a construction enterprise, measured by the ratio between tangible fixed assets and total assets of the enterprise.

$$\text{TANG} = (\text{Tangible fixed assets})/(\text{Total assets})$$

Tangible fixed assets characterize the willingness of enterprises to mortgage before loans. Collateral is a good, important condition for creditors to consider credit decisions. According to the trade-off theory and the results of studies by Chen (2004), Nguyen Thi Nhu Quynh et al. (2020), the ratio of tangible fixed assets (TANG) has a positive relationship with the financial leverage of enterprises. In this study, the author also predicts that tangible fixed assets have a positive relationship with the debt ratio of enterprises. ***The second hypothesis (H_2): The structure of tangible fixed assets has a positive relationship with the debt ratio.***

Liquidity Variable (LIQ): The liquidity of assets of construction enterprises is measured by the ratio between short-term assets and short-term liabilities of enterprises.

$$\text{LIQ} = (\text{Current Assets})/(\text{Current Liabilities})$$

According to pecking order theory, the liquidity of enterprises is negatively related to the debt ratio. Because businesses have abundant liquidity, they can use these assets to finance their investments as retained earnings, without the need to raise external capital. ***The third hypothesis (H_3): Liquidity has a negative relationship with debt ratio.***

Return on Assets (ROA): The return on assets (ROA) ratio measures a company's ability to earn per dollar of assets. According to Nguyen Minh Kieu (2009), the formula for determining this ratio is by dividing net profit after tax by total asset value.

$$\text{ROA} = (\text{Profit after tax})/(\text{Total assets})$$

Profitability has both a positive effect (according to the trade-off theory) and a negative effect (according to the pecking order theory) on the use of debt of enterprises. According to most recent empirical studies, profitability and coefficient have an inverse relationship such as Wanrapee Banchuenvijit (2009), Tran Dinh Khoi Nguyen and Ramachandran (2006), Dang Thi Quynh Anh and Quach Thi Hai Yen (2014). The author also predicts that ROA has a negative relationship with the debt ratio of enterprises. ***The fourth hypothesis (H_4): Profitability has a negative relationship with debt ratio.***

Growth Rate Variable (GROW): The Growth Rate Variable (GROW) is used to measure the effect of annual revenue growth on firm value. The value of the variable is determined:

$$\text{GROW} = (\text{Revenue}_{\text{n}}\text{Revenue}_{(\text{n}-1)})/\left(\text{Revenue}_{(\text{n}-1)}\right)$$

Revenue growth is one of the top concerns of corporate managers, according to previous empirical studies, which have shown a positive relationship between growth rate and debt ratio like Chen (2004), Nguyen Thi Nhu Quynh, Le Dinh Luan and Le Hoang Vinh (2020). ***The fifth hypothesis (H_5): Growth rate has a positive relationship with the debt ratio.***

Corporate Income Tax Rate (TAX): The corporate income tax rate is measured by the ratio between the payable corporate income tax on the pre-tax profit of the enterprise.

$$\text{TAX} = (\text{Corporate income tax payable})/(\text{Profit before tax})$$

According to M&M theory, and trade-off theory, there is a positive relationship between tax and debt ratio as studied by Chen (2004). However, in recent years, studies have shown that there is an inverse relationship between corporate income tax rates and the use of debt by enterprises such as Dang Thi Quynh Anh and Quach Thi Hai Yen (2014), Le Quynh Anh and Quach Thi Hai Yen (2014), Thi Minh Nguyen (2016). Therefore, the author expects in this study the relationship between corporate income tax rate and debt ratio is negative. ***The sixth hypothesis (H_6): The corporate income tax rate has a negative relationship with the debt coefficient.***

Enterprise Age Variable (AGE): The age of the company is determined by logarithm of the number of years from inception to the year of the study data collection. And the author predicts that in this study, the age of enterprises has a positive effect on the debt coefficient.

$$\text{AGE} = \text{Log}(\text{Year of Research}--\text{Year of Establishment})$$

The Seventh Hypothesis (H_7): Firm Age Has a Positive Relationship with Debt Coefficient (Table 1).

3.3 Data

Table 1. Description of the model's variables, measurement methods and hypotheses

Variable	Description	Measurement	Hypotheses
Dependent variable			
TLEV	The total debt ratio	Total Liabilities/Total Assets	
Independent variables			
SIZE	Enterprise Size	Log(Total Assets)	H_1: +
TANG	Structure of tangible assets	Tangible fixed assets/Total assets	H_2: +
LIQ	Liquidity	Current Assets/Current Liabilities	H_3: –
ROA	Return on Assets	Profit after tax/Total assets	H_4: –
GROW	Growth Rate	(Next year's revenue – Previous year's revenue)/Previous year's revenue	H_5: –
TAX	Corporate income tax rate	(Corporate income tax payable)/(Profit before tax)	H_6: –
AGE	Enterprise age	Log (Year of Research – Year of Establishment)	H_7:+

Source: Compiled by the author

3.4 Model Estimation Method

To evaluate the impact of foreign ownership on liquidity risk, the authors will make model estimation according to Bayesian approach. To conduct a Bayesian analysis, a priori information is required for the research model, but since most of the prior research was performed using a frequency approach, a priori information is not available. However, the research data of 472 observations is quite large, so the a priori information does not have a great influence on the posterior distribution. In this case, Block et al. (2011) proposed a standard Gaussian distribution with different a priori information (simulation of a priori information) and carried out Bayesian factor analysis to choose a simulation with the best priori news.

The simulations in Table 2 show decreasing levels of a priori information with Simulation 1 having the strongest a priori information and Simulation 5 having the weakest a priori information.

Table 2. Simulation of a priori information

Rational function	TLEV $\sim N(\mu, \sigma)$
A priori distribution	
Simulation 1	$\alpha \sim N(0, 1)$ $\sigma^2 \sim Invgamma(0.01, 0.01)$
Simulation 2	$\alpha \sim N(0, 10)$ $\sigma^2 \sim Invgamma(0.01, 0.01)$
Simulation 3	$\alpha \sim N(0, 100)$ $\sigma^2 \sim Invgamma(0.01, 0.01)$
Simulation 4	$\alpha \sim N(0, 1000)$ $\sigma^2 \sim Invgamma(0.01, 0.01)$
Simulation 5	$\alpha \sim N(0, 10000)$ $\sigma^2 \sim Invgamma(0.01, 0.01)$

Source: Compiled by the author

In the next step, the research team carried out Bayesian regression for the above simulations, then performed Bayesian factor analysis (Bayes Factors) and Bayes test model (bayestest model). These are the techniques proposed by StataCorp LLC (2019) to select the simulation with the best a priori information. Basically, the Bayesian factor will provide a tool to compare the probability of a particular hypothesis (a priori information) to the probability of another hypothesis. It can be understood as a measure of the strength of evidence in favor of a theory among competing (information a priori) theories. Accordingly, Bayesian analysis will provide average Log BF (Bayes Factor), Log ML (Marginal Likelihood) and average DIC (Deviance Information Criterion-information bias); The posterior Bayesian test will help compare the posterior probability of the simulations with different a priori information, accordingly, based on the research data combined with the proposed a priori information, we will choose the simulation has the greatest posterior probability P(M|y).

In summary, in this study, the research team will build 5 simulations with 5 different a priori information, and Bayesian factor analysis and posterior Bayesian test will help to choose a simulation with suitable a priori information. The simulation selected will be the one with the largest Log BF, Log ML average, minimum DIC mean and the largest P(M|y).

4 Research Results and Discussion

4.1 Results

Table 3. Bayes Factor analysis results

	Chains	Avg. DIC	Avg. log (ML)	Log (BF)	P (Mly)
Simulation 1	3	−597.617	265.344		0.9997
Simulation 2	3	−597.643	257.062	−8.282	0.0003
Simulation 3	3	−597.709	247.965	−17.379	0.0000
Simulation 4	3	−597.643	238.796	−26.548	0.0000
Simulation 5	3	−597.595	229.604	−35.740	0.0000

Source: Calculations of the author

Table 3 shows that simulation 1 meets the criteria to be the most suitable a priori information simulation. Moreover, the results of post-test also show that simulation 1 has superiority over other simulations, so simulation 1 with a priori information N(0,1) will be selected.

Bayesian analysis is simulated through the Markov chain Monte Carlo (MCMC), therefore, to ensure the stability of the Bayesian regression, the MCMC series must converge, which means that the MCMC series must ensure stationarity StataCorp LLC (2019) proposes that the MCMC series convergence test can be conducted through the convergence diagnostic graph.

According to StataCorp LLC (2019), the MCMC series convergence diagnostic graph includes trace plot, histogram, autocorrelation, and density estimation. The trace plot helps to track the historical display of a parameter value over the iterations of the series, Fig. 1 shows the trace plot fluctuates around the mean value, so the MCMC series is stationary, that is, reaching convergence conditions. Besides, the autocorrelation chart in the graphs only fluctuates around the level below 0.02, according to StataCorp LLC (2019) the autocorrelation chart fluctuates around the level below 0.02, showing the agreement with the density simulate the distribution and reflect all delays that are within the effective limit. According to StataCorp LLC (2019), the posterior distribution plot and density estimate show that the simulation of the shape of the normal distribution of the parameters, the histogram shape is uniform, it can be concluded that Bayesian regression ensure stability. Thus, the results from Fig. 1 show that the MCMC series meets the convergence condition.

In addition to graphical convergence diagnostics, StataCorp LLC (2019) also recommends testing through Mean Acceptance Rate; Average minimum efficiency; and Gelman-Rubin Rc max. Table 4 shows that the model's acceptance rate reaches 1, the model's minimum efficiency is 0.99, far exceeding the allowable level of 0.01. In addition, the maximum Rc value of the coefficients is 1, Gelman and Rubin (1992) argue that the diagnostic value Rc of any coefficient of the model greater than 1.2 will be

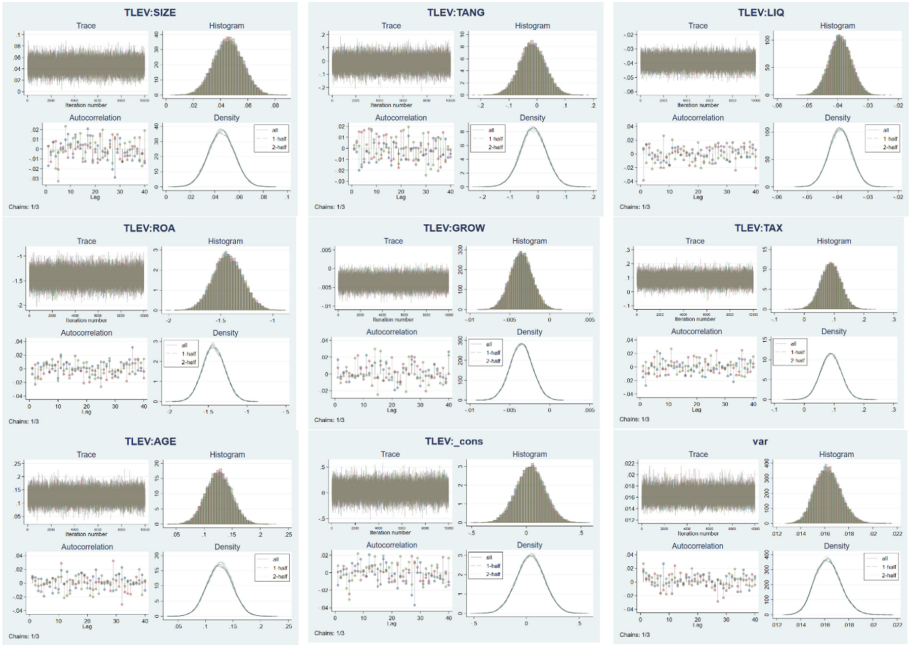

Fig. 1. Convergence diagnostic graph Source: Calculations of the author

Table 4. Regression results

	Mean	Std. Dev.	MCSE	Median	Equal−tailed [95% Cred. Interval]	
SIZE	0.046	0.011	0.000	0.046	0.024	0.067
TANG	−0.017	0.047	0.000	−0.017	−0.108	0.073
LIQ	−0.039	0.004	0.000	−0.039	−0.047	−0.032
ROA	−1.432	0.142	0.001	−1.432	−1.712	−1.153
GROW	−0.004	0.001	0.000	−0.004	−0.006	−0.001
TAX	0.089	0.034	0.000	0.089	0.022	0.155
AGE	0.126	0.023	0.000	0.126	0.081	0.171
_cons	0.039	0.132	0.001	0.037	−0.218	0.300
var	0.016	0.001	0.000	0.016	0.014	0.019
Avg acceptance rate	1					
Avg efficiency min	0.9919					
Max Gelman−Rubin Rc	1					

Source: Calculations of the author

considered non-convergent. Thus, the values in Table 4 show that the MCMC series of the model satisfy the convergence requirements.

The regression results in the Table 4 have determined that the variables SIZE, TAX, AGE have a positive impact on the capital structure of construction firms while the variables TANG, LIQ, ROA, GROW have a negative impact on the capital structure of the construction industry. Besides determining the sign of the regression coefficients, unlike the frequency method, the Bayesian approach also allows us to calculate the probability of the occurrence of these effects (Table 5).

Table 5. Probabilistic test

	Mean	Std. Dev.	MCSE
{TLEV:SIZE} >0	1.000	0.000	0.000
{TLEV:TANG} <0	0.640	0.480	0.003
{TLEV:LIQ} <0	1.000	0.000	0.000
{TLEV:ROA} <0	1.000	0.000	0.000
{TLEV:GROW} <0	0.995	0.072	0.000
{TLEV:TAX} >0	0.996	0.065	0.000
{TLEV:AGE} >0	1.000	0.000	0.000

Source: Calculations of the author

5 Discussion

Enterprise Size: The positive effect of firm size on debt ratio, consistent with the capital structure trade-off theory and in accordance with the hypothesis H_1 posed. The larger the business size, the stronger the financial potential, the lower the bankruptcy risk. In addition, large-scale enterprises have a better reputation in the debt market, gain trust from creditors, so they can easily access loans and reduce transaction costs when issuing long-term debt. Huang and Song (2001), Bhaduri (2002), Wanrapee Banchuenvijit (2009), Tran Dinh Nguyen Khoi and Ramachandran (2006), Harc (2015), Dang Thi Quynh Anh and Quach Thi Hai Yen (2014) gave the results similar to the research.

Structure of Tangible Fixed Assets: The results show that the level of impact of TANG is not really clear when its impact probability is only 64%, this is not true with the author's initial expectation, but to explain this, the construction industry in Vietnam is a project-based business, so it doesn't need a lot of fixed assets as collateral. It can be seen that in the capital structure of construction enterprises, mainly short-term loans, because the project-based business only borrows and calls for short-term investment capital, it does not need many fixed assets.

Liquidity: Liquidity has a negative relationship with the overall debt ratio of enterprises. This result is completely consistent with the original hypothesis and the point of view

of pecking order theory about shareholders, that enterprises with good liquidity will be more likely to convert short-term assets into cash to finance arising capital needs rather than borrowing from outside. Some studies by Le Thi Minh Nguyen (2016), Nguyen Thi Thuy Hanh (2018) also have results on the negative correlation between liquidity and corporate shareholders.

Profitability: ROA has the opposite and statistically significant effect on capital structure, high-profit enterprises in the construction industry listed in Vietnam use a lot of equity and little debt. Therefore, a firm with high profits will avoid taking on a lot of debt, this result is consistent with pecking order theory. That once again confirms, businesses with high profitability tend to finance with internal capital rather than external capital. Similar results are shown in studies Huang and Song (2001), Chen (2004), Wanrapee Banchuenvijit (2009), Tran Dinh Khoi Nguyen and Ramachandran (2006), Dang Thi Quynh Anh and Quach Thi Hai Yen (2014), Nguyen Thi Nhu Quynh, Le Dinh Luan and Le Hoang Vinh (2020).

Growth Opportunity: Growth opportunities have a negative impact on the capital structure of construction enterprises, although not in line with the author's expectations, it can be explained that construction enterprises with growth opportunities tend to use less debt to operate. It is also reasonable that when construction enterprises mainly use short-term loans, so there is great pressure on debt repayment, so when there is a good growth rate, construction enterprises will limit the use of loans, reduce financial costs for businesses. Research results agree with the opinion of Huang and Song (2001).

Corporate Income Tax Rate: The value of corporate tax rate measured by corporate income tax on EBT has a positive correlation with capital structure, although it is not consistent with the author's initial expectation, but it is consistent with the business situation of the company. Construction enterprises use a lot of debt. It also means that the higher the corporate tax rate, the higher the financial leverage of the business and vice versa. In addition, interest has created a "tax shield" for businesses, thereby creating higher business efficiency than using only equity. This assertion is also consistent with the results of Chen (2004).

Age of Business: The age of enterprises has a positive correlation with the capital structure of enterprises with a long history of operation in the market, the position of the enterprise has also been confirmed, the higher the prestige, the ability to borrow capital from the higher the regulations. Similar results were shown in the study of Mutalib (2011).

6 Conclusion and Policy Implications

The ultimate goal of corporate financial management is to maximize the value of the business, thereby maximizing the value for the owners of the business, this is done through minimizing the average cost of capital (WACC), including the cost of equity and the cost of debt. The research topic has identified the factors affecting the use of debt of construction enterprises, from which the managers can increase or decrease the level of debt use through affecting the factors of the model. In the current context of Vietnam's financial market, the authors propose some recommendations as follows:

Adjust the Size of the Business Appropriately: Enterprise size can bring positive effects, but at the same time, it can also become a burden of bankruptcy risk if enterprises do not have reasonable adjustment solutions. Enterprises should expand when there are many investment projects and vice versa, businesses with low debt ratio can scale synchronously to access more and more loan sources. However, when the debt ratio of enterprises increases, surpasses the alarming threshold in the context of the economy showing signs of decline or enterprises are facing difficulties, business managers should have solutions to adjust the size of the enterprise in order to adjust the target capital structure of the enterprise, avoiding the risk of bankruptcy.

Improve Corporate Financial Management Capacity: Construction enterprises are at the end of the growth period and entering the restructuring phase in the years 2014–2019, so financial management and maximizing corporate value of the company are very important. Therefore, leaders must really be aware of the role of financial management, as well as in-depth knowledge of the field of financial management to consider options for mobilizing and using funding for projects. Projects in an appropriate and effective manner and to limit financial risks. To do this, businesses need to specialize by separating the financial and accounting functions; at the same time consider using financial hedging tools such as financial derivatives.

Improve the Efficiency of Production and Business Activities: The profitability factor (ROA) has a negative impact on the target capital structure of the enterprise. Increased profitability will reduce the debt ratio of businesses. When businesses have abundant internal capital and have increasing profits, businesses will have the necessary financial autonomy. To achieve the above goals, businesses need to improve business efficiency and develop specific financial plans to avoid wasting capital as well as better manage and control production costs.

Increase Equity Capital and Exploit more Capital Mobilization Channels: The solution to increase equity capital will help improve the financial autonomy of businesses, which will help these businesses overcome difficult times when banks reduce lending limits, increase interest rates. Construction enterprises can increase their equity capital by ways such as increasing retained earnings, concentrating on collecting outstanding debts from projects, expanding scale, calling for more members as well as shareholders contribute capital, this will help the business have a huge amount of additional capital.

Increase Transparency of Information: One of the barriers that reduces the ability of enterprises to access loans is the problem of information disparity. This also directly affects the ability to win contracts of construction enterprises in particular and the access to investment projects of enterprises in general. Therefore, agencies and sectors need to continue to develop and improve regulations on publicity and transparency of information systems on both supply and demand of the market, in order to reduce the harmful effects of asymmetric information. The authorities also need to strengthen the collection and disclosure of information, and at the same time should build a national information infrastructure to help banks quantify the capacity and risks of businesses to adopt appropriate policies.

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