Does Debt Affect Profitability of Construction Companies in Vietnam? A Bayesian Approach

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Abstract. This study aims to find out the effects of debt on profitability of construction companies listed on the Stock Exchange in Vietnam in the period from 2010 to 2020. Using secondary data from 72 enterprises listing construction, including 792 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 the profitability ratio, namely short-term debt to total assets (SDA), long-term debt to total assets (LDA), liquidity (LQ), annual revenue growth (GROWTH), firm size (SIZE), inflation rate (INF). From there, business managers can refer to the research results to make decisions in the course of business operations, ensuring compliance with the development goals of enterprises in the construction industry.

Keywords: Capital structure · construction firms · Bayesian regression

1 Introduction

The construction industry is one of the key economic sectors of Vietnam. In the past 15 years, foreign companies have not stopped pouring investment capital into Vietnam. Typically, in 2018, FDI capital increased by 9.1% compared to 2017 (according to data from the Foreign Investment Department - Ministry of Planning and Investment). High-rise buildings such as Bitexco Financial Tower, Keangnam Landmark Tower, Vincom Landmark 81 are growing up more and more. Accordingly, Vietnam's construction industry has also made great progress. However, the stronger the commercialization and integration process, the more challenges construction businesses face such as capital management, competitors, decline of building materials, etc. leading to suboptimal business performance.

The main reason affecting the business performance of construction enterprises is that the debt capital is often very large, especially in the construction industry, which occupies capital for a long period of time. Therefore, determining the influence of debt in order to use debt effectively will help Vietnamese construction enterprises achieve high profit margins.

Determining the capital structure of Vietnamese construction enterprises is the main goal of this study. In particular, we define the optimum level of debt utilized to finance the

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operations of construction enterprises in growing countries like Vietnam. We anticipate that the results of this study will help financial managers in the future make the best decisions about capital structure policies.

2 Literature Review

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

Capital Structure Has no Effect on Firm Value (M&M 1958)
In 1958, Modilligani and Miller (M&M) investigated whether the cost of capital increased or decreased as a firm increased or decreased its external debt. M&M made several assumptions about perfect capital markets: No transaction costs; all investors can borrow or lend at the same interest rate; no bankruptcy costs and financial distress costs; assuming the risk class is homogeneous, i.e. businesses operating under similar conditions will have the same level of business risk; no income tax.

If capital markets are perfect, M&M assumes that businesses that do the same business and expect the same annual returns should have the same value, regardless of capital structure because the value of the business must depend on its activities rather than depending on the form of funding. From this it can be concluded that all firms with the same expected returns and the same value should have the same average cost of capital at all levels of debt and equity ratios.

Although the assumptions of perfect capital markets are unrealistic, there are two assumptions that need to be emphasized because these assumptions have an impact on the results of M&M's research:

- No taxation: This is an important issue and one of the key advantages of debt is the effect of tax shields;
- M&M's theoretical risk is calculated entirely by the volatility of cash flows. M&M ignores the possibility that cash flows may stop because of default. This is a significant problem compared to other theories if debt is high.

These assumptions bring only one advantage (debt is cheaper and less risky for investors) and one disadvantage of borrowing money (cost of equity increases with debt ratio because of debt ratio to total capital).

Thus, according to the point of view of M&M (1958), in a perfect market, the value of an unlevered firm is also equal to the value of a debt enterprise, or in other words, the value of a firm is independent of its capital structure.

Capital Structure Affects the Value of the Firm (Modilligani and Miller 1963)
In 1963, M&M launched a follow-up study with the elimination of the corporate income tax hypothesis. According to M&M, with corporate income tax, the use of debt will increase the value of the business. Since interest expense is a reasonable expense that is deductible when calculating income tax, a portion of the income of a debt-using business is passed on to investors, resulting in the value of the debt-using business equal to value of the non-debt firm plus the gain from the use of debt.

Thus, according to the M&M tax model (1963), capital structure is related to the value of the firm. The higher the use of debt, the higher the value of the business increases and increases until the business is financed with 100% debt.

2.2 Pecking Order Theory

The pecking order theory originates from the research of Donaldson (1961). This study provides evidence that many executives prefer to use internal financing and only consider external financing (debt and issue of new shares) in cases where the capital needs are inevitable increase. This theory was further investigated by Myers and Majluf (1984). They argue that corporate financing decisions are based on asymmetric information. Asymmetric information is a phrase that indicates that CFOs know their company's value better than outside investors. Asymmetric information affects the choice between internal and external funding; between new issuance of debt securities and equity securities.

2.3 Trade – off Theory

The trade-off theory of capital structure is based on M&M theory, which considers the costs of financial distress and the effects of taxes. According to research by Kraus and Litzenberger (1973) and Myers (1977), in contrast to M&M theory, the value of a firm should only accept a specific level of debt to maximize firm value. According to the trade-off hypothesis, the target capital structure is the extent to which the benefits of the tax shield can offset the costs of financial distress. However, the cost of financial distress will outweigh the benefit of the interest tax shield when the debt ratio reaches a specific point. The value of the company will then decrease, increasing the possibility of bankruptcy.

From a capital structure trade-off point of view, the following factors have an impact on capital structure: corporate income tax, costs associated with financial distress, tangible fixed assets, firm size and profitability.

The last part of the M&M theory on the financial crisis costs of financially distressed firms has been addressed by the trade-off theory. However, there are also many things that trade-off theory cannot explain, such as why some businesses continue to succeed, good business results with very little debt, or the fact that a company has more likely to issue shares when stock prices are high and the company needs external funding (instead of debt).

2.4 Comprehensive Study

Abor (2005) conducted a study on 22 companies listed on the Ghana exchange in the period 1998–2002. The results show that the ratio of short-term debt to total assets (STD) has a significant positive relationship with ROE. According to the author's argument, the company using short-term debt will cost less, increasing profits. In contrast, the results show a significant negative relationship of long-term debt to total assets (LTD) with ROE. An increase in long-term debt that is associated with a decrease in profitability has a higher cost of long-term debt and vice versa. The research results also show a positive

relationship between the debt-to-total assets (TD) ratio and the efficiency of corporate financial management. This shows that an increase in debt is associated with an increase in profits. Therefore, the company with higher debt will have a higher profit. And the results also show that the profits of the companies in the sample also increase due to the increase in the size and revenue of the company.

Tian and Zeitun (2007) conducted a study based on data of 167 companies for the period 1989–2003. The study aimed to examine the influence of capital structure on firm performance in Jordan. The research results show that the ratio of short-term debt to total assets has a positive impact on the performance of the business, specifically, companies with a high ratio of short-term debt to total assets will have a high growth and profitability performance.

Ahmad et al. (2012) studied the relationship between capital structure and performance among firms, using data from the reports of 58 companies listed on the Malaysian stock market in the period 2005–2010. According to research, operational efficiency is measured by ROE and ROA. The research results show that the variables: the ratio of short-term debt to total assets, the ratio of long-term debt to total assets, the ratio of total debt to total assets, the growth rate of assets and business performance have the positive effect on ROE. Besides, the results also show that the variables of long-term debt to total assets and revenue growth rate have no significant influence on corporate profits.

Pouraghajan and Malekian (2012) analyze the impact of capital structure on the financial performance of companies listed on the Tehran Stock Exchange. For this purpose, they studied a sample of 400 companies in the form of 12 industrial groups between 2006 and 2010. In the study, the variables ROA and ROE were used to measure the financial performance of the companies. The results show that there is a significant negative relationship between debt ratio and financial performance of companies and a significant positive relationship between asset turnover, firm size, tangible assets ratio and growth opportunities with measures of financial performance. In addition, the research results show that by reducing the debt ratio, management can increase the profitability of the company.

Bui Dan Thanh (2016) conducted a study using data of 1032 small and medium-sized enterprises in Ho Chi Minh City in the period 2006–2014. The results show that the ratio of total debt to total assets and the ratio of short-term debt to total assets has a positive relationship with the financial performance (ROA, ROE) of the enterprise. In addition, the control variables: firm size and the ratio of fixed assets to total assets have a negative impact on ROA, ROE.

Doan Ngoc Phuc (2018) studied the impact of capital structure on the performance of 217 companies listed on the 2 Stock Exchanges of Ho Chi Minh City and Hanoi in the period 2007–2012. Research results shows that long-term debt has a positive impact on ROA and ROE, while short-term debt and total debt have a statistically significant negative impact on firm performance measured by ROA and ROE.

Nguyen Thi Dieu Chi (2018) used Tobit model to conduct a study of 116 service enterprises listed on the Vietnamese stock market in the period 2010–2018 on the impact of debt capital structure on financial results. Research results show that both short-term debt structure and long-term debt structure have a negative impact on corporate profitability. Specifically, when an enterprise uses too much debt in its capital structure,

it will have negative effects on financial performance, or the more debt the enterprise borrows, the lower the financial performance of the enterprise, due to increased costs from loan interest.

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 72 enterprises listing construction on the Vietnam Stock Exchange in the period from 2010 to 2020, this study used Bayesian logistic regression with informative priors. The research has made the following contributions, as expected: (i) Help financial managers in the future make the best decisions about capital structure policies.; (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 (data of one or more variables collected for multiple sample units or sample locations at the same time) 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.

3.2 Research Model

Based on empirical studies in the world and in Vietnam, the author found that the number of variables as well as the way to measure the variable and the results of the direction of the impact of the variables on the profitability ratio is different in different research. However, these studies all selected some of the effects of debt on corporate profitability such as the ratio of short-term debt to total assets, the ratio of long-term debt to total assets, liquidity, revenue growth rate, business size and inflation rate. 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 the research model of the topic as follows:

$$\mathbf{ROA_{it} = a + b_1 SDA_{it} + b_2 LDA_{it} + b_3 LQ_{it} + b_4 GROWTH_{it} + b_5 SIZE_{it} + b_6 INF_{it} + u_{it}}$$

In there: - ROA: Dependent variable in observation time i in period t. Return on total assets, representing the profit rate of the business.

– SDA: Ratio of short-term debt to total assets; LDA: Ratio of long-term debt to total assets; LQ: Liquidity; GROWTH: Revenue growth rate; SIZE: Logarit of Total assets; INF: Inflation rate.

3.3 Variables and Hypotheses

From the review of previous studies, the author proposes the following research hypotheses:

Dependent Variable

Return on Total Assets – ROA: Return on total assets is measured by profit after tax on total assets. It is a pure measure of a business's efficiency in generating returns on assets that are not affected by management's funding decisions. According to the studies of Gleason et al. (2000), Tian and Zeitun (2007), Ahmad et al. (2012) all chose ROA as a measure of the profitability of the business. The research results show that the higher the ROA of the enterprise, the better the capital investment efficiency of the enterprise.

Independent Variables

Short-Term Debt-to-Total Assets Ratio – SDA: The ratio of short-term debt to total assets indicates how much of a percentage of total capital the company uses short-term debt to finance its assets. According to Zeitun and Tian (2007), SDA is calculated according to the formula:

$$\text{SDA} = \frac{\text{Current Liabilities}}{\text{Total Assets}}$$

According to the research results of Abor (2005), Gill (2011), Bui Dan Thanh (2016) show that SDA has a positive relationship with the profitability of enterprises. In contrast, the research results of Tian and Zeitun (2007), Ahmad et al. (2012) suggest that SDA has a negative relationship with the profitability of the business. The peculiarity of construction enterprises is that the use of short-term debt is very large, accounting for a small proportion of total assets. This can reduce profitability and bring burden on businesses. This runs counter to the optimal capital structure theory, which traditionally holds that the cost of capital can be reduced by increasing the use of debt. Thus, the higher the ratio of short-term debt to total assets, the lower the profit of the business. ***Hypothesis H1: The short-term debt ratio (SDA) has a negative effect on the profitability of the business.***

Long-Term Debt to Total Assets Ratio – LDA: The ratio of long-term debt to total assets shows how much of a business's long-term debt is used to finance its assets. According to Abor (2005), long-term debt ratio (LDA) is calculated according to the formula:

$$\text{LDA} = \frac{\text{Long term Debt}}{\text{Total Assets}}$$

Large capital occupation and prolonged business cycle lead to increased interest costs from long-term borrowing of construction enterprises. This can have a negative impact on financial performance, reducing corporate profits. In fact, the Vietnamese economy in particular and the world economy in general are constantly fluctuating. If the economy has bad changes, construction enterprises will have difficulty in getting loans. According to the research results of Abor (2005), Tian and Zeitun (2007) also show that, the higher the LDA, the lower the corporate profit. ***Hypothesis H2: Long-term debt ratio (LDA) has a negative effect on corporate profitability.***

Liquidity – LQ: Liquidity is the ability to convert into cash to pay for short-term debts of the business. According to Githaiga and Karibu (2015), liquidity is measured as follows:

$$\text{LQ} = \frac{\text{Current Assets}}{\text{Current Liabilities}}$$

In the total capital of construction enterprises in Vietnam, short-term capital accounts for a higher proportion than long-term capital. This limits long-term investment capital. At that time, the enterprise must increase an additional cost to maintain liquidity. The liquidity of each short-term debt is also different. According to Goddard et al. (2004), Molyneux and Thornton (1992) argue that a higher level of liquidity also creates an opportunity cost due to lower returns compared to other assets. ***Hypothesis H3: Liquidity (LQ) has a negative effect on the profitability of the business.***

Revenue Growth Rate – GROWTH: Revenue growth rate shows the relative revenue growth (in %) over time. Thereby, see the business situation of the enterprise. According to Tian and Zeitun (2007), the revenue growth rate is calculated as follows:

$$\text{GROWTH} = \frac{\text{Net Revenue}_{\text{n}} - \text{Net Revenue}_{\text{n}-1}}{\text{Net Revenue}_{\text{n}-1}} \times 100\%$$

In there n: years. The studies of Zeitun and Tian (2007), Nunes et al. (2009) all show that revenue growth rate has a positive relationship with business performance. Myers (1977) also pointed out that: Firms with high revenue growth have more options for future investment than firms with low revenue growth. Myers' comments are almost consistent with construction industry businesses. The specificity of the industry is to create products of great value, so the profit from business activities is often very high. This helps businesses have good revenue growth and attract many investors. ***Hypothesis H4: Revenue growth rate (GROWTH) has a positive effect on the profit margin of the business.***

Firm Size – SIZE: According to Abor (2005) and Ahmad (2012), enterprise size is calculated as follows:

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

Construction corporations and enterprises often raise capital by issuing shares on the stock market or borrowing from credit institutions. The larger the size of the business, the more opportunities it has. Because a large-scale business will easily make customers have more confidence and often receive more incentives in credit activities. Consistent with the research results of Mahfuzah Salim and Dr Raj Yadav (2012), the author also shows that the size of the company has a positive impact on the performance of the company. The larger the company size, the higher the corporate profits. ***Hypothesis H5: Firm size (SIZE) has a positive effect on firm's profit margin.***

Inflation Rate – INF: According to Comley (2015), inflation occurs when the purchasing power of money decreases due to an increase in the price level of goods and services in the economy. The formula for calculating the inflation rate according to the consumer price index (CPI) is as follows:

$$\text{Inflation rate in period t} = \frac{\text{Consumer Price Index}_n - \text{Consumer Price Index}_{n-1}}{\text{Consumer Price Index}_{n-1}} \times 100\%$$

In there n: n-th year. According to Tran Viet Dung and Bui Dan Thanh (2021), the inflation rate is a macro factor that affects the capital structure of enterprises. When the inflation rate of the economy is high, the Government will require tightening credit to curb inflation, causing the lending interest rate of banks to increase. This leads to a shortage of capital for construction enterprises, adversely affecting the profits of enterprises. However, in another aspect, inflation creates cheap capital, contributing to economic development. A typical example is that in the period 1984–1997, China accepted an average inflation of 10.98% to raise the amount of capital from issuing money to 3235.71 billion yuan. This helps China's GDP grow 3.23 times (According to financial statistics of the IMF), becoming the world's 2nd economic power after the United States (According to the ranking of the list of countries by gross domestic product of the International Monetary Fund in 2021). If Vietnam's economy maintains inflation at a moderate level, construction businesses can also develop and increase profits through the stability of the country's macro-economy. ***Hypothesis H6: Inflation rate (INF) has a positive effect on firm's profit rate*** (Table 1).

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

Variable	Description	Measurement	Hypotheses
Dependent variable			
ROA	Return on Assets	$\text{ROA} = \frac{\text{Earning After Tax}}{\text{Total Assets}}$	
Biến độc lập			
SDA	Short – term debt to total assets	$\text{SDA} = \frac{\text{Current Liabilities}}{\text{Total Assets}}$	–
LDA	Long – term debt to total assets	$\text{LDA} = \frac{\text{Long term Debt}}{\text{Total Assets}}$	–
LQ	Liquidity	$\text{LQ} = \frac{\text{Current Assets}}{\text{Current Liabilities}}$	–
GROWTH	Revenue growth rate	$\text{GROWTH} = \frac{\text{Net Revenue}_n - \text{Net Revenue}_{n-1}}{\text{Net Revenue}_{n-1}} \times 100\%$	+
SIZE	Firm size	$\text{SIZE} = \text{Log}_e(\text{Total Assets})$	+
INF	Inflation Rate	$\text{Inflation rate in period t} = \frac{\text{Consumer Price Index}_n - \text{Consumer Price Index}_{n-1}}{\text{Consumer Price Index}_{n-1}} \times 100\%$	+

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 792 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.

Table 2. Simulation of a priori information

Rational function	ROA $\sim N(\mu, \sigma)$
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

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.

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

The simulation selected will be the one with the largest Log BF, Log ML average, minimum DIC mean, and the largest P(M|y). Simulation 2 has the largest Log BF, however, Avg DIC is not as good as 3, 4, 5, in addition, Avg Log (ML) of simulation 2 does not show its superiority compared to other simulations, so we continue to analyze the Bayes test model. The results show that simulation 2 has a higher posterior probability than the other simulations, so simulation 2 with a priori distribution N (0,10) will be selected (Table 3).

Table 3. Bayes Factor analysis results

	Chains	Avg DIC	Avg log (ML)	Log (BF)	P(M|y)
Simulation1	3	4610.8	−2.32E+03		0.000
Simulation2	3	4593.3	−2.32E+03	8.129	0.893
Simulation3	3	4591.0	−2.32E+03	6.004	0.107
Simulation4	3	4591.4	−2.33E+03	−0.960	0.000
Simulation5	3	4591.4	−2.33E+03	−9.039	0.000

Source: Calculations of the author

Bayesian analysis is simulated through a Markov chain Monte Carlo (MCMC), so to ensure the stability of 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

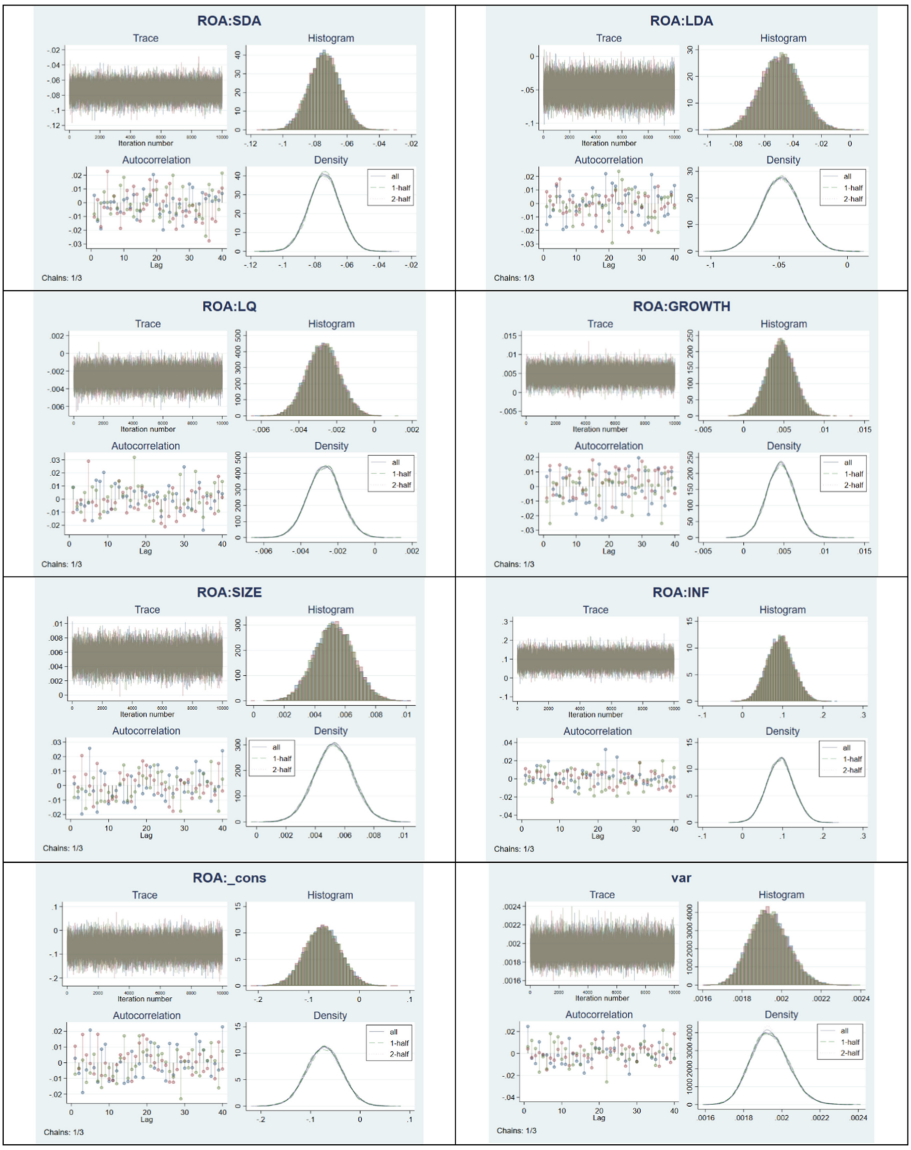

Fig. 1. Convergence diagnostic graph Source: Calculations of the author

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

Table 4. Regression results

	Mean	Std. Dev	MCSE	Median	Equal-tailed [95% Cred. Interval]	
SDA	−0.074	0.010	0.000	−0.074	−0.093	−0.055
LDA	−0.049	0.014	0.000	−0.049	−0.076	−0.021
LQ	−0.003	0.001	0.000	−0.003	−0.004	−0.001
GROWTH	0.005	0.002	0.000	0.005	0.001	0.008
SIZE	0.005	0.001	0.000	0.005	0.003	0.008
INF	0.094	0.033	0.000	0.094	0.028	0.159
_cons	−0.073	0.035	0.000	−0.073	−0.141	−0.004
var	0.002	0.000	5.70E+07	0.0019	0.0018	0.0021
Avg acceptance rate	1.000					
Avg efficiency min	0.984					
Max Gelman-Rubin Rc	1.000					

Source: Calculations of the author

Gelman-Rubin Rc max. Table 4 shows that the model's acceptance rate reaches 1, the model's minimum efficiency is 0.984, 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 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 Table 4 have determined that the variables SDA, LDA, LQ have a negative impact on the profit margin of construction enterprises while the variables GROWTH, SIZE, INF have a positive effect on the rate of return. Besides determining the sign of the regression coefficients, unlike the frequency method, the Bayesian approach also allows us to calculate the probability of these effects.

4.2 Discussion

Short-Term Debt to Total Assets – SDA: Research results show that SDA has a negative relationship with ROA, in line with the author's initial expectation. The higher the short-term debt ratio, the lower the profit margin of the construction industry. This result is consistent with the experimental studies of Doan Ngoc Phuc (2018), Pouraghajan and Malekian (2012), Nguyen Thi Dieu Chi (2018). When construction enterprises prioritize using short-term financing in the course of business operations, it will create short-term payment pressure, negatively affecting the profits of enterprises. Moreover, when the ratio of short-term debt to total assets is high, it means that the enterprise maintains a relatively high amount of short-term assets, resulting in the enterprise not effectively using short-term assets.

Long-Term Debt to Total Assets – LDA: Research results show that LDA has a negative relationship with ROA, in line with the author's initial expectation. Construction enterprises often have relatively large capital requirements and long business cycles. Long-term debt is considered an essential source of capital in the capital structure of construction enterprises. However, overusing this capital will cause businesses to face high interest rates when the market economy fluctuates. High interest rates will lead to an increase in the burden of interest expenses or interest on borrowed capital, negatively impacting business performance. This result is consistent with the study of Pouraghajan and Malekian (2012), Mesquita and Lara (2003), Abor (2005).

Liquidity – LQ: Research results show that LQ has a negative relationship with ROA, in line with the author's initial expectation. However, this result is contrary to the study of the authors Dang Phuong Mai (2016), Nguyen Thi Dieu Chi (2018). When the expenses of maintaining liquidity are unstable, leading to costs incurred in the business's operation and not ensuring the ability to pay short-term debts of the enterprise. The characteristics of enterprises in the construction industry are slow-moving short-term assets and large receivables. When current assets are larger than current liabilities, it does not guarantee that current assets will be able to pay short-term liabilities when they come due. Current assets are highly liquid assets such as cash, so when short-term assets increase, the profit margin of the business also decreases.

Revenue Growth Rate – GROWTH: Research results show that GROWTH has a positive relationship with ROA, in line with the author's initial expectation. For businesses, the business's operational efforts are often reflected in revenue growth. Enterprises with higher revenue growth contribute to increased profits and increase business value. This result is consistent with the study of Pouraghajan and Malekian (2012), Tian and Zeitun (2007).

Firm Size - SIZE: Research results show that SIZE has a positive relationship with ROA, in line with the author's initial expectation. As the business grows in size through increasing assets, the value of the business will also increase. This result is similar to the study of Gleason (2000), Abor (2005) and Ahmad (2012). Large enterprises in the construction industry often have high competitiveness, so it is easier for businesses to carry out activities to expand their scale. This increases the profit margin and the value of the business.

Inflation Rate – INF: Research results show that INF has a positive relationship with ROA, in line with the author's initial expectation. This result is consistent with the study of Wanjohi (2003), but contradicts with the study of Vena (2012). If Vietnam's economy maintains moderate inflation, construction enterprises will have to take adjustment measures to adapt to changes in the economy. Since then, businesses still develop and increase profits through the stability of the macro economy.

5 Conclusion and Policy Implications

5.1 Conclusion

In the period of 2010–2020, construction enterprises in Vietnam increased their profits mainly thanks to the increase in asset size, business development, and cost reduction. The inflation rate has a positive impact on the profit rate of enterprises because the Government has tried to recover the economy after the global economic crisis in 2008 with various measures to control inflation, leading to GDP growth returned, leading to an increase in inflation.

5.2 Policy Implications

Short-Term Debt: Enterprises should prepare well loan documents, transparent financial statements, etc. to increase access to capital and reduce transaction costs from banks or credit institutions. In addition, businesses need to make sure to make payments to suppliers in accordance with the agreement, the purpose of which is to increase the reputation and position of the business.

Long-Term Debt: One of the solutions to provide effective long-term capital today is the form of financial leasing because this is a highly safe and effective form of financing for the transaction parties. To implement this project, the enterprise must have a viable finance lease project, a healthy financial situation and financial ability to participate in the lease project. Especially, enterprises need to have an effective production and business plan. For construction companies listed on the HSX, bond issuance is one of the long-term capital mobilization operations. Therefore, in order to successfully issue bonds, enterprises need to prove their operational capacity to have high profits, ensure debt repayment and interest expenses for investors.

Liquidity: When it is unable to pay its short-term debts, a business can switch from short-term debt to long-term debt, which results in smaller monthly payments and gives the business more time to pay off. In addition, businesses can keep a relative level of liquidity, not too low by controlling overhead costs or selling unnecessary assets to ensure liquidity.

Revenue Growth Rate: Enterprises should focus on product quality to improve their reputation and increase their ability to meet the needs and desires of customers. In addition, expanding the business into new markets or areas and scaling up also helps in a high rate of revenue growth.

Enterprise Size: Enterprises can increase their business size through increasing capital to expand their business scale, investing in fixed assets to build more branches in big cities and densely populated area to increase the popularity of the business among new customers.

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