

# “Relationship between cash holding and capital structure of Vietnamese public companies in the COVID-19 pandemic context”

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# RELATIONSHIP BETWEEN CASH HOLDING AND CAPITAL STRUCTURE OF VIETNAMESE PUBLIC COMPANIES IN THE COVID-19 PANDEMIC CONTEXT

## Abstract

Determining the capital and cash holdings pattern is among the most critical decisions of firm executives. This study investigates the link between cash holdings and capital structure to help executives consider the best pattern of capital and cash. The study collected a sample of 5,747 observations from public companies in Vietnam during 2019–2022 and employed the panel data regression method for analysis. The findings demonstrate a correlation between capital structure and cash holding ratio that is statistically significant. However, these relationships are inconsistent between the cash holdings and each component of the capital structure. Current debt and total debt ratios have a positive and linear association with cash holdings, while non-current debt ratio has a negative and nonlinear association. The study highlights a heterogeneous association of the cash holding ratio with three proxies of debt structure. The results reveal that, during COVID-19, the effects of the non-current debt ratio on cash holding and of cash holding on the current debt ratio have no statistical significance.

## Keywords

capital structure, cash holding, COVID-19 pandemic

## JEL Classification

G11, F61

## INTRODUCTION

The characteristics of an imperfect market economy are taxes, transaction costs, and friction. Cost of transaction and frictions are real constraints that businesses must consider when deciding on a capital structure and financing strategy. Most empirical capital structure studies consider debt as uniform, despite heterogeneity, meaning that companies simultaneously use various sources, types, and priorities of debt (Rauh & Sufi, 2010). Firms must consider the configuration of friction, transaction costs, and information asymmetry in capital markets and harmonize the opportunity cost of holding cash against the advantage of having cash in ensuring further investment funding (Loncan & Caldeira, 2014). Pecking order theory proposes similar forecasts of cash holdings to leverage. Cash would be a buffer between profit retained and investment demand; thus, there is no idea level of optimum cash (Ferreira & Vilela, 2004; Myers & Majluf, 1984). The balance between cash and debt leverage in capital structure is optimal when marginal cost and benefit intersect.

The relationship between debt leverage in the financial structure and the volume of cash held by enterprises has been studied globally. However, most previous studies only found the impact of the degree of debt used in capital structure on cash holdings or the inverse relationship (Denis & Sibilkov, 2010). A recent study by Loncan and Caldeira

(2014) on the relationship between debt leverage in the financial structure and the cash holdings of listed companies in Brazil, an emerging market, reveals that the amount of current and non-current debt utilized in the financial pattern is adversely associated with cash holdings. Loncan and Caldeira (2014) suggest a connection between the debt amount used in the financial structure and the cash holdings of Brazilian listed corporations.

The COVID-19 pandemic spread globally from the end of 2019, impacting all aspects of social life, economic and social perspectives in Vietnam. In early 2022, the Vietnamese government reopened international trade and enacted policies to recover the economy. However, two years of the COVID-19 pandemic have caused long-term impacts on business activities, especially cash flows and corporate capital structure. Some studies investigate cash holding or capital structure in Vietnam (Hung et al., 2020).

## 1. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

A firm operating in a perfect capital market does not have the demand for cash holdings due to the availability of external finance sources without transaction costs. However, an imperfect capital market requires transaction costs for a firm's funding. Two baseline theories, trade-off theory and pecking-order theory, focus on how an enterprise manages its debt, equity, and cash holding to fund its operations.

Trade-off theory states that corporates maximize their firm values by judging the marginal benefits and marginal costs of holding cash, and they must consider the balance between capital structures and cash holdings (Modigliani & Miller, 1958). To raise the market value, firms typically maintain cash at an optimal level and modify their current capital structure to the optimal one. The conclusions from Modigliani and Miller (1958) are valid, but only in ideal capital markets with no corporate income tax. The two contend that under the presumptions mentioned above and in a fully competitive market, shareholders will not allow the business to gain from increased debt. Shareholders adjust their capital structures to get more money while maintaining the same level of revenue. Therefore, the company's capital structure change from utilizing debt to using debt will not significantly affect shareholders. In particular, Modigliani and Miller (1958) contend that when non-debt-free businesses transition to a debt-based capital structure, rising stock prices allow shareholders to sell expensive company shares.

Businesses then borrow money and purchase company shares without incurring debt through concurrent purchasing and selling. Investors can improve their revenue without increasing risk with these no-fee trades; as a result, they substitute personal leverage for financial leverage provided by the corporation. And the company has tended not to change its capital structure in a way that would affect its market valuation, and its cash holdings would remain the same regardless of how the market viewed the firm's stock. Modigliani and Miller (1958) conclude from the abovementioned justifications that capital structure won't impact the company's cash holdings. Furthermore, some researchers focus on developing markets. They stress that market imperfections in developing markets are more severe than in developed markets, and bankruptcy-related costs are higher; trade-off theory can give reasons for cash holding decisions in these emerging market (Al-Najjar, 2013; Al-Najjar, 2011).

Pecking order theory recommends that firms have no ideal level of cash holdings. The information asymmetry between corporate managers and outside stakeholders is the foundation of the pecking order theory (Myers & Majluf, 1984). Corporations frequently choose internal funding over external investment. Additionally, firms use capital structure over issuing shares when employing outside financing. The goal is to reduce corporate losses and the costs associated with knowledge asymmetry. Due to the circumstances, a company's directors have extensive knowledge about the risks it faces and the rate at which it will expand through investment projects. When corporate managers share information with the public, investors will view this information source differently. Firms must pay for audits and the costs of persuading in-

vestors to fund their ventures. The deployment of internal or external capital will then have an impact on the business's value. Pecking order theory states that inside capital should come first when choosing a firm's funding source. The cause is that alternative funding methods could be more difficult and expensive. CFOs do not have to spend transaction expenses persuading or outlining their options to outside investors if the company uses its internal capital. Debt financing is preferred over issuing new shares because it is less expensive and provides tax benefits (Myers, 1984). Pecking order theory suggests that issuing additional shares is the final choice because companies must give shareholders a lot of information about investment projects, and the cost of issuing additional shares is relatively high. Companies must reveal information while borrowing, but the requirements are less stringent. Thus, companies often require less debt financing when internal finance is prioritized. A company will therefore tend to utilize less debt financing as its cash reserves grow due to retained earnings. In other words, financial leverage, a measure of capital structure, shows a negative association with cash holdings.

There are many preceding studies on the connection between cash holdings and funding structure; however, the interpreted results are diverse and inconsistent. There are two streams in previous studies about this relationship. To extend streamlines, this paper will examine and verify the interrelationship between firm capital structure and its cash holding.

The first stream of studies describes the influence of capital patterns on the amount of money held. The effect of the level of debt used in capital structure on cash holdings is explained by the agency problem when having cash. With a high cash holding ratio, company shareholders often suffer when business managers can use some money for personal purposes without maximizing income for company owners. Companies' shareholders often require managers to keep a low cash-holding ratio and use external debt financing sources. By using debt funding sources, a firm's management will be more closely regulated by creditors, solving the issue of agency costs. Studies confirm the negative impact of capital patterns on cash holding in different contexts. Kim et al. (1998) reveal capital structure levels are in-

versely correlated with cash holdings of US industrial corporations. This correlation demonstrates that US industrial firms anticipate poor operating cash flow; therefore, the less cash they store, the more debt they use. Opler et al. (1999) discover an adverse correlation between the amount of debt utilized in an enterprise's capital structure and cash holdings in publicly traded US companies from 1971 to 1994. The issue of representation and knowledge asymmetry explains the cause of this negative correlation. Notably, a high level of financial leverage indicates that a firm can quickly raise capital from the market. Then, shareholders often demand that corporate management maintain less capital by distributing excess cash in cash dividends, limiting losses and damages to shareholders. Shareholders require that corporate managers maintain minimal cash to decrease information asymmetry between them and external stakeholders. Ozkan and Ozkan (2004) also demonstrate a negative association between UK-listed corporations' cash holdings and the amount of debt utilized in their capital structures between 1963 and 2000. Anderson and Hamadi (2016), with a sample of listed companies in Belgium between 1991 and 2006, carry out three regression techniques that the debt amount in the financial structure affects the cash holdings of Belgian-listed companies. As a result, from 1991 to 2006, the cash holdings of listed companies in Belgium were negatively impacted by the debt amount utilized in the financial structure. Anderson and Hamadi (2016) explain that corporations with high financial leverage will have low cash if they can raise capital from outside sources because of the ease of accessing capital markets. Bates et al. (2009) summarize four reasons companies require a large quantity of cash on hand, which is one of the further explanations for the adverse association between the amount of debt used in financial structure and the amount of cash holding. The first is the transactional motive, whereby corporations hoard cash to pay for expenses spent to avoid paying additional costs when selling corporate assets for cash, like transaction or commission costs. The second reason is hedging, whereby businesses frequently hold a significant cash ratio against adverse shocks. The third reason is the tax incentive, which is relevant to multinational corporations since it lowers the tax burden when transferring profits abroad if they have a high cash ratio. Finally, the fourth motive is the agency motive because entrenched managers tend to hold more cash. However, corporate

shareholders frequently require that managers maintain less cash to prevent losses brought on by agency issues, arguing that companies should instead increase dividend payments to shareholders. Creditors can supervise company management, reducing agency issues (Ferreira & Vilela, 2004). As a result, companies tend to have high levels of financial debt and less cash. Leveraged firms are more likely to keep cash to reduce the likelihood of financial burden (Al-Najjar, 2013). However, if corporates quickly access capital markets, firms with high leverage will have less cash (Loncan & Caldeira, 2014; Maheshwari & Rao, 2017). Vietnamese listed firms frequently employ debt if operating cash flow projections are low, resulting in modest cash holdings. There is a lack of interrelationship between cash holding or capital structure in Vietnam and a lack of evidence in the COVID-19 pandemic context. This paper aims to explore the connection between capital structure and corporate cash holdings in the context of the COVID-19 pandemic. The study also tests and compares these effects before and during the COVID-19 pandemic. This study developed the following hypothesis:

$H_1$ : *The capital structure's short-term, long-term, and total debt ratio has a negative effect on cash holdings.*

Conversely, some researchers investigate the effect of cash holdings on a company's capital structure. Pecking order theory explains how cash holdings affect how much debt is utilized in the capital structure. The information asymmetry between corporate executives and outside stakeholders is the foundation of the pecking order theory (Myers & Majluf, 1984). Consequently, companies frequently choose internal investment over external funding. Additionally, companies use debt over issuing shares when employing outside financing. This arrangement reduces information asymmetry and associated expenses, including transactions, issuance, and agency costs. Pecking order theory states that corporate managers have access to more information than outside investors regarding a business's development potential, hazards, and other values. Firms must pay costs for audits and additional costs associated with persuading investors or creditors. According to the pecking order theory, firms prefer to use cash from retained earnings and internal sources to finance the

company's investment needs. If internal finance is insufficient, external funding options, including issuing debt securities, are a backup plan. Loncan and Caldeira (2014), with a sample of Brazilian public companies from 2002 to 2012, revealed a negative connection between cash holdings and debt amount utilized in the capital structure. Both Loncan and Caldeira (2014) and Maheshwari and Rao (2017) demonstrate that financial leverage will decrease if firms hold a lot of cash. Most earlier studies have shown a negative correlation between cash holdings and debt amount utilized in the capital structure. However, Deloof (2003) discovered a positive connection between cash holding and capital structure. The reason stated is that a company engages in debt financing with a high debt ratio running into financial trouble when its financial leverage surpasses benchmarks. Suppose the company does not generate enough profits to meet its contractual financial obligations with its creditors by the time the debt is due. In that case, it will fall into financial burden or bankruptcy. From these arguments, this study developed the following hypothesis:

$H_2$ : *The cash holding ratio affects how much debt is utilized in the capital structure of enterprises.*

## 2. METHODOLOGY

Based on the literature review this study proposed two following models to test the interrelationship between corporate financial structure and its cash holding.

Model 1

$$CHR_{it} = \beta_0 + \beta_1 CS + \text{Control variables}_{it} + \varepsilon_{it} \quad (1)$$

Model 2

$$CS = \beta_0 + \beta_1 CHR_{it} + \text{Control variables}_{it} + \varepsilon_{it} \quad (2)$$

where  $CHR$  – Cash holding ratio,  $CS$  – Capital structure with three proxies, including short-term/current debt (STD), long-term/non-current debt (LTD), and total debt (TD).

Also, in model 1 and model 2, this study considered whether the connections between capital structure and money holding are nonlinear. The study squared the capital structure and money holding variables to test the nonlinear relationships. The variables in the two models are depicted in detail in Table 1.

**Table 1.** Instrument measurement

Variables	Variable code	Instrument
Cash holding ratio	CHR	Cash/ Total assets
Capital structure	CS	
Current ratio	STD	Current debt/Total assets
Non-current ratio	LTD	Non-current debt/Total assets
Total debt ratio	TD	Total liabilities/Total assets
Control variables		
Profitability	ROA	Net profit /Total assets
Firm size	SIZE	Log (Revenue)
Dividend rate	DY	Cash dividends/Stock price
Current ratio	LIQ	Current assets/Current debt

The context of COVID-19 was shown as a dummy variable; COVID-19 = 1 refers to the period from 2020 to 2022, while COVID-19 = 0 refers to the year 2019.

The study used secondary data from the financial reporting of Vietnamese public companies between 2019 and 2022. There are 5,747 observations, including 1,449, 1,452, 1,453, and 1,393 firms in 2019, 2020, 2021, and 2022, respectively. The data included eight industries, excluding the financial, banking, insurance, and securities sectors, due to their unique regulations in presenting financial reporting. As shown in Table 2, manufacturing

firms accounted for the highest rate, with 37.4%, followed by 20.8% of firms in the construction and real estate sectors.

This study used a panel data regression approach. The regression method employed is the fixed-effects method (FEM), fixed years, and sectors when doing estimates. FEM is a suitable method for panel data.

### 3. RESULTS

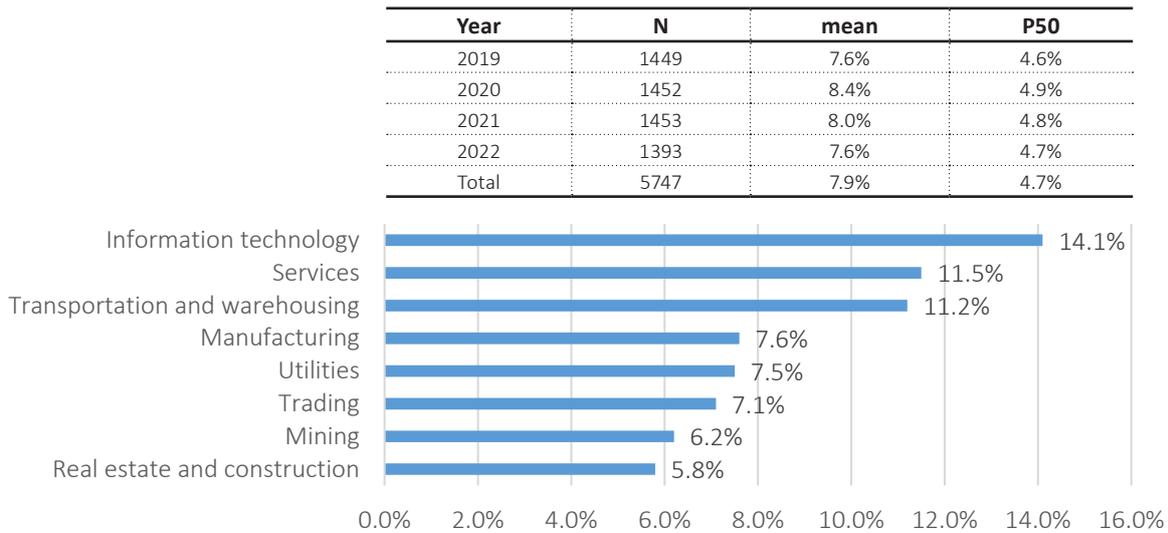
From 2019 to 2022, the cash holding ratio has had minor fluctuations. In 2019, the proportion of cash holding accounted for 7.6% of total assets. In 2020, it increased to 8.4%, followed by a slight downward trend of 8% and 7.6%, respectively, in 2021 and 2022. Regarding industries, the cash holding ratio with high levels is information technology, with a rate of 14.1%, followed by the service industry at 11.5%. In comparison, the real estate and construction industry has a low % cash holding rate of 5.8% (Figure 1).

The analysis results of capital structure in 2019–2022 are shown in Figure 2. The finding indicates that the structure of debt tends to increase. Short-term debt (STD) had a rate of 48.5% in 2019 and then expanded to 55.0% in 2022, making the total debt ratio (TD) also tend to increase from 52.4% to 65%. Meanwhile, the long-term/non-current debt ratio tends to be stable at around 10%.

In Figure 3, the industries with a high ratio of short-term/current debt and total debt are the manufacturing and trading industries, followed by the construction & real estate industries. In contrast, the industry with a low debt ratio is the utility industry.

**Table 2.** Summary of data by year and business sector

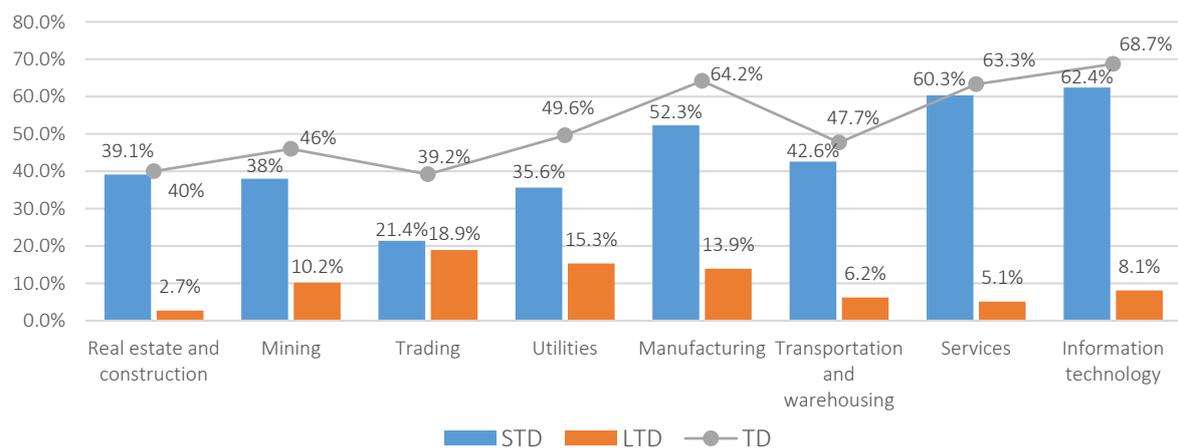
Industry	2019	2020	2021	2022	Total	Proportion
Information technology	47	47	46	41	181	3.1%
Mining	56	56	53	51	216	3.8%
Utilities	134	134	134	131	533	9.3%
Transportation and warehousing	132	132	130	127	521	9.1%
Real estate and construction	301	303	305	288	1,197	20.8%
Services	96	98	98	96	388	6.8%
Trading	144	141	143	134	562	9.8%
Manufacturing	539	541	544	525	2,149	37.4%
Total	1,449	1,452	1,453	1,393	5,747	100%



**Figure 1.** Cash holding ratio of listed companies by year and industry



**Figure 2.** Results of the capital structure by year



**Figure 3.** Results of the capital structure by industry

Table 3 shows that the average cash holding ratio is 7.9% of total assets. Regarding the capital structure, the mean of the current debt ratio (STD) is 51%, the non-current debt ratio (LTD) is 10%, and the total debt ratio (TD) is 60%. Profitability with a proxy of return on total assets (ROA) is 4.7%, the

average current ratio is 2.8, and the average dividend rate of enterprises is 8.5%.

Table 4 reveals the correlation analysis results between variables. The correlation analysis aims to test whether or not there are strong relation-

**Table 3.** Descriptive statistics of variables

Variable	Obs	Mean	Std. Dev.	Min	Max
CHR	5,747	0.079	0.095	0.000	0.863
STD	5,747	0.509	1.800	0.001	79.215
LTD	5,747	0.105	0.237	0.000	7.167
TD	5,747	0.596	1.840	0.000	79.280
ROA	5,747	0.047	0.152	-5.347	1.307
SIZE	5,747	27.089	1.663	16.722	33.990
LIQ	5,747	2.807	8.837	0.000	408.731
DY	5,747	0.085	1.700	0.000	120.000

ships between the dependent variable and the independent variables; then, it is to remove factors leading to multicollinearity in regression analysis. The correlation coefficients between independent variables with no pair are higher than 0.8, so there is a low possibility of multicollinearity between the independent variables when doing regression analysis. Except that the correlation between the total debt ratio (TD) and current debt ratio (STD) has a strong correlation, so if performing the regression to include the same model, multicollinearity will occur. This study conducts regression analysis into sub-models with different capital structure proxies.

In the next step, this study examines two models, model 1 and model 2, using a dataset from 2019 to 2022. The results are described in Table 5 and Table 6. Table 5 depicts the regression analysis results of model 1, answering hypothesis H<sub>1</sub>, which states a negative impact of capital structure on the cash holding ratio. As seen in Table 5, the debt level used in the capital structure statistically significantly influences the cash holding ratio. The study continues testing the impact of capital structure on cash holdings is linear or nonlinear correlated. The research square capital structure variables, the results give us the current debt ratio (STD) and total debt ratio (TD) have a linear relationship.

**Table 4.** Autocorrelation matrix results

	CHR	STD	LTD	TD	ROA	SIZE	LIQ	DY
CHR	1							
STD	-0.0105	1						
LTD	-0.1277	0.0916	1					
TD	-0.0253	0.9902	0.2165	1				
ROA	0.1553	-0.6801	-0.1104	-0.6788	1			
SIZE	-0.1598	-0.1249	0.1329	-0.1043	0.122	1		
LIQ	0.0356	-0.0531	-0.0496	-0.0569	0.0356	-0.0764	1	
DY	0.0763	-0.0023	-0.0088	-0.0032	0.0268	-0.0121	-0.0041	1

The result of model 2 in Table 6 is to answer hypothesis 2. The cash holding ratio statistically affects the debt level used in Vietnamese listed companies' capital structure. Moreover, this study also considers the influence of the cash holding ratio, whether the structure has a linear or nonlinear effect; the results show a nonlinear connection between the cash holding ratio (CHR) and the non-current debt ratio (LTD). In contrast, the current debt ratio (STD) and the total debt ratio (TD) are linear.

This study examines the differences between the means of cash holding ratio and proxies of the capital structure before and during COVID-19. The study considers the cash holding ratio and capital structure between the pre-COVID-19 and COVID-19 periods. The results are depicted in Table 7 and Table 8.

The results in Table 7 show that the cash holding ratio in the COVID-19 period slightly increased compared to the pre-COVID-19 period. The test results show no difference in the rate of cash holding before and during COVID-19. The results in Table 8 demonstrate that the rate of current debt and the total debt in post COVID-19 period increased significantly, especially the total debt ratio in the COVID-19 period accounted for 52.4%. In the post COVID-19 period, this rate rose to 62%.

**Table 5.** Results of Model 1 regression analysis from 2019 to 2022

	CHR	CHR	CHR	CHR	CHR	CHR
STD	0.00847** [5.13]			0.00384** [4.16]		
STD2				0.000100* [2.82]		
LTD		-0.0354*** [-6.17]			-0.0820*** [-21.48]	
LTD2					0.0133*** [10.04]	
TD			0.00714** [4.50]			0.00104 [0.91]
TD2						0.000137* [3.02]
ROA	0.168** [5.26]	0.0919** [3.51]	0.158** [5.09]	0.173** [4.93]	0.0891** [3.47]	0.167** [4.76]
SIZE	-0.00775*** [-11.50]	-0.00747*** [-10.80]	-0.00795*** [-11.25]	-0.00806*** [-13.09]	-0.00616*** [-8.20]	-0.00822*** [-13.24]
LIQ	0.000207* [2.52]	0.000123 [1.67]	0.000202* [2.56]	0.000161 [2.07]	0.000105 [1.52]	0.000139 [1.92]
DY	0.00383** [3.22]	0.00395* [3.17]	0.00385** [3.21]	0.00382** [3.23]	0.00394* [3.16]	0.00383** [3.23]
_cons	0.276*** [14.85]	0.280*** [14.66]	0.282*** [14.48]	0.287*** [16.75]	0.249*** [12.01]	0.292*** [16.92]
N	5747	5747	5747	5747	5747	5747
R-sq	0.105	0.099	0.102	0.108	0.106	0.106
Industry	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes

Note: t statistics in brackets; \* p < 0.1, \*\* p < 0.05, \*\*\* p < 0.01.

**Table 6.** Results of Model 2 regression analysis from 2019 to 2022

	STD	LTD	TD	STD	LTD	TD
CHR	1.782** [3.63]	-0.228*** [-22.13]	1.578** [3.35]	2.486* [2.82]	-0.429*** [-7.59]	2.093* [2.36]
CHR2				-1.723 [-1.06]	0.491** [4.08]	-1.261 [-0.74]
ROA	-8.238** [-4.96]	-0.186** [-4.82]	-8.418** [-5.00]	-8.252** [-4.95]	-0.182** [-4.71]	-8.429** [-4.99]
SIZE	-0.0299* [-2.52]	0.0166*** [11.92]	-0.0119 [-1.07]	-0.0298* [-2.51]	0.0166*** [11.53]	-0.0117 [-1.05]
LIQ	-0.00670** [-3.92]	-0.000795** [-3.85]	-0.00718** [-4.36]	-0.00655** [-4.09]	-0.000839** [-3.67]	-0.00706** [-4.50]
DY	0.00787 [1.42]	0.000502 [1.74]	0.00849 [1.46]	0.00876 [1.30]	0.000248 [1.28]	0.00915 [1.32]
_cons	1.581** [5.81]	-0.317*** [-8.48]	1.205** [4.88]	1.547** [5.38]	-0.307*** [-8.35]	1.180** [4.50]
N	5747	5747	5747	5747	5747	5747
R-sq	0.478	0.072	0.473	0.479	0.074	0.473
Industry	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes

Note: t statistics in brackets; \* p < 0.1, \*\* p < 0.05, \*\*\* p < 0.01.

**Table 7.** Cash holding ratio before and during COVID-19

Research period	Observations	CHR
Pre-COVID-19	1449	7.6%
During COVID-19	4298	8.03%
		0.1826

Note: Testing differences between means.

**Table 8.** Capital structure of public companies before and during COVID-19

Research period		Observations	STD	LTD	TD
Pre-COVID-19	Mean	1449	48.5%	10.9%	52.4%
	Median		36.6%	2.8%	44.0%
During COVID-19	Mean	4298	51.7%	10.3%	62.0%
	Median		35.8%	2.4%	47.5%
<b>Testing differences</b>			<b>0.5533</b>	<b>0.4021</b>	<b>0.087</b>
<b>Pr</b>					

This difference is statistically significant at the level of 10%.

The research continues testing two models using data from 2020 to 2022, the COVID-19 period. This study wants to shed light on the impact of COVID-19 on using debt in capital structure and hoarding cash of public companies in Vietnam. Table 9 and Table 10 present model 1 and model 2 regression results, respectively.

**Table 9.** Regression results of Model 1 during COVID-19

Independent variable	CHR	CHR	CHR
STD	0.00638** [3.91]		
STD_COVID	0.00230** [4.48]		
LTD		-0.0325*** [-10.34]	
LTD_COVID		-0.00407 [-1.07]	
TD			0.00470** [3.18]
TD_COVID			0.00271** [4.93]
ROA	0.167** [5.15]	0.0917** [3.52]	0.157** [4.98]
SIZE	-0.00776*** [-11.55]	-0.00746*** [-10.96]	-0.00795*** [-11.30]
LIQ	0.000204* [2.55]	0.000123 [1.67]	0.000199* [2.60]
DY	0.00383** [3.22]	0.00395* [3.17]	0.00385** [3.22]
_cons	0.277*** [14.90]	0.280*** [14.86]	0.282*** [14.57]
N	5747	5747	5747
R-sq	0.105	0.099	0.102
R-sq	0.479	0.062	0.055
Industry	Yes	Yes	Yes
Year	Yes	Yes	Yes

Note: t statistics in brackets; \* p < 0.1, \*\* p < 0.05, \*\*\* p < 0.01.

Table 9 indicates that the results are inconsistent when studying the influence of the capital structure

on cash holdings in the context of the COVID-19 pandemic (Model 1). The current debt ratio and total debt ratio have a positive effect on cash holdings, while the non-current debt ratio has a negative effect on cash holdings. However, the impact of the non-current debt ratio (LTD) on cash holdings during COVID-19 is insignificant. Regarding Table 10, the effect of the holding cash ratio on proxies of the capital structure before COVID-19 has the same vein as the COVID-19 context. However, during the pandemic, the cash holding ratio does not significantly affect the current debt ratio.

**Table 10.** Regression results of Model 2 during COVID-19

Independent variable	STD	LTD	TD
CHR	1.534** [3.80]	-0.177*** [-13.82]	1.135** [3.48]
CHR_Covid19	0.32 [1.84]	-0.0658*** [-5.99]	0.570** [3.23]
ROA	-8.236** [-4.95]	-0.187** [-4.84]	-8.415** [-4.99]
SIZE	-0.0301* [-2.53]	0.0167*** [12.26]	-0.0123 [-1.10]
LIQ	-0.00670** [-3.93]	-0.000795** [-3.85]	-0.00718** [-4.36]
DY	0.00753 [1.38]	0.000571 [2.09]	0.0079 [1.40]
_cons	1.587** [5.78]	-0.318*** [-8.74]	1.216** [4.89]
N	5747	5747	5747
R-sq	0.478	0.073	0.473
Industry	Yes	Yes	Yes
Year	Yes	Yes	Yes

Note: t statistics in brackets; \* p < 0.1, \*\* p < 0.05, \*\*\* p < 0.01.

## 4. DISCUSSION

This study explores the connection between cash holdings and corporate capital structure. Regarding the results of the first model, as seen in Table 6, the debt level used in the capital structure has a statistically significant influence on the

cash holding ratio. An intriguing finding of this research is that the current and total debt ratios positively affect the cash holding ratio. In contrast, the non-current debt ratio negatively impacts cash holdings. This finding implies that Vietnamese listed companies hold less cash when increasing the current debt used in capital structure. The reason is that listed companies in Vietnam forecast low operating cash flow, with a small amount of cash holding, and Vietnamese listed companies tend to use debt. This result is in accordance with the finding of Anderson and Hamadi (2016) and Loncan and Caldeira (2014), with the capital structure being a non-current debt ratio, but disagreement when considering capital structure as current debt ratio and total debt ratio. When squaring capital structure variables, the results demonstrate that the current and total debt ratios have a linear relationship. In contrast, the non-current debt ratio has a nonlinear relationship with the cash holding ratio of listed companies. In addition, the study also found that profitability and dividend rate positively affect the cash holding ratio, whereas firm size has a negative impact. These findings are similar to preceding studies by Hung et al. (2020), Dang Ngoc et al. (2020), and Van et al. (2022).

Testing results of the second model reveal the influence of the cash holding ratio on the debt level used in the capital structure of Vietnamese public companies. The findings show that the effect of debt structure on the cash holding ratio is inconsistent. The cash holding ratio has a positive impact on the current and total debt ratios but has a negative effect on the non-current debt ratio. These findings are consistent with the research hypothesis and previous studies like Loncan and Caldeira (2014) when considering the debt structure as the current debt ratio. With this finding, Vietnamese listed companies, when holding a lot of cash, tend to use less debt in their capital structure. The reason is that Vietnamese listed companies can use this cash to finance investment portfolios without using external funding sources when holding a lot of cash. And this is following the pecking order theory. The findings also show inconsistent results, including a nonlinear connection between the cash holding ratio and the non-current debt ratio, whereas the current debt ratio and the debt ratio are linear.

The COVID-19 outbreak jeopardizes many aspects of the economy and society. This study tests the dif-

ference in cash holdings and capital structure before and during the COVID-19 pandemic. The test results show no difference in the rate of cash holding before and during COVID-19. These findings are consistent with the economic shock theory and the situation in the context of Vietnam. The COVID-19 pandemic occurred at the end of 2019. And the outbreak of the COVID-19 epidemic caused the Vietnamese government to issue a social distancing order that has affected many aspects of the economy and society. Enterprises are paralyzed in production and other activities, resulting in unemployment, income reduction, and losses.

Consequently, COVID-19 inevitably affects the business performance of Vietnamese enterprises. However, the cash holding ratio in the COVID-19 period did not change significantly compared to the rate before the COVID-19 period. Regarding capital structure, current debt, and the total debt ratio in the COVID-19 period rose significantly, while the non-current debt ratio in the post-COVID-19 period decreased slightly compared to the COVID-19 period. At the significance level of 10%, the study states the differences in capital structure by employing debt in the COVID-19 context.

Generally, the findings illustrate that Vietnamese listed companies with a lot of cash tend to have higher financial leverage (for current liabilities) but lower for long-term liabilities. The reason is that when holding cash, Vietnamese listed companies can use this cash to finance investment projects without using external funding sources. This finding is in accordance with the pecking order theory. Specifically, firms prioritize using internal funding over external funding sources, namely debt. In this case, the companies prefer to use cash from retained earnings over cash from debt issuance. Therefore, while a company's cash increases, the level of financial leverage of the business decreases. These results are inconsistent when studying the influence of capital structure on cash holdings in the context of the COVID-19 pandemic. The current debt ratio did not affect cash holdings during COVID-19. For the non-current debt ratio, there is a negative effect on the cash holding ratio during the COVID-19 period. As shown in Figure 2, most of the debts of listed companies in Vietnam are current debts, so the regression results of the total debt ratio are similar to the influence of the current debt ratio during the COVID-19 period.

## CONCLUSION

This study examines the connection between capital structure and cash holdings and tests the impact of the COVID-19 pandemic on capital structure and cash holdings from 2019 to 2022. The results reveal a connection between capital structure and cash holding ratio, supporting the pecking order theory. The association between capital structure and cash holding ratio is inconsistent. The current and total debt ratios are positively and linearly related to the cash holding ratio of Vietnamese public companies. Still, the non-current debt ratio has a negative and nonlinear relationship with the cash holding ratio. With this empirical evidence, Vietnamese listed companies hold more cash as firms increase financial leverage and current debt. The reason is that Vietnamese listed companies forecast low operating cash flow, so Vietnamese listed companies tend to use debt when holding a small amount of cash. The study contributes to the academic aspect that the pattern of cash holding and debt ratios are interrelated and heterogeneous. In practice, the findings give implications for executives to determine the financial balance to avoid financial burden or bankruptcy.

## AUTHOR CONTRIBUTIONS

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