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Nonlinear Impact of Financial Leverage on Profits: Case of Listed Companies in Vietnam

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Abstract

The aim of the article is to show the nonlinear impact of financial leverage on the profitability of companies listed on the Vietnamese stock market. Thereby, the author determines the threshold of each leverage with the goal of maximizing profit. The research sample includes 8,459 observations from 769 listed companies in Vietnam, period 2012-2022. The GLS estimation results confirm that financial leverage has a nonlinear effect on profitability in the form of an inverted U. On the basis of the estimated coefficients of the nonlinear function, the author uses the derivative method and determines the financial leverage threshold represented by a debt coefficient of 58.6% for ROA and 62.9% for ROE. At this threshold ROA peaks at 0.132 and ROE peaks at 0.163. In addition, the author also finds explanations for profitability by other factors such as firm size, level of tangible fixed asset investment and firm's liquidity. The research results provide useful information for financial managers at companies and other entities that can be referenced to make relevant decisions. In addition, the author gives some recommendations for listed companies, investors, business leaders and policy makers in choosing a reasonable capital structure for enterprises.

Keywords: Financial Leverage, Profit, ROA, ROE, Impact

1. Introduction

Financial leverage formed in the business comes from financial decisions using borrowed capital. Accordingly, firms using debt and preferred equity will form financial leverage (Anderson & Reeb, 2003; Van Horne & Wachowicz, 2008). From the perspective of financial management, businesses will decide to choose the level of financial leverage based on assessing the impact of these levers on profits. Using financial leverage is like a double-edged sword, therefore, the construction of capital structure has a great influence on firm value (Chang, 2003; Van Horne & Wachowicz, 2008).

Assessing the impact of financial leverage on profitability, the same conclusion is confirmed by the empirical research of Mavromatti et al. (2021), Silambarasan & Azhagaiah (2015), Chowdhury et al. (2010), Habib (2014), Kumar (2014), Patel (2014), Shahzad et al. (2016), Tayyaba (2013); in contrast, experimental evidence for the opposite effect was found by Wieczorek-Kosmala et al. (2021), Chen (2020), Zeitun et al. (2015); Dawar (2014), Agburuga & Ibanichuka (2016), Pavan Kumar (2017), Sen & Ranjan (2018); Villalonga & Amit (2006). Thus, the empirical evidence indicates a possible positive or negative relationship of financial leverage on profitability, which is a linear function, that is, the slope of the return is constant for all different financial leverage. In fact, each different level of debt ratio will affect profitability positively or negatively with different estimated coefficients. Therefore, the study of the linear function is not enough to conclude on the effect of capital structure and firm value.

Theoretically and experimentally, studies have demonstrated the existence of a nonlinear relationship between financial leverage and profitability or firm value as Nieh et al. (2008); Yang et al. (2010); Berzkalne (2015). Accordingly, profits increase when using financial leverage, but if borrowed capital is abused, business results will decrease. Accordingly, the author poses two research questions: (i) Is there a nonlinear effect of financial leverage on profitability? (ii) If there is a nonlinear effect, what is the threshold for using leverage to maximize firm profits?

To answer the above two questions, the author chooses to approach listed companies in Vietnam. The research results are expected to provide useful reference information for financial managers and other entities when making investment decisions. This article is structured in 6 content sections. In addition to the introduction, the following sections include: Theoretical basis and research overview presented in Section 2; Section 3 presents the research model; Section 4 describes the data and research methods; Section 5 presents research results and discussions; Section 6 presents conclusions and recommendations.

2. Theoretical basis and research overview

2.1. Theoretical basis

2.1.1. Agency Cost Theory

Berle & Means (1932) mentioned agency costs in the modern firm model. This theory was developed by Jensen & Meckling (1976). Accordingly, agency costs increase due to conflicts of interest between shareholders and managers, and between shareholders and creditors. This shows that managers will for personal interests instead of maximizing the value of the business, so they tend to choose investment projects with low risk, low return and a low debt ratio to reduce the risk of bankruptcy. To resolve conflicts through reducing agency costs, Harris and Raviv (1991) demonstrated debt as a mechanism to monitor and encourage board performance because of the positive relationship between the ratio debt and financial difficulties of the company. The company is at risk of bankruptcy if financial difficulties increase. This fact motivates managers to improve performance if they do not want to lose their jobs or leave a bad reputation. Thus, through minimizing agency costs between shareholders and managers, this theory favors the use of debt.

2.1.2. Durand's Classical Theory

Durand (1952) was the first to put forward the theory of the capital structure of the firm. Debt has a "cheaper" cost of capital than equity, he said. Therefore, if the enterprise uses a lot of debt, it will reduce the average cost of capital and increase the value of the enterprise. Furthermore, as the debt-to-equity ratio increases, the return on equity will increase because the cost of equity is higher than debt. However, if the enterprise increases the ratio of debt to total capital, the cost of debt will also increase due to the increased risk of bankruptcy. Therefore, the impact of capital structure on firm value depends on the balance between the benefits of using debt and equity. Therefore, enterprises need to build a reasonable capital structure to minimize the average cost of capital and

maximize the value of the enterprise. This study does not draw conclusions about what is the optimal capital structure for enterprises.

2.1.3. Modigliani and Miller's Theory

Modigliani and Miller (1958) concluded that firm value does not depend on its debt ratio. This study is set in a perfect market, with no competition, no taxes, no risk, and constant interest rates. This is contrary to the fact so, Modigliani and Miller carried out a follow-up study in 1963, they presented new evidence that the cost of capital affects capital structure and therefore affects the value of the firm. Using debt will incur interest expense and this expense is partially deductible when calculating corporate income tax. Enterprises save on corporate income tax costs by taking advantage of tax shields, leading to maximization of business value. The theory of Modigliani and Miller laid the foundation for the birth of later theories of capital structure.

2.2. Research overview and hypothesis

Financial leverage is formed when firms choose fixed-cost capital sources, this choice is expected to increase profits (Van Horne & Wachowicz, 2008). According to the M&M theory of Modigliani & Miller (1958), profit for shareholders is expected to increase when the firm decides to increase the level of financial leverage formed from debt, which is a compensation for accepting accept the added risk of this decision.

The proposed Dupont model is used to analyze the profitability of capital expressed through the rate of return on equity, whereby financial leverage explains the same direction for profitability. However, it is proposed to apply Durand's (1952) net operating profit theory and M&M theory to analyze return on equity, indicating that profitability is available to the owners of the company, affected by financial leverage in the same or opposite direction depending on the relationship between the return on assets and the cost of debt. If businesses can achieve a return on assets that exceed the cost of debt, the decision to choose debt financing will contribute to increased profitability for owners and vice versa.

2.2.1. Financial leverage has a positive effect on profitability

Mavromatti et al. (2021) approached financial data of 68 aquaculture companies in Greece for the period 2010-2015 and concluded that financial leverage is positively related to profitability. This implies that the higher the financial leverage, the higher the profit. In addition, the study also shows that corporate profitability is positively affected by liquidity, working capital management, productivity and industry growth and negatively affected by financial leverage. A firm's performance is positively determined by its profitability and ability to pay its debt obligations and negatively by its capital intensity, operating leverage, and scale.

Silambarasan & Azhagaiah (2015) using data collected from 28 companies in the IT industry in India for the period 2010-2014, concluded that financial leverage has a positive impact on profitability. This relationship is also confirmed by the study of Shahzad et al. (2016) for the case of cement companies in Pakistan during 7 years, from 2009 to 2015, the authors prove, increasing the use of financial leverage formed from debt contributes to increased profits by taking advantage of tax shields. As a result, return on equity increases. Therefore, for companies in the energy sector with high financial leverage, it is recommended to increase the use of financial leverage to optimize benefits from debt.

Kumar (2014), studied leverage and its relationship between profitability in Bata India Limited. The results provide empirical evidence that the degree of financial leverage is positively correlated with return on investment (ROI).

Patel (2014) also concludes that an increase in the use of financial leverage will contribute to an increase in profitability and vice versa.

Tayyaba (2013) explores the effect of financial leverage on the profitability (EPS) of the oil and gas industry. The results demonstrate the positive relationship of financial leverage and earnings per share (EPS) in this sector.

2.2.2. Financial leverage has a negative impact on profitability

Many other empirical evidences also confirm that financial leverage has a negative effect on profitability. Specifically:

Wieczorek-Kosmala et al. (2021), investigating the determinants of profitability of unlisted energy companies from four Central European countries: Hungary, Poland, Slovakia and the Czech Republic, time 2015–2019. The research results support the inverse relationship of financial leverage to profitability, which is consistent with the assumptions of pecking order theory.

Chen (2020) analyzes the case of joint stock companies listed on the Shanghai and Shenzhen Stock Exchanges in China in the period 2010-2019, confirming the existence of a negative effect of financial leverage on the efficiency of the return on assets, in addition, this relationship is also positively affected by operating leverage, revenue growth rate. The results of this empirical study have certain significance in funding decisions and risk management in companies; Accordingly, the company using high level of financial leverage formed from debt will have a negative effect on profitability, because of the increase of financial risk and agency cost. Therefore, Chen's suggestion is that businesses should maintain a reasonable capital structure. Real estate companies are more likely to use financial leverage than companies in other industries.

Agburuga & Ibanichuka (2016), analyze financial, investment and operating leverage to predict future earnings. The results show that future income has a negative relationship with financial leverage and investment leverage and has a positive relationship with operating leverage. Therefore, this study provides evidence consistent with the trade-off theory.

2.2.3. Financial leverage has no significant impact on profitability

Pavan Kumar (2017), Sen & Ranjan (2018), analyze the impact of leverage on profitability and corporate performance of auto companies from 2006 to 2016. The results show leverage Operating, financial, and aggregate leverage do not play a major role in a company's investment decision making. Financial leverage has no significant impact on ROA.

Habib (2014), research in companies producing consumer products in Pakistan in the period 2002-2013. Data were analyzed using descriptive statistics, correlation and regression models; The dependent variables include Return on Equity (ROE), Return on Assets (ROA) and Net Profit while the independent variable is the financial leverage ratio. Research results show that there is no significant impact of financial leverage on ROA and ROE. But there is a significant impact of leverage on net profit.

2.2.4. Financial leverage has a nonlinear effect on profitability

Nieh et al. (2008) used array data of 143 electronic companies listed in Taiwan for the period 1999- 2004. Profitability of enterprises is measured by ROE and EPS. The research team used Hansen threshold regression, the results showed that: The appropriate debt ratio for enterprises is from 12.37% to 51.57%, the optimal debt ratio is in the range of 12.37% to 28, 7% will improve the profitability of enterprises. Besides, the authors also put two control variables, growth rate and enterprise scale, into the model because they think that these two variables can affect business performance. However, with the sample of the author's study, no statistical evidence has been found to show the impact of these two control variables on the profitability of enterprises.

Yang et al. (2010) studied in China using a threshold regression model, a sample of 650 enterprises in the period 2001-2006 with profitability indicators measured by ROE, capital structure measured through debt index. The research results show that the profitability of enterprises will increase when the debt ratio is lower than 53.97%, when the debt ratio is lower than this level, the enterprises will increase their debt and increase only to 53.97%, which increase profitability. In addition, the research results also show that: the profitability of enterprises is still high but will begin to decrease gradually when the debt ratio is between 53.97% and 70.48%, the profitability of enterprises will decline sharply when the debt ratio is greater than 70.48%.

Berzkalne (2015) studies the non-linear relationship between capital structure and profitability of firms by using threshold regression analysis with a sample of 58 listed companies in the Baltic in the period 2005 - 2013. Research using debt ratio and total debt/total capital to represent capital structure and choose stock price as the best indicator to represent profitability of enterprises. The study concluded that there is a non-linear relationship between capital structure and profitability. For listed companies in the Baltic region with small market capitalization, an increase in leverage will increase the profitability of the business and reach the highest value if the debt ratio reaches 24.64%.

Thus, companies need to determine a reasonable limit on the extent to which debt is used to form financial leverage, thereby ensuring a balanced relationship between investment efficiency and debt cost and profit maximization. Accordingly, the author hypothesizes that companies have an appropriate threshold for using financial leverage to maximize profits, namely that profits will increase with the higher level of financial leverage but lower than the threshold and will reverse the relationship when financial leverage is too large compared to the threshold. This is a research problem that will be concluded whether it exists or not through hypothesis testing in this article.

H1: Financial leverage has an inverted U-shaped nonlinear effect on the profitability of listed companies in Vietnam

3. Research model

To test the proposed research hypothesis, the author sets up a research model for the second order nonlinear impact of financial leverage (Lia, Lia²) on profitability (ROA, ROE); In addition, the model also adds control variables (Size, Tang, Liq) that have a linear impact on profitability. Specifically, the regression equation is as follows:

$$ROA = \beta_0 + \beta_1 Lia_{it} + \beta_2 Lia_{it}^2 + \beta_3 Size_{it} + \beta_4 Tang_{it} + \beta_5 Liq_{it} + \varepsilon_{it} \quad (1)$$

$$ROE = \beta_0 + \beta_1 Lia_{it} + \beta_2 Lia_{it}^2 + \beta_3 Size_{it} + \beta_4 Tang_{it} + \beta_5 Liq_{it} + \varepsilon_{it} \quad (2)$$

In which:

β_0 : Constant; $\beta_1, \beta_2, \beta_3, \beta_4$ is regression coefficients

it : The observed variable of company i at time t

i : 1, 2, ... 769 enterprises

t : 2012, 2013, ...2022 (total 11 years)

ε : error.

The dependent variable is represented by return on assets (ROA) and return on equity (ROE). The independent variable is financial leverage (Lia) as measured by debt to assets. In addition, the control variables in the research model include: enterprise size (Size) expressed through the base 10 logarithm of total assets, the level of tangible fixed asset investment (Tang) measured. It is measured by the proportion of tangible fixed assets in total assets, and a company's liquidity (Liq) is represented by its current ratio.

Table 1 presents the measurement and data collection sources of all variables in the research model.

Table 1: Formula for measuring variables

Variable code	Variable name	Determination formula	Source
ROA	Return on assets	Profit after tax/Average assets	Wieczorek-Kosmala et al. (2021), Chen (2020), Zeitun et al. (2015); Abor (2005)
ROE	Return on equity	Profit after tax/Average equity	Wieczorek-Kosmala et al. (2021), Chen (2020), Zeitun et al. (2015); Abor (2005)
Lia	Financial leverage	Total debt/Total assets	Dawar (2014), Agburuga & Ibanichuka (2016), Pavan Kumar (2017), Zeitun et al. (2015);
Size	Enterprise's size	Natural logarithm of total wealth	Zeitun et al. (2015); Pavan Kumar (2017), Sen & Ranjan (2018), Chen (2020).
Tang	Level of fixed asset investment	Fixed assets/Total assets	Pavan Kumar (2017), Zeitun et al. (2015); Sen & Ranjan (2018).
Liq	Liquidity ratio	Short-term assets / Short-term liabilities	Pavan Kumar (2017), Sen & Ranjan (2018).

Source: Author's summary

4. Research methodology

Applying the purposeful sampling method, the author determines the research sample includes 769 listed companies in Vietnam under the following conditions: (i) The company's shares are still in the listing status as of now. As of December 31, 2022, (ii) The companies have complete financial statements for the year 2012 to 2022, (iii) All financial statements have been audited and the audit reports for reasonable and truthful approval in accordance with the principle of materiality. The article uses secondary data from the financial statements of companies for a continuous period of 11 years, collected through the company's data system FiinPro.

To answer the first research question and test hypothesis H1, with the research data in the form of a balanced panel, the author uses the basic estimation methods, which are the pooled regression model (POLS), random effects models (REM) and fixed effects models (FEM); at the same time, Hausman test and Redundant Fixed Effects test to choose a more suitable model. In addition, the author also tests multicollinearity, autocorrelation and variance of variance; If these problems occur, the general least squares (GLS) model is used to overcome (Susmel, 2015). To answer the second research question, based on the analysis results of the nonlinear impact of financial leverage on profitability, if this relationship is confirmed, the author will determine the threshold of leverage to maximize the profit using the derivative method. Specifically, according to the regression equation set up in Section 3 as follows:

(i) The derivative of ROA, ROE in terms of Lia is $\beta_1 + 2\beta_2$ Lia; Therefore, ROA, ROE is highest when Lia is $-\beta_1/2\beta_2$

5. Research results and discussion

5.1. Descriptive statistics results

The results of descriptive statistics for the variables are summarized in Table 2a. Accordingly, the average return on assets (ROA) is 5.30%, the lowest is -62.45%, the highest is 83.90%. Return on equity (ROE) has an average value of 10.32%. This shows that companies are guaranteed to be profitable after tax.

Financial leverage (Lia) is determined on the basis of liabilities to total assets, the average is 43.31% and ranges from as low as 0.01 (Stock TEG, 2014), the highest is 99.17% (Vietnam Airlines Company, stock code HVN, 2021). Thus, the fluctuation range of financial leverage is very large between companies.

In addition, table 2 also provides descriptive statistical information of the control variables, which is the variable (Size) of the asset with an average value of 10,940 billion VND, the level of fixed asset investment (Tang) and liquidity factor (Liq) have an average value of 21.40% and 2.42 rounds, respectively. This mean suggests that there is no multicollinearity among the independent variables.

Table 2a: Descriptive statistics of variables

Variable	Obs	Mean	Std. Dev.	Min	Max
ROA	8,459	0.053028	0.076065	-0.62458	0.839056
ROE	8,459	0.103189	0.18926	-7.50341	2.93092
Lia	8,459	0.433137	0.259052	0.0100	0.99167
TTS (billions VND)	7,843	10,940	85,400	6,100	2,120,527
Size	7,842	27.58962	1.854617	22.53163	35.29044
Tang	8,459	0.2140	0.2043	0.0000	0.9400
Liq	8,459	2.4245	3.2413	0.1716	64.2247

Source: Extracted from the author's data processing results

Table 2b shows the results of the variables by year. For the profit indicator measured by return on equity (ROE), the average value of the years from 2012 to 2021 ranges from 0.07 to 0.12. In which, in 2012 ROE was the lowest (0.07), in 2015 ROE was the highest (0.12). For the return on assets (ROA) indicator, the average value is 0.04 - 0.06, this result shows the stability of ROA over the years. In general, 2012 is where the ROA and ROE indexes have the lowest value. Because, this is the period when Vietnam's economy is affected by the global economic crisis. After that, the Government of Vietnam must implement synchronously strong solutions to stabilize the macro-economy and restructure the economy, giving priority to tightening monetary policy to control inflation. Therefore, from 2015 onwards, the economy in general has recovered, so ROA and ROE of enterprises tend to increase. By 2020-2021, the economy of Vietnam and the world is affected by the COVID-19 epidemic, so the indicators of business performance are low, especially in the service, transportation, and aviation industries.

Table 2b shows the fluctuations of the coefficients year over year for the period 2012-2022, showing that the debt/assets ratio (Lia) is quite stable over the years with a range of 0.41-0.45. In which, 2014 has the lowest Lia coefficient (0.02), in 2021 has the highest Lia coefficient (0.99).

Table 2b: Descriptive statistics of variables

Year	ROA		ROE			Lia			
	mean	max	min	mean	max	min	mean	max	min
2012	0.046	0.5964	-0.3172	0.0743	0.7134	-7.5034	0.41	0.78	0.0812
2013	0.0442	0.7426	-0.3697	0.0891	0.8946	-1.5215	0.41	0.69	0.0601
2014	0.054	0.6218	-0.3609	0.1139	1.5609	-1.2428	0.43	0.87	0.0210
2015	0.0618	0.8391	-0.2924	0.1221	1.4907	-0.9993	0.43	0.68	0.0510
2016	0.0585	0.536	-0.6246	0.1168	0.7767	-0.9532	0.43	0.90	0.0100
2017	0.0617	0.5465	-0.5172	0.1248	1.0616	-1.0743	0.44	0.96	0.8514
2018	0.06	0.8122	-0.3697	0.1169	1.6075	-1.6872	0.45	0.98	0.2365
2019	0.0528	0.4914	-0.3642	0.1085	2.9309	-0.559	0.45	0.59	0.2547
2020	0.046	0.4285	-0.227	0.0916	0.6357	-0.8855	0.45	0.76	0.1568
2021	0.0536	0.5561	-0.2557	0.0997	0.6462	-3.9133	0.45	0.99	0.1548
2022	0.0447	0.6126	-0.4355	0.0774	2.1607	-1.9023	0.42	0.89	0.2658

Source: Extracted from the author's data processing results

5.2. Correlation coefficient matrix

Table 3 presents the correlation coefficient matrix between the variables. At 1% significance level, financial leverage (Lia) is negatively correlated with ROA, the correlation coefficient is (-0.1542) but positive correlation with ROE, the correlation coefficient is 0.0171. In addition, the enterprise size variable (Size) is not correlated with ROA and ROA, while the remaining control variables (Tang) are positively correlated with the dependent variable, the variable (Liq) is negatively correlated.

Table 3: Correlation coefficient matrix

	ROA	Lia	Lia ²	Size	Tang	Liq
ROA	1					
Lia	-0.1542 0.0000	1				
Lia ²	-0.2363 0.0000	0.0545 0.0000	1			
Size	-0.0036 0.7529	0.0194 0.0861	0.0158 0.162	1		
Tang	0.2284 0.0200	0.1057 0.0000	0.0768 0.0000	-0.0064 0.5704	1	
Liq	-0.1606 0.0000	0.4301 0.0000	0.1092 0.0000	0.021 0.0628	0.195 0.0000	1
	ROE	Lia	Lia ²	Size	Tang	Liq
ROE	1					
Lia	0.0171 0.0000	1				
Lia ²	-0.0338 0.0018	0.0545 0.0000	1			
Size	-0.0054 0.6311	0.0194 0.0861	0.0158 0.162	1		
Tang	0.0676 0.0000	0.1057 0.0000	0.0768 0.0000	-0.0064 0.5704	1	
Liq	-0.2401 0.0000	0.4301 0.0000	0.1092 0.0000	0.021 0.0628	0.195 0.0000	1

Source: Extracted from the author's data processing results

Regarding the correlation between the explanatory variables shown in Table 3, the correlation coefficient received a positive value ranging from 0.0019 to 0.57049 and a negative value ranging from 0.0054 to 0.2400. These results suggest that multicollinearity is not a serious problem in the research model (Hair et al., 2006; Gujarati, 2008). In addition, the VIF coefficients are all very small, from the lowest level of 1.1257 to the highest of 2.3841, which confirms the absence of serious multicollinearity (Hair et al., 2006; Gujarati, 2008).

5.3. Regression results

Performing regression to prove the nonlinear impact of financial leverage on ROA and ROE of the enterprise is done as follows. With the selection derived from the simultaneous use of OLS, FEM and REM estimation methods, the Redundant Fixed Effects test results with a P-value less than 5% determine that FEM is more suitable than OLS, besides the results. Hausman test with P-value less than 5% determines that FEM is more suitable than REM. Thus, the author finds FEM more suitable than OLS and REM to estimate the nonlinear impact of financial leverage on profitability for the case of enterprises listed on Vietnam stock market in the period 2012- 2022.

According to Hair et al (2006), Susmel (2015), FEM is only interested in considering individual differences contributing to the model, so it concludes that the model has no autocorrelation problem. However, based on the FEM estimation results, the Modified Wald test is used and the P-value is less than 5%, indicating that the model

has variable variance. To fix the problem of variable variance, the author chooses to use the GLS method and the results are presented in the last column of Tables 4 and 5.

In Table 4, the results of GLS estimation on the impact of financial leverage on ROA show that the coefficients of β of Lia and lia2 are 0.451 and -0.385, respectively, with statistical significance at 1%. This result indicates that financial leverage has a quadratic nonlinear effect on profitability in an inverted U-shape. Accordingly, the author determined the financial leverage threshold is 58.6%, then ROA is the highest (0.132). The detailed results are shown in Table 4 and Figure 1:

Table 4: The impact of financial leverage on ROA

	OLS	FEM	REM	GLS
Lia	0.199*** [18.52]	0.229*** [16.41]	0.210*** [16.64]	0.451*** [18.14]
Lia ²	-0.299*** [-22.63]	-0.301*** [-18.09]	-0.295*** [-19.47]	-0.385*** [-15.26]
Size	-0.0000236 [-0.06]	-0.00155 [-1.34]	-0.000491 [-0.66]	-0.000685 [-0.78]
Tang	0.0136*** [21.90]	-0.00848*** [-8.65]	0.000492 [0.59]	0.000761 [0.61]
Liq	-0.000826*** [-2.87]	0.000454* [1.72]	-0.0003 [-1.16]	-0.0009 [-1.28]
_cons	0.0286** [2.40]	0.0828*** [2.60]	0.0507** [2.47]	0.0673** [2.54]
N	7842	7842	7842	7842
R-sq	0.159	0.058		
Prob (F-statistic)	0.0000	0.0000	0.0000	0.0000
White's test	Prob>chi2=0.0000			
Wooldridge test	Prob>F= 0.0000			
Modified Wald test		0.0000		
Hausman test		913.43 0.0000		

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Source: Summary of the author's data processing results

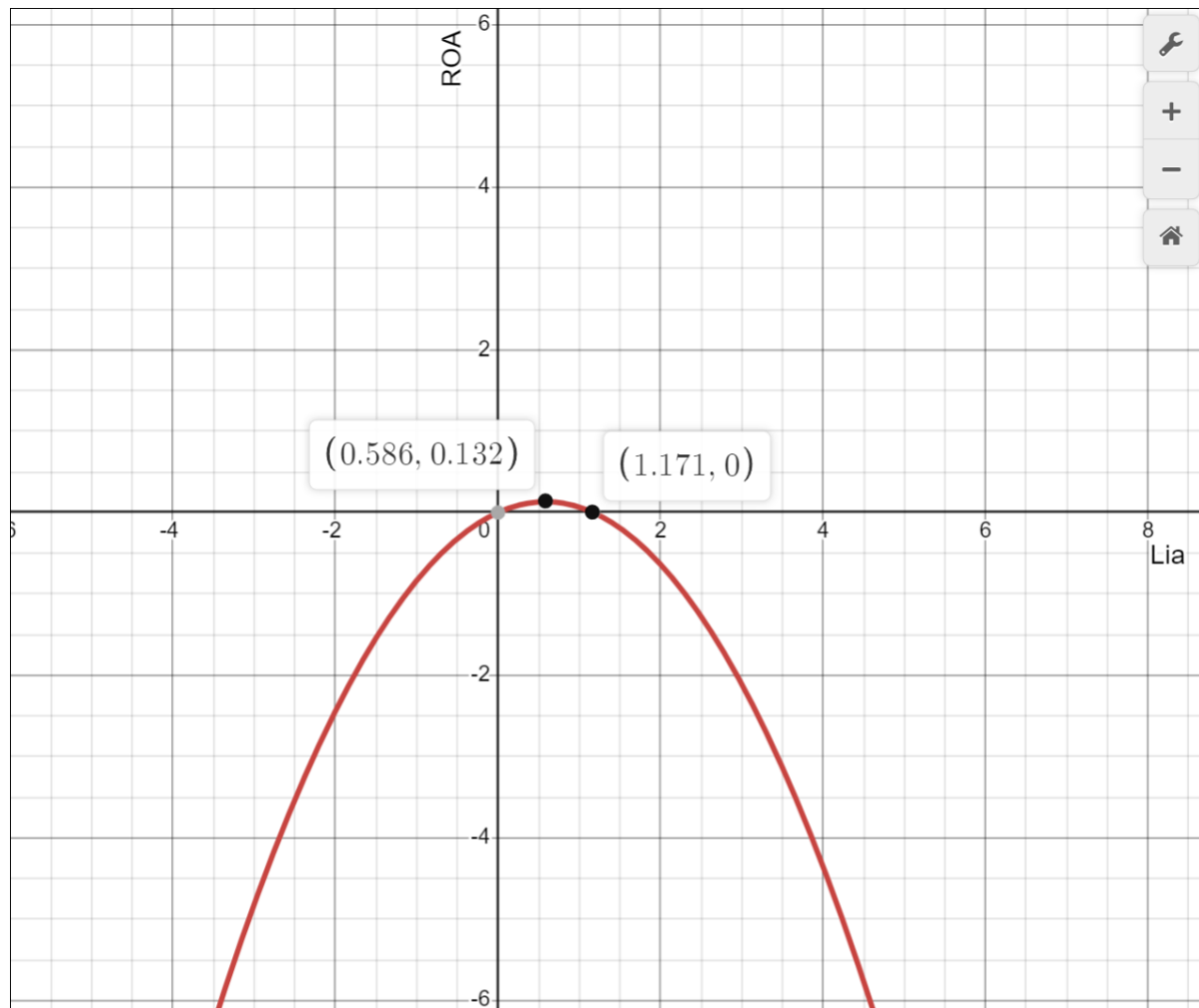


Figure 1: Nonlinear graph of the impact of financial leverage (Lia) on ROA

Source: Extracted from the author's data processing results

Figure 1 also shows that when financial leverage increases above 58.6% ROA tends to decrease, especially, when financial leverage reaches 100%, ROA will be 0.

The nonlinear effect of financial leverage on ROE is also confirmed in Table 5 below. Based on the GLS estimation results, it is also an inverted U-shaped nonlinear relationship. The β coefficients of Lia and lia2 are 0.518 and -0.412, respectively, with statistical significance at 1%. Accordingly, the author finds that the threshold for financial leverage represented by the debt-to-assets ratio (Lia) is 62.9% for ROE to reach the highest level (0.163). The detailed results are shown in Table 5 and Figure 2:

Table 5: Impact of financial leverage on ROE

	OLS	FEM	REM	GLS
Lia	0.278*** [-9.98]	0.570*** [-13.61]	0.365*** [-10.96]	0.518*** [-11.12]
Lia ²	-0.228*** [-6.69]	-0.488*** [-9.77]	-0.308*** [-7.66]	-0.412*** [-8.76]
Size	-0.000233 [-0.21]	-0.00162 [-0.46]	-0.000262 [-0.17]	-0.000128 [-0.35]
Tang	0.0148*** [-9.27]	-0.0455*** [-15.45]	-0.00297 [-1.45]	-0.00381 [-2.37]
Liq	-0.0146***	-0.0124***	-0.0152***	-0.0212***

	[-19.59]	[-15.60]	[-20.24]	[-18.13]
_cons	0.0515*	0.0974	0.0572	0.0972
	[-1.67]	[-1.02]	[-1.3]	[-1.4]
N	7842	7842	7842	7842
R-sq	0.082	0.125		
Prob (F-statistic)	0.0000	0.0000	0.0000	0.0000
White's test	Prob>chi2=0.0000			
Wooldridge test	Prob>F= 0.0000			
Modified Wald test	0.0000			
Hausman test	573.97 0.0000			

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Source: Summary of the author's data processing results

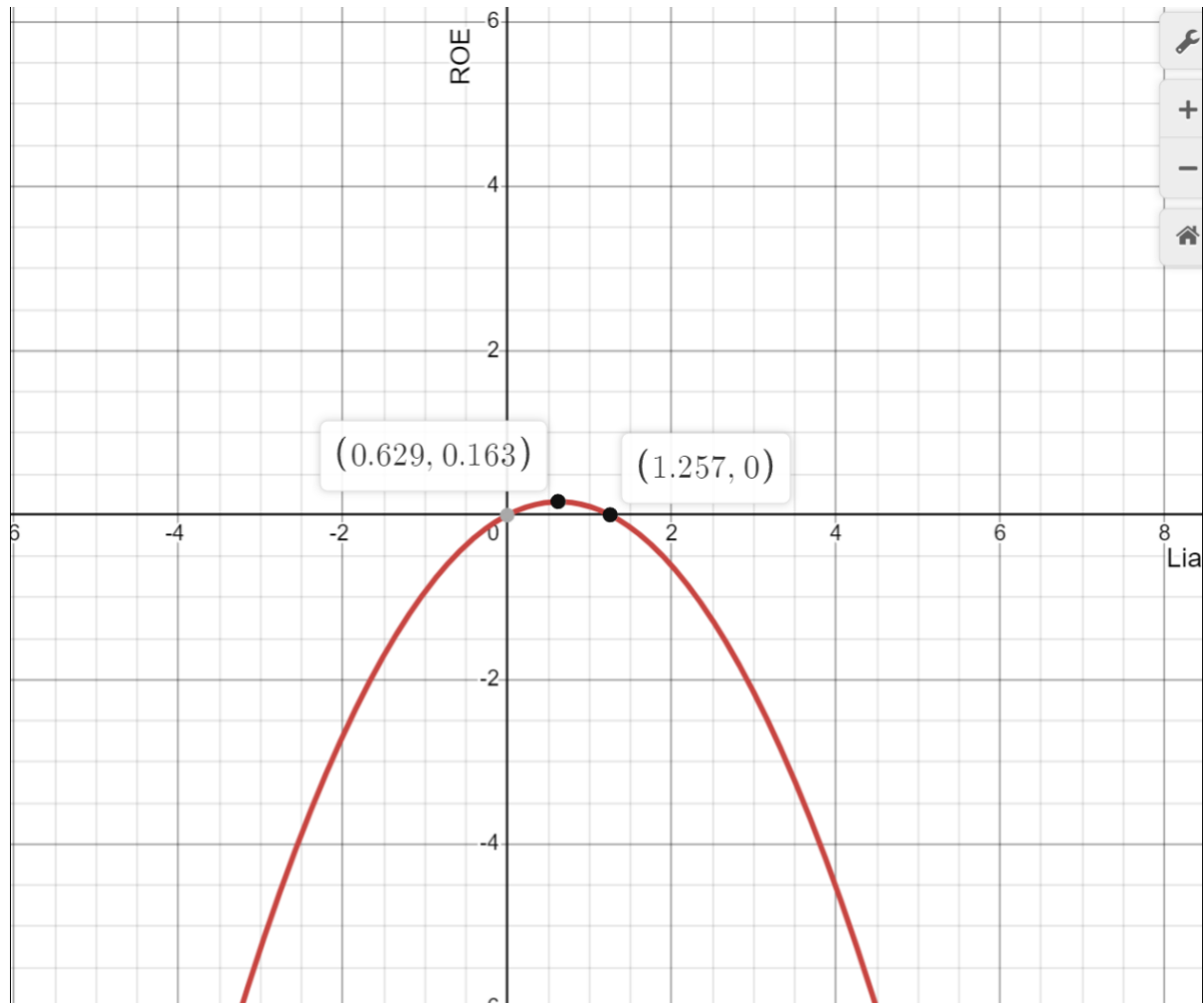


Figure 2: Nonlinear graph of the impact of financial leverage (Lia) on ROE

Source: Summary of the author's data processing results

5.4. Discussion

The results of the study found evidence of an inverted U-shaped nonlinear effect on ROA and ROE for the case of listed companies in Vietnam, which supports the research hypothesis H1. ROA is highest when the level of financial leverage expressed in debt ratio is 58.6%. ROE is highest when the level of financial leverage expressed in debt ratio is 62.9%. When these thresholds are not exceeded, financial leverage has the effect of increasing ROA and ROE of enterprises. Therefore, it has a positive impact on profits. The results of this empirical study support the experimental studies of Nieh et al. (2008); Yang et al. (2010); Berzkalne (2015) on second-order nonlinear effects, supporting the authors Silambarasan & Azhagaiah (2015), Shahzad et al. (2016), Tayyaba (2013), Habib (2014), Kumar (2014), Patel (2014) about the linear effect. Moreover, the nonlinear relationship according to the results of the study just mentioned supports the theory of trade-offs in capital structure, if the level of financial leverage formed from debt is low, the net benefit will be positive and contribute to increase profits and vice versa. In addition, the existence of an inverted U-shaped effect of financial leverage on profitability can also be explained by the relationship between the level of debt use and the cost of debt, thereby deciding whether or not to have effective use of debt. If the debt ratio increases but is still within the maximum limit so that companies can control the cost of debt well and ensure the effective use of debt, the profit will still increase. In contrast, excessive and increased debt utilization often leads to very substantial increases in interest rates where the income from additional investments may not be sufficient to cover the cost of debt and negative impact from debt use on profitability. In addition to the impact of financial leverage on profits, the estimation results in Tables 4 and 5 also provide that the profits of companies listed on the Vietnamese stock market are also affected in the same direction with the company's liquidity (Liq).

6. Conclusion and recommendations

Profit is the basic and primary financial goal of companies, so it requires the company's managers to fully and reliably identify the relationship between profits and financial decisions. In the case of listed companies in Vietnam, the paper finds evidence of the existence of an inverted U-shaped nonlinear effect of financial leverage on profitability, and estimates the threshold at which profit is profit expressed in return on assets (ROA) and return on equity (ROE) reached the highest level for financial leverage represented by debt ratio (Lia) times 58, 6 and 62.9%. The research results suggest that companies need to determine a reasonable limit for the use of leverage in relation to the target profit, from which a reference to adjust the current leverage. Some recommendations for businesses are as follows:

If a business maintains a high debt ratio, the risk of the business is also high. Businesses will face financial distress when they are unable to pay their debts. This situation can cause some trouble for the business or the business may go bankrupt. In contrast, the issue of shares can help public companies attract a large amount of capital to expand the scope of business activities. However, the cost to issue common shares is high and the pressure to maintain the growth rate increases on enterprises. Enterprises also face other risks such as loss of control, company value decline if it does not meet investors expectations. Therefore, the selection of funding sources is an important issue. If financial leverage is used, a reasonable capital structure must be determined.

According to agency cost theory, debt is like a mechanism to monitor and encourage the performance of the board of directors because of the positive relationship between debt ratio and financial difficulties of the company. But considering the conflict between shareholders and creditors, debt has the effect of increasing agency costs. As debt levels rise, creditors tend to demand a higher interest rate on loans to compensate for the risks they may face. Each capital raising tool is issued, businesses have to spend certain costs. For debt instruments, the business needs to pay interest, for equity instruments, the business needs to meet investors' expectations through the level of dividends paid or the growth of the business in the future. Therefore, the policy on capital structure needs to harmonize the interests of shareholders, the Board of Directors, the executive board and creditors.

The article has provided more rigorous empirical evidence on the use of financial leverage system in companies, through which financial managers can refer to make appropriate decisions. Other actors have an information channel to compare and derive the leverage efficiency of companies. Although the article has made certain

contributions as mentioned above, the explanations for the existence of nonlinear effects of each lever need to be further explained by factors such as revenue growth, investment efficiency, operating leverage, for indicators of enterprise profitability, future research can be extended to indicators such as return on sales (ROS), return on invested capital (ROI), earnings per share (EPS), market value to book value of stock (Tobin'Q).

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