Capital structure and stock price of non-financial firms listed in Vietnam

Vinh Hoang Le¹*, Thuy Minh Thi Le²

ABSTRACT
The aim of our paper is to consider the non-linear effect of the capital structure represented by debt ratio on stock prices of non-financial firms listed in Vietnam. The research sample in this paper is 458 firms, which was selected by the purposive sampling method. The research data has been extracted from audited financial statements of the firms at the end of every year over the period from 2015 to 2019 and processed correspondingly with stock price statistics from FinPro Data. According to the panel data of our paper, we used Pooled Ordinary Least Squares (POLS), Fixed Effects Model (FEM) and Random Effects Model (REM), but we only selected FEM after using Redundant Fixed Effects test, Breusch-Pagan test and Hausman test. However, the Wald test’s result showed that the heteroscedasticity does exist in the model; therefore, we adjusted by using Generalized Least Squares (GLS) method. The final estimation results based on GLS show that capital structure has a positive effect on stock price within a limit of debt ratio and will have a negative effect when this limit has been exceeded. This implies that capital structure has an inverted-U-shaped effect on stock price, and we identify the debt ratio threshold of capital structure as 22.07%. The findings are expected to provide useful information for financial managers when making financing decisions with the expectation of maximizing shareholder value and also for investors when analyzing and investing in stocks. The limitations of this research are that the research sample does not include all non-financial firms listed in Vietnam and the research model has not considered the moderating or intervening relationship between factors; according to that, future studies may consider these.

Key words: Capital structure, Debt ratio, Non-linear effect, Stock price, Non-financial firms

INTRODUCTION
The relationship between capital structure and firm value or shareholder value represented by stock prices has been reviewed in many theories and empirical studies. A typical example is the M&M theory of Modigliani & Miller (1958)¹ stating that capital structure is independent of firm value in the absence of taxes. It was also confirmed that when debt is included in the capital structure, the presence of tax can lead to increases in firm value thanks to tax shields. Trade-off theory states that firms have to accept a trade-off between the benefits of tax shields and the costs of financial distress due to debt use, which implies that capital structure tends to have a nonlinear inverted-U-shaped effect on firm value².

From the results of empirical studies, Masulis (1980)³, Buigut et al (2013)⁴, Jayaraman & Ramaratnam (2017)⁵, Dinh & Nguyen (2016)⁶, and Vo (2014)⁷ all confirmed a positive impact of capital structure on stock prices. In contrast, Vahid et al (2013)⁸, Kayode & Olaolu (2020)⁹, Andow & Wetsi (2018)¹⁰ found a negative effect of capital structure on stock prices. Due to such inconsistent results on the linear relationship between capital structure and stock prices, this article could identify the research gap which was the nonlinear effect in this relationship. It is also expected that the article could provide more empirical evidence as well as more detailed and accurate information for those who are involved when making relevant decisions.

THEORETICAL BASIS, EMPIRICAL EVIDENCE AND RESEARCH HYPOTHESIS

M&M Theory proposed by Modigliani and Miller (1958)¹ argued that borrowing decisions will bring tax savings to firms, which in turn increases net profits and generates an increase in stock prices. However, Kraus & Litzenberger (1973)¹¹, Myers (1977)¹² added that debts will expose firms to the risk of financial distress, resulting in costs arising. Trade-off theory supports and also complements M&M Theory, determining that in order to maximize value firms need to consider choosing a capital structure based on the balance between the additional benefits from tax savings and the additional costs from the risk of financial distress due to the use of debts.
Fischer et al (1989)\textsuperscript{13} developed Dynamic Trade-Off Theory which encouraged firms to use a lot of debts to fully utilize the tax shield from interest when the cost of financial distress is not significant. This theory was supported by the results of empirical research by Roden & Lewellen (1995)\textsuperscript{14}, Hadlock & James (2002)\textsuperscript{15}, Berger & Bonaccorsi di Patti (2006)\textsuperscript{16}, which also confirmed positive impacts of capital structure on corporate financial performance represented by stock prices. Purnamawati (2016)\textsuperscript{17} studied the data of listed manufacturing firms in Indonesia and concluded that capital structures represented by debts-equity ratios have a positive impact on stock prices at the rate of 12.4%. In addition, capital structures also affect stock price through the intervention of profitability at the rate of 14.5%.

Jensen & Meckling (1976)\textsuperscript{18} also developed Agency Theory based on the separation of ownership from management rights, according to which firms tend to borrow more to increase control over management decisions and the expectations of increasing shareholder value. Debts are preferred over new shares because the issue of shares can send negative signals and lower the stock price. This relationship is also confirmed by Pecking Order Theory first proposed by Donaldson (1961)\textsuperscript{19} and revised by Myers & Majluf (1984)\textsuperscript{20}. However, this theory also encouraged firms to prioritize retaining profits to increase owners’ equity over debts because this priority can lead to stock price appreciation.

Research results of Rajan & Zingales (1995)\textsuperscript{21}, Graham & Harvey (2001)\textsuperscript{22} supported the view that prices have a great significance in the issuance or repurchase of shares. Research by Marsh (1982)\textsuperscript{23}, Lucas & McDonald (1990)\textsuperscript{24}, Jung et al. (1996)\textsuperscript{25}, and Hovakimian et al (2001)\textsuperscript{26} determined that the decision to adjust equity is correlated with stock prices in the market. Market Timing Theory introduced by Baker & Wurgler (2002)\textsuperscript{27} implied that firms tend to choose to issue shares instead of borrowing if the market price of a stock is higher than the book value or than the past market prices, or the business will repurchase shares and make adjustments to decrease equity when the current market price is lower. The generalization from the relationships mentioned above is that firms will adjust their capital structure with the expectation that stock prices will change in the same direction as the level of debt use.

Through theoretical review and empirical evidence, the article determines that capital structures represented by levels of debt use combined with expected equity have a positive impact on stock prices, but too much debt or debt exceeding the optimal threshold will have a negative effect on stock prices. Accordingly, The hypothesis posed for this article are as follows:

H\textsubscript{1}: The capital structure represented by the level of debt use has a nonlinear inverted U-shaped effect on stock prices.

**RESEARCH MODEL**

Based on the summary and research hypotheses set out in Section 2, the research model included stock price (PRICE) as the dependent variable, capital structure (CS) as the independent variable, and firm size (SIZE) and profitability (PROF) as the control variables, which is as follows:

\[
\text{PRICE}_{i,t} = \beta_0 + \beta_1 \times \text{CS}_{i,t} + \beta_2 \times (\text{CS}_{i,t})^2 + \beta_3 \times \text{SIZE}_{i,t} + \beta_4 \times \text{PROF}_{i,t} + \epsilon_{i,t}
\]

- The dependent variable PRICE was measured by the logarithm of the closing price at the end of the year \[3–5,8–10\] which was based on stock price statistics on the official stock market in Vietnam.
- The independent variable CS was measured using the debt ratios \[3–5,8–10\], which were processed basing on the balance sheet of each firm.
- The control variables SIZE and PROF were respectively measured by the logarithm of total assets\textsuperscript{8} and rates of return on equity,\textsuperscript{8} which were processed basing on the balance sheets and business performance reports of each firm.

**RESEARCH DATA AND METHODS**

Using the purposive sampling method, the article selected 458 firms as research samples among the non-financial firms listed in Vietnam that could meet the requirements as follows: (i) shares were not delisted during the period from 2015 to 2019, (ii) there was full access to financial statements and stock market prices in this period, and (iii) all the financial statements had been audited with the confirmation that they were reasonable and fair based on Materiality Principle. The article selected 2015-2019 as the research period to ensure the consistency of the financial statements in accordance with Circular 200 of the Ministry of Finance on Vietnam’s corporate accounting regime (effective from January 1st, 2015).

Research data was collected from FiinPro System provided by FiinGroup Corporation. The article yielded research results using quantitative research methods with specific data processing methods as follows: Descriptive statistics, Correlation analysis, and Panel data regression analysis based on Pooled Ordinary Least Squares (POLS), Fixed Effects Model (FEM), and Random Effects Model (REM).
To choose the appropriate estimation method, the article used the Hausman test with Hypothesis $H_0$ to accept REM and Hypothesis $H_1$ to accept FEM, Redundant Fixed Effects test with Hypothesis $H_0$ to accept POLS and $H_1$ to accept FEM, and the Breusch-Pagan test in the Lagrange multiplier group with Hypothesis $H_0$ to accept POLS and $H_1$ to accept REM. If there are violations such as severe multicollinearity, heteroskedasticity, or autocorrelation, the study results will use the estimation method of General Least Squares (GLS).

**RESEARCH RESULTS AND DISCUSSION**

**Descriptive Statistics**

The market price of a stock, the capital structure represented by the debt ratio, and other variables are statistically described in Table 1.

Based on Table 1, the average of PRICE is 4.1288, which means the price per share before logarithm is 13,452 VND, higher than the standardized par value when listed (10,000 VND). The average of CS is 48.43%, showing that the capital structure of firms tends to favour equity and the level of debt use in total funding ranges from 0.41% to 96.93%. In addition, it is shown in Table 1 that there is a diversity of business sizes and in general, firms can ensure profitability for shareholders.

**Correlation analysis and multicollinearity**

The correlation matrix and the variance inflation factor (VIF) are summarized in Table 2.

Given the linear correlation, it is shown in Table 2 that the market price of shares moves inversely with the volatility of capital structure represented by the debt ratio, but in the same direction with the volatility of firm size and profitability.

In addition, according to Table 2, capital structure fluctuates in the same direction as firm size and inversely with profitability while firm size and profitability move in the same direction. However, these relationships are not strong as the absolute values of the correlation coefficients are less than 0.8. Moreover, VIF is less than 10, confirming that there is no serious multicollinearity between independent variables and control variables together.28,29

**Regression analysis**

Table 3 summarizes the estimation results according to POLS, FEM, and REM, as well as the related test results to determine the appropriate estimation method.

Table 3 shows that according to the Redundant Fixed Effects test, FEM is more suitable than POLS with a P-value result of less than 5% while according to the Breusch-Pagan test, REM is more suitable than POLS with P-value results of less than 5%, and according to the Hausman test, FEM is more suitable than REM with a P-value of less than 5%. Thus, the estimated results based on FEM are selected, because FEM is concerned with single differences contributing to the model, so it is confirmed that there is no autocorrelation,28,30, and the article also implemented the Wald test to consider Heteroskedasticity.

The Wald test's result is summarized in Table 3 with a Chi-square ($\chi^2$) of 182.2117 and a P-value of 0.0000 concluding that heteroscedasticity does exist in the model. Therefore, the article re-estimates the relationships according to GLS in Table 4 to eliminate this phenomenon.

**Discussion**

As mentioned in Table 4, the capital structure represented by the debt ratios has a positive effect on stock prices, but this relationship is not true for all cases. Once the optimal threshold of debt ratio is exceeded and firms increase debt use, stock prices will decrease, which means that the capital structure has an inverted U-shaped nonlinear effect on stock prices. In addition, stock prices are also affected by the firm size and profitability. This estimate is consistent at 59.39%, in other words, 40.61% of the changes in stock prices can be attributed to other factors which are not included in the research model.

**Table 4: Estimated results according to GLS**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS</td>
<td>0.3118***</td>
<td>0.0000</td>
</tr>
<tr>
<td>CS2</td>
<td>-0.7065***</td>
<td>0.0000</td>
</tr>
<tr>
<td>SIZE</td>
<td>0.1051***</td>
<td>0.0000</td>
</tr>
<tr>
<td>PROF</td>
<td>1.3596***</td>
<td>0.0000</td>
</tr>
<tr>
<td>C</td>
<td>3.4090***</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

$R^2 = 0.5939$

(***) a significance level of 1%

Source: Results obtained from processing research data using Eviews 10.0

According to Table 4, the capital structure represented by debt ratios has a positive effect on stock prices, but this relationship is determined with a certain limit on the use of debt in the capital structure. If the increase in debt ratios goes beyond the limit,
Table 1: Descriptive statistics of variables

<table>
<thead>
<tr>
<th>Criteria</th>
<th>PRICE</th>
<th>CS</th>
<th>SIZE</th>
<th>PROF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average value</td>
<td>4.1288</td>
<td>0.4843</td>
<td>5.7994</td>
<td>0.1201</td>
</tr>
<tr>
<td>Maximum value</td>
<td>5.3551</td>
<td>0.9693</td>
<td>7.9542</td>
<td>1.6075</td>
</tr>
<tr>
<td>Minimum value</td>
<td>2.6021</td>
<td>0.0041</td>
<td>4.1830</td>
<td>-1.0743</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>0.3898</td>
<td>0.2256</td>
<td>0.6665</td>
<td>0.1483</td>
</tr>
<tr>
<td>Observation</td>
<td>2290</td>
<td>2290</td>
<td>2290</td>
<td>2290</td>
</tr>
</tbody>
</table>

Source: Results obtained from processing research data using Eviews 10.0

Table 2: Correlation coefficients and VIF

<table>
<thead>
<tr>
<th>PRICE</th>
<th>CS</th>
<th>SIZE</th>
<th>PROF</th>
<th>VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRICE</td>
<td>1.0000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS</td>
<td>-0.1789</td>
<td>1.0000</td>
<td></td>
<td>1.1399</td>
</tr>
<tr>
<td>SIZE</td>
<td>0.1616</td>
<td>0.3300</td>
<td>1.0000</td>
<td>1.1404</td>
</tr>
<tr>
<td>PROF</td>
<td>0.5287</td>
<td>-0.0874</td>
<td>0.0899</td>
<td>1.0000</td>
</tr>
</tbody>
</table>

Source: Results obtained from processing research data using Eviews 10.0

Table 3: Estimation results according to POLS, FEM, and REM

<table>
<thead>
<tr>
<th>Variable</th>
<th>POLS</th>
<th>FEM</th>
<th>REM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficient</td>
<td>P-value</td>
<td>Coefficient</td>
</tr>
<tr>
<td>CS</td>
<td>0.3144**</td>
<td>0.0107</td>
<td>-0.0576</td>
</tr>
<tr>
<td>CS2</td>
<td>-0.6939***</td>
<td>0.0000</td>
<td>-0.1795</td>
</tr>
<tr>
<td>SIZE</td>
<td>0.1042***</td>
<td>0.0000</td>
<td>0.2158***</td>
</tr>
<tr>
<td>PROF</td>
<td>1.2791***</td>
<td>0.0000</td>
<td>0.4223***</td>
</tr>
<tr>
<td>C</td>
<td>3.4165***</td>
<td>0.0000</td>
<td>2.9060***</td>
</tr>
<tr>
<td>Breusch-Pagan Test</td>
<td>0.0000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Redundant Fixed Effects Test</td>
<td>0.0000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wald Test ($\chi^2 = 182,2117$)</td>
<td>0.0000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hausman Test</td>
<td>0.0000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(***) significance level of 1%, (**) significance level of 5%

Source: Results obtained from processing research data using Eviews 10.0

the opposite effect will occur. This implies the existence of an inverted U-shaped nonlinear effect of capital structure on stock prices, as shown in Figure 1. This result is consistent with the research hypothesis and supports Trade-off theory, or more specifically, the theory of optimal capital structure.

According to Table 4, The regression equation is defined as follows:

$$\text{PRICE} = 0.3118 * \text{CS} - 0.7065 * \text{CS}^2 + 0.1051 * \text{SIZE} + 1.3596 * \text{PROF} + 3.4090.$$  

From the above regression equation, the paper takes the derivative of PRICE with respect to CS. PRICE reaches its maximum when this derivative is zero and CS found is 0.2207. Thus, non-financial companies listed in Vietnam will have their stock price reaching the highest level as outlined in Figure 1 if their capital structure threshold is a debt ratio of 22.07%.

In financial management, the decision to use debt in capital structure, as well as other financial decisions, has a duality that businesses must always consider before making a choice to achieve a balance between return and risk, and thereby achieve the ultimate goal of increasing business value. Accordingly, a firm can ensure financial efficiency when there is debt in its capital structure. In particular, the firm can achieve a rate of return from debt-based investments, which
is more significant than the profits gained from the cost of debt. Simultaneously, the fact that the firm can control the risk of financial distress implies great significance, contributing to the increase in stock price. On the contrary, when there is too much debt in the capital structure, the firm may not be able to balance cash flow to fulfill its commitments to creditors, the cost of debt may be too large compared to its ability to generate profit from assets, which will negatively affect the firm value as well as the share price in the market.

In addition, the estimation results in Table 4 also confirm that stock prices of non-financial firms listed in Vietnam are also explained by the positive impact of firm size and profitability. This could explain that firms that are larger in size, capable of generating more profits will be valued more highly by the market and therefore their stock prices will also be higher.

CONCLUSION

A rational decision on capital structure represented by the debt ratio will have a positive effect on the value of the firm as well as shareholder value illustrated by the market price of the stock, and vice versa. The article used data of 458 non-financial firms listed in Vietnam and confirmed based on the GLS estimate that capital structure has an inverse U-shaped nonlinear effect on stock prices. This result implies that corporate financial managers should focus on planning a limit to the use of debt in the capital structure, thereby adjusting the current capital structure in a way that can contribute to the increase of stock prices. At the same time, the results also recommend that businesses always have to fully consider two important financial aspects related to the use of debt before they can determine and make decisions on the relationship between debt and equity in the capital structure, including the balance between the profitability of assets with the cost of debt and the risk of financial distress.

ABBREVIATIONS

CS: Capital structure
FEM: Fixed Effects Model
GLS: General Least Squares
H: Hypothesis
M&M: Modigliani and Miller
POLS: Pooled Ordinary Least Squares
PRICE: Stock price
PROF: Profitability
REM: Random Effects Model
SIZE: firm size
VIF: Variance Inflation Factor
VND: Vietnam Dong

DECLARATION OF COMPETING INTEREST

The authors declare that they have no conflicts of interest.

AUTHOR CONTRIBUTIONS

Vinh Hoang Le: conceived and designed the analysis, collected the data, processed the data, performed the analysis, wrote the paper.

Thuy Minh Thi Le: processed the data, wrote the paper, other contribution.

REFERENCES

Tóm tắt
Mục tiêu bài viết này là xem xét tác động phi tuyến của cơ cấu vốn đến giá cổ phiếu của các doanh nghiệp phi tài chính niêm yết tại Việt Nam, trong đó cơ cấu vốn được đại diện bởi tỷ số nợ. Mẫu nghiên cứu bao gồm 458 doanh nghiệp, được lựa chọn theo phương pháp chọn mẫu có mục đích. Dự liệu nghiên cứu được xử lý bằng cách phân chia dữ liệu theo các doanh nghiệp trong suốt giai đoạn từ năm 2015 đến năm 2019, và tương ứng để thống kê giá cổ phiếu từ hệ thống FinPro. Với dữ liệu bằng, bài viết sử dụng mô hình hồi quy gộp (POLS), mô hình tác động cố định (FEM) và mô hình tác động ngẫu nhiên (REM); kết quả kiểm định chỉ ra FEM là phù hợp. Tuy nhiên, kiểm định Wald chỉ ra sự tồn tại của hiện tượng phương sai thay đổi, vì vậy bài viết khắc phục bằng phương pháp bình phương tổng quát (GLS). Kết quả ước lượng cuối cùng theo GLS xác định cơ cấu vốn tác động cùng chiều đến giá cổ phiếu trong một giới hạn về tỷ số nợ, và sẽ tác động ngược chiều khi vượt quá giới hạn này. Kết quả ước lượng cho thấy, cơ cấu vốn có tác động phi tuyến đến giá cổ phiếu, với tỷ lệ 22.07%. Kết quả nghiên cứu cũng cung cấp thông tin hữu ích cho nhà quản lý tài chính khi đưa ra quyết định tài trợ gắn với mục tiêu gia tăng giá trị tài sản của công ty. Giới hạn của bài nghiên cứu là chưa bao quát tất cả các doanh nghiệp phi tài chính niêm yết tại Việt Nam, và mô hình nghiên cứu chưa xem xét quan hệ điều tiết hay can thiệp giữa các biến; theo đó, các nghiên cứu tiếp theo có thể phân tích nội dung này.

Từ khóa: Cơ cấu vốn, Tỷ số nợ, Tác động phi tuyến, Giá cổ phiếu, doanh nghiệp phi tài chính