

Quoc Trung Nguyen Kim

Article

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*Corresponding author: Quoc Trung Nguyen Kim, Faculty of Accounting – Auditing, University of Finance – Marketing, Ho Chi Minh, Vietnam
E-mail: nkq.trung@ufm.edu.vn

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David McMillan, University of Stirling,
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FINANCIAL ECONOMICS | RESEARCH ARTICLE

Does COVID-19 affect small and medium enterprises' capital structure in vietnam?

Quoc Trung Nguyen Kim^{1*}

Abstract: This study estimates the effect of COVID-19 on listed small and medium enterprises' capital structures in Vietnam from 2010 to 2020 by a dynamic panel model with 825 observations. Conducting the generalized method of moments, the findings show that COVID-19 is a significant factor affecting small and medium enterprises' capital structures. The current results are explained based on the signalling theory. Although the findings are consistent with the previous empirical studies indicating the capital structure and exploring its determinants in diverse ways, these studies are interpreted based on agency theory, pecking of order, trade-off theory. Furthermore, our results are robust to a series of endogeneity checks using an alternative method of regression.

Subjects: Macroeconomics; Entrepreneurial Finance; Finance

Keywords: capital structure; COVID-19; signalling theory; Vietnam

JEL Classifications: D24; J11; L21

1. Introduction

A business's capital structure is a term used to describe the capital that originates from the financial resources to create the company's assets. Capital structure theories have been developed and focused on listed large firms compared to small and medium enterprises (Daskalakis & Thanou, 2010). However, small and medium enterprises (SMEs) account for an important role in the economy because their community comprises diverse businesses, and they can link the



Quoc Trung Nguyen Kim

ABOUT THE AUTHOR

Nguyen Kim Quoc Trung is currently a lecturer of the Faculty of Accounting–Auditing; the University of Finance – Marketing, Vietnam. He is interested in researching the banking sector and finance and accounting. His fields of research and teaching are banking, finance, and governance. He has written a total of some articles in various international journals and conferences, including *International Journal of Economics and Finance Studies*, *Cogent Business & Management*, *International Journal of Interdisciplinary Organizational Studies*; and has served as a reviewer of some international journals listed in Scopus, such as *Cogent Economics and Finance*; *International Journal of Law and Management*; *Journal of Financial Services Marketing*; *International Journal of Asian Business and Information Management*

PUBLIC INTEREST STATEMENT

Capital structure refers to the specific mix of debt and equity used to finance a company's assets and operations. This study estimates the effect of COVID-19 on listed small and medium enterprises' capital structures in Vietnam from 2010 to 2020 by a dynamic panel model with 825 observations. Conducting the generalized method of moments, the findings show that COVID-19 is a significant factor affecting small and medium enterprises' capital structures. The current results are explained based on the signalling theory. Although, the findings are consistent with the previous empirical studies indicating the capital structure and exploring its determinants in diverse ways, these studies are interpreted based on agency theory, pecking of order, trade-off theory. Furthermore, our results are robust to a series of endogeneity checks using an alternative method of regression.

informal economy of family businesses and the formalized corporate sector in developing countries. In particular, SMEs make up 90% of businesses and employ 63% of the world's workforce (Munro, 2013). In addition, according to Vandenberg et al. (2016), SMEs account for a large proportion of the total number of businesses in a country, region, or globally, potentially employing over 50% of the total.

Martinez et al. (2018) established a systematic review of the previous studies about the capital structure aiming to build the theoretical framework for the determinants of capital structure. Moreover, previous studies examine the determinants of capital structure, with the data collected from developed and developing countries (Ahmad & Etudaiye-Muhtar, 2017; Alves & Ferreira, 2011; Awartani et al., 2016; Demirgüç-Kunt et al., 2020; Hotchkiss et al., 2020; Martinez et al., 2018; Matemilola et al., 2019; Turkki, 2021; Çam & Özer, 2022), while others explore the COVID-19 and capital structure relationship (Demirgüç-Kunt et al., 2020; Hotchkiss et al., 2020; Turkki, 2021; Varghese & Haque, 2021). In detail, Demirgüç-Kunt et al. (2020) investigates the evolution of capital structure in crisis in developed and developing countries. Turkki (2021) applies agency theory, asymmetric information, and trade-off theory to clarify the above relationship in the European countries. Also, Varghese and Haque (2021) mention that capital structure theory can be used to explore the relationship between COVID-19 and capital structure. It means that the shock from COVID-19 leads to the capital structure's decrease which is compared to the pre-COVID-19 period.

In Vietnam, according to the Vietnam Chamber of Commerce and Industry (VCCI), the SME sector currently accounts for about 98% of the total number of operating businesses that contribute 45% of GDP and attacks over 5 million employees (in 2020). Due to the impact of the COVID-19 pandemic and political problems in Europe, over 90% of affected SMEs in different countries need to be supported by government-related policies such as the interest rate and fiscal policies. Besides, SMEs have inherent limitations in resources, so their access to external funds will be limited, which leads to the possibility of interruption in their business operations. When SMEs do not fulfill their loan obligations, they may face with liquidation problems. With an inappropriate leverage ratio, SMEs will lack financial flexibility and will be very sensitive to economic shocks. For that reason, the SME's capital structure needs to be clarified to highlight the importance of accessing sources of finance compared to large firms' capital structures. Some studies in Vietnam focus on firm-specific factors influencing capital structure, such as Biger et al. (2007); D. C. Le (2013); N. T. M. Le (2016); T. D. K. Nguyen and Ramachandran (2006); Pham (2018); Tran and Bui (2021). However, these authors have not mentioned the existence of COVID-19 in their research model.

Previous empirical studies indicate the capital structure and explore its determinants in diverse ways based on agency theory, pecking of order, trade-off theory. However, Ross (1977) use signalling theory to emphasize the crisis period impact to the debt level which measure capital structure, and Proença et al. (2014) proclaim that leverage ratio has a downward trend during financial distress. These studies advocate the asymmetric information impact of the priority in choosing the capital structure of the enterprise. The signalling theory is originated from the information asymmetric that affects the decision of managers and stakeholders. As a result, it creates the positive signal in the market (Watts & Zimmerman, 1986), companies must to volunteer in publishing their information that aims to attract investors, especially during the COVID-19 pandemic. The theory emanates from information asymmetries between firm management and shareholders (Taj, 2016). Information asymmetry in developing countries such as Vietnam is a prominent issue and significantly affects investors' decisions. In particular, during the COVID-19 period, information asymmetry will increase (Dang Ngoc et al., 2021).

All considered above arguments, the author recognizes a link between SMEs' capital structure and COVID-19, which recent studies in Vietnam have not been updated. Hence, this paper aims to estimate the effect of COVID-19 on the capital structures of listed SMEs in Vietnam. Besides, the

model addresses the endogeneity issue, which fills the gap some studies do not research. To obtain the objective, the main research question is formulated: “To what extent, does COVID-19 affect the capital structure of listed small and medium-sized enterprises in Vietnam?”. Therefore, from the findings, the research contributions are as follows. First, the author applies signalling theory to explain the effect of COVID-19 on the SME’s capital structure that are still not mentioned in the previous studies. Second, the findings are consistent with the previous studies (Badawy, 2020; Demirgüç-Kunt et al., 2020; Ding et al., 2021; D’amato, 2020; Hotchkiss et al., 2020). Finally, our results are robust to a series of endogeneity checks using an alternative method of regression.

Starting with the literature review involves capital structure theories, the author discusses them briefly to set a background for building the model. The author suggests factors influencing capital structure at Vietnamese listed SMEs in the second section, which mentions related studies. Those are the platforms from which the research hypotheses are proposed. The following section presents the methodology by which the author implements the generalized method of moments (GMM) to deal with endogeneity. In addition, the author interprets and discusses the findings in the next section. Finally, the author mentions some of the study’s limitations based on the findings.

2. Literature reviews and hypotheses development

According to Baker and Martin (2011), “capital structure refers to the sources of financing employed by the firm”. These sources include debt, equity, and other securities that are used to finance firms’ assets, operations, and future activities. The capital structure is affected by firm-specific factors and macro-economics factors; however, the evolution of capital structure in the COVID-19 pandemic is explored by the following studies (Demirgüç-Kunt et al., 2020; Hotchkiss et al., 2020; Turkki, 2021; Varghese & Haque, 2021). These studies investigate the relationship in some developed and developing countries, except for Vietnam. In this paper, the capital structure is measured by leverage ratio (Czerwonka & Jaworski, 2021; Demirgüç-Kunt et al., 2020; Khaki & Akin, 2020; Ullah et al., 2017).

According to signalling theory, in unstable economic conditions such as a pandemic or financial distress, companies’ demand for debts decreases because they lack the funds to repay them (Ghosh & Chatterjee, 2018; Mohammad et al., 2021). Besides, empirical evidence suggests that small nonfinancial firms deleverage during pandemic recessions (Demirgüç-Kunt et al., 2020; D’amato, 2020). Similarly, the effects of COVID-19 on the capital structures of European companies (Turkki, 2021). Based on information transparency and collateral, debt holders, who are outsiders, are afraid of lending money (Jensen & Meckling, 1976; Myers, 1977), whereas companies’ insiders want to use outside resources to fund their activities. As a result, the cost of asymmetric information between insiders and outsiders rises. Other studies by Badawy (2020); D’amato (2020); Demirgüç-Kunt et al. (2020); Hotchkiss et al. (2020) examined the negative impact of the global financial crisis on capital structures in different countries. Together with previous studies, Ding et al. (2021) conclude that firms using their equity for operations perform better than those using leverage during the pandemic. From the discussions, the proposed hypothesis is as follows.

Hypothesis 1 (H1): *COVID-19 affects negatively the capital structure of SMEs in Vietnam.*

Besides the independent variable, the econometric model incorporated the following control variables are stated as:

Firm size

According to the agency theory, many economists have concluded a relationship between the firm size and capital structure (Chiarella et al., 1992; Fischer et al., 1989; Jalilvand & Harris, 1984; Myers, 2001). The previous studies have demonstrated the positive effect of firm size on capital structure

(Delikanlı & Kılıç, 2021; Forte et al., 2013; J. Chen & Strange, 2005; Khaki & Akin, 2020; Kurshev & Strebulaev, 2015; T. D. K. Nguyen & Ramachandran, 2006; T. T. H. Nguyen, 2019; Tongkong, 2012).

In this paper, the firm size is measured by $\ln(\text{total assets})$. And the proposed hypothesis is as follows:

Hypothesis 2 (H2): *firm size positively affects the capital structure of SMEs in Vietnam.*

Firm age

Dewaelheyns and Van Hulle (2010); Ezeoha and Botha (2012); Sakai et al. (2010) discovered a significant relationship between age and capital structure. Their findings are supported by the trade-off theory and agency cost theory, demonstrating a positive relationship between age and capital structure. Based on long-lasting business benefits, the possibility of establishing a lender–borrower relationship has arisen (Sakai et al., 2010). Therefore, the borrowers have better access to loans with lower transaction costs based on the financial relationship (Bernasconi et al., 2005).

In this paper, the firm age is determined as the number of years since the company's incorporation date (Kieschnick & Moussawi, 2018; Quoc Trung & Tan, 2021; Shumway, 2001).

Hypothesis 3 (H3): *firm age positively affects the capital structure of SMEs in Vietnam.*

Asset structure

Based on the agency theory, the tangible assets are also considered a capital structure determinant. Rajan and Zingales (1995) claim that tangible assets are used as collateral for debt, which can reduce agency costs. Using collateral to minimize the cost of debt and takes a tax shield, which decreases the interest conflict between lenders and owners (Harris & Raviv, 1991; Jensen & Meckling, 1976). Furthermore, according to the pecking order theory of debt, the value of tangible assets impacts the capital structure. The studies by Harris and Raviv (1991); Frank and Goyal (2009) confirm that the higher the collateral assets leads to higher levels of leverage. The studies by Camisón et al. (2022); Khaki and Akin (2020) have also supported the positive effect of asset structure on capital structure.

In this work, the ratio of net-fixed assets to total assets is a measurement of tangible assets (Camisón et al., 2022).

$$tang_{i,t} = \frac{\text{tangible assets}_{i,t}}{\text{total assets}_{i,t}}$$

Hypothesis 4 (H4): *asset structure affects positively the capital structure of SMEs in Vietnam.*

Tax

According to the trade-off theory, the company would prefer debt financing because of the tax-deductibility of interest payments (Y Miller, 1958). In particular, SMEs are subsidized by the government through incentive tax policies. There is a positive effect of the tax on capital structure (Barakat & Rao, 2003; D. C. Le, 2013). Moreover, Barclay et al. (2013); Faccio and Xu (2015); Heider and Ljungqvist (2015) find a significant influence of corporate taxation on the capital structure, since the trade-off theory identified this relationship as a cost and benefit analysis of borrowings.

$$tax_{i,t} = \frac{Income\ tax\ expenses_{i,t}}{Earnings\ before\ interest\ and\ taxes_{i,t}}$$

Hypothesis 5 (H5): *tax affects the capital structure of SMEs in Vietnam.*

Industry

Industry is the classification of fields in which firms operate with their primary business activities. As Hall et al. (2000); Jordan et al. (1998) confirm, *industry* is another factor that impacts the capital structure. MacKay and Phillips (2005) show that the use of leverage varies across industries. Specifically, the influence of business type will affect access to external funds. Michaelas et al. (1999) demonstrate industry impacts on the firms' capital structures, especially UK SMEs. Harris and Raviv (1991) argue that firms in the same industry are more similar capital structure than those in different industries.

The previous study has explored that industry plays an important role in determining its effect on capital structure (McWilliams & Siegel, 2001). In this paper, the sample includes SMEs from 3 industry groups based on the General Statistics Office of Vietnam coding system. They are (1) agriculture, forestry, and fishery, (2) the construction industry, and (3) the service trade.

Hypothesis 6 (H6): *Industry effect should have an influence on the capital structure of SMEs in Vietnam.*

Revenue growth

Growth opportunity is one criterion used to evaluate the financial health of enterprises and can be measured through revenue growth. The growth ratio determines how much evolution was achieved in a certain period and measures the success of a company's activities.

The agency theory indicates a negative relationship between firm growth opportunity and capital structure. According to Myers (1977), high-growth firms may have more options for making investments than low-growth firms. As a result, companies with high growth prospects may avoid issuing debt in the first place, and leverage is expected to be negatively correlated with growth opportunity.

In this paper, revenue growth is measured as follows.

$$rev_{i,t} = \frac{Sales_{i,t} - Sales_{i,t-1}}{Sales_{i,t-1}}$$

Hypothesis 7 (H7): *revenue growth has a positive effect on the capital structure of SMEs in Vietnam.*

Profitability

The following theories predict the correlation between firm profitability and capital structure (measured by the amount of leverage) are agency theory, and pecking order theory (Dreyer, 2010). However, based on the agency theory, shareholders do not want to share this advantage with creditors. Hence, they do not encourage managers to approach external funds, especially leverage. That means there is a negative relationship between profitability and capital structure (J. Chen & Strange, 2005; Tongkong, 2012). In other cases, firms earn more profitably, they use

retained earnings to operate their new business cycle instead of leverage (Myers & Majluf, 1984). Guha-Khasnobis and Bhaduri (2002); Sogorb Mira (2002); Voulgaris et al. (2004) confirm the negative relationship between profitability and capital structure that the results in line with the pecking order theory (Afza & Hussain, 2011; Andani & Al-Hassan, 2012; Biger et al., 2007; D. T. T. Nguyen et al., 2012; J. J. Chen, 2004; Okuda & Nhung, 2010; Sudiyatno & Sari, 2013; T. D. K. Nguyen & Ramachandran, 2006).

In this paper, profitability is measured by net income divided by total assets.

$$roa_{i,t} = \frac{Net\ income_{i,t}}{Total\ assets_{i,t-1}}$$

Hypothesis 8 (H8): Profitability affects the capital structure of SMEs in Vietnam negatively.

Gross domestic product

Bokpin (2009); Camara (2012); Dias Basto et al. (2009) reveal that gross domestic product is one of the most common outside factors that affect the capital structure of a company. These authors determined that the corporate capital structure and GDP have a significant negative relationship. Gajurel (2006) also claims that GDP negatively affects the total debt ratio and the short-term debt ratio, while GDP positively influences the long-term debt ratio. It means the economy's expansion because the GDP growth leads to increased corporate profits. According to the pecking order theory, internal resources from retained earnings are preferable resources compared to external ones.

Hypothesis 9 (H9): Gross domestic product affects negatively the capital structure of SMEs in Vietnam.

Inflation

According to the pecking order theory, it is difficult to observe the effect of inflation on financial decisions (Frank & Goyal, 2009). Because of high inflation, regulators have to raise interest rates, making it hard to get money from financial institutions because of the high-interest costs. (Beck et al., 2008; Chipeta & Mbululu, 2013; D. C. Le, 2013; Muthama et al., 2013) give evidence to convince the negative relationship between inflation and capital structure. (Gajurel, 2006) finds that inflation has negatively effect on total leverage and the short-term debt ratio but positively impacts the long-term debt ratio.

Hypothesis 10 (H10): Inflation negatively affects the capital structure of SMEs in Vietnam.

3. Methodology

3.1. Sample

In Vietnam, an SME is defined as follows: annual average number of employees contributing to Social Insurance and total capital or total revenue, according to Decree 39/2018/ND-CP issued by the government on 11 March 2018. The number of listed SMEs collected from the FiinPro database is 75 because of the availability of information connected to SMEs listed on the Ho Chi Minh City Stock Exchange (HOSE). These 75 listed companies that satisfied the requirement of Decree 39/2018/ND-CP about Small-size enterprise according to appendix 1. In concretely, in agriculture, forestry, aquaculture, industry and construction, SMEs must satisfy the employees are no more than 100 people and total capital is no more than 20 billion. In trading and services, the decree

shows that SMEs have no more than 50 employees and 50 billion for total capital. The Arellano Bond estimator, according to (Arellano & Bond, 1991), is also appropriate for a dataset with a large number of enterprises and a limited number of years. The paper is based on the data collected annually over 11 years (2010–2020) for a set of 75 listed SMEs on the stock market. As a result, after deleting some missing data, the total number of observations is 825.

3.2. Proposed model

The proposed model is as follows:

$$lev_{i,t} = \beta_0 + \beta_1 covid_t + \sum_{m=2}^{10} control_variables + \varepsilon \quad (1)$$

Because of the endogeneity problem, pooled OLS, FEM, and REM estimates are biased and inconsistent. Therefore, the endogeneity needs to be eliminated by applying Arellano-Bond's two-step SGMM estimation (Arellano & Bond, 1991) with valuable instrument variables. Hence, from Model [1], it is modified in detail as follows (Model 2).

$$lev_{i,t} = \beta_0 + \beta_1 lev_{i,t-1} + \beta_2 covid_t + \beta_3 size_{i,t} + \beta_4 age_{i,t} + \beta_5 tang_{i,t} + \beta_6 tax_{i,t} + \beta_7 indus_{i,t} + \beta_8 gro_{i,t} + \beta_9 roa_{i,t} + \beta_{10} gdp_t + \beta_{11} inf_t + \varepsilon \quad (2)$$

Where:

$lev_{i,t}$: leverage ratio measure capital structure.

$lev_{i,t-1}$: is the latency of leverage

$covid_t$: is COVID-19 size $_{i,t}$:

is firm size

$age_{i,t}$: is firm age

$tang_{i,t}$: is asset structure's firm

$tax_{i,t}$: is firm's tax

$indus_{i,t}$: is the industry

$gro_{i,t}$: is revenue growth

$roa_{i,t}$: is the profitability

gdp_t : is gross domestic product

$inf_{i,t}$: is inflation

3.3. Methodology

According to Forte et al. (2013), the endogeneity exists when conducting the relationship between the proxies for the determinants of capital structure and the leverage ratio. Besides, potential endogeneity between leverage and tangibility is addressed in the study by (Campello & Giambona, 2011).

To eliminate the endogeneity in the model, the author conducts the Arellano-Bond two-step SGMM estimation with robust standard errors (Arellano & Bond, 1991), which was adopted and developed by (Blundell & Bond, 1998) because this method has an advantage in identifying the

strong instrument variables to solve the endogeneity. The Arellano Bond estimation combines the lags of the dependent variables ($leverage_{i,t-1}$) as instrument variables.

The number of instruments is always kept below the number of groups in all our SGMM specifications (Roodman, 2009). Furthermore, AR(1) and AR(2) are the Arellano—Bond tests for the first- and second-order autocorrelations of the residuals, respectively. The test for AR(2) errors shows that endogeneity problem is solved at the AR(2) level. According to the Sargan test statistics, the null hypothesis is that the over-identifying restrictions are valid. The Wald (joint) test chi-square statistics (Bekana, 2021) show that the overall model of SGMM is fit.

4. Model analysis and discussions

4.1. Model analysis

Before using data for analysis, testing for unit roots in heterogeneous panel data is implemented. The results are presented in Table 1.

In the theory, unit root tests in panel data are mentioned in the studies by Levin—Lin – Chu (2002), Harris—Tzavalis (1999), Im—Pesaran – Shin (2003), or Fisher-type (Choi, 2001). Based on augmented Dickey–Fuller tests, the hypotheses (all panels contain unit roots) are rejected, so we can conclude that at least one panel is stationary. As a result, the model estimation with the above factors will be effective and give more reliable regression results.

The next section will present the descriptive statistics that summarize a given data of 825 observations. A set of brief descriptive coefficients includes mean value, minimum and maximum values (Table 2).

In Table 2, the mean value of leverage is 0.529 with a standard deviation of 0.363. Its minimum and maximum values are in order 0.001 and 0.995. The factors are classified into two groups: firm-specific factors and macro-economic factors.

Concerning the firm-specific factors, they are firm size, firm age, tangible assets, profitability, tax, revenue growth, industry. For firm size and firm age, they minimum and maximum values are 11.227, 30.282 and 5.000, 23.000, respectively.

Regarding to tangible assets (tang), it takes the minimum and maximum values of 0.035 and 0.995. While profitability (roa) has a minimum value of 0.025 and maximum value of 0.589.

The mean value of tax and revenue growth factors is 0.148 and 0.969, respectively. The minimum and maximum values of tax correspond to 0.0001 and 0.652. There is a minimum value for revenue growth of 0.014, and it can go up to 2.870.

The minimum value of the industry factor is 1 and its maximum is 3. It means that SMEs are agriculture, forestry, and fishery if industry equals 1; it equals 2 if they are the construction industry; and they are the service trade if industry equals 3.

For macro-economic factors, the minimum value of GDP is 0.029 and its maximum value is 0.071. The minimum and maximum values of inflation are 0.006 and 0.187, respectively. Finally, the COVID factor is also a dummy variable with a minimum value of 0 and a maximum value of 1. It means the years that have the occurrence of COVID-19 will take the value of 1, and they are the years 2019 and 2020. Otherwise, the remaining years with no effect from COVID-19 have a value of 0.

The following section presents a test of multi-collinear phenomenon, autocorrelation and heteroskedasticity after running the OLS between leverage (dependent variable) and all independent

Table 1. Fisher-type unit-root test for variables

Variable	Inverse chi-squared(150) P	Inverse normal Z	Inverse logit t (379) L*	Modified inv. chi-squared Pm
lev	0.0000	0.0000	0.0000	0.0000
covid	0.0000	0.0183	0.0005	0.0000
size	0.0000	0.0000	0.0009	0.0000
age	0.0000	0.0183	0.0011	0.0000
tang	0.0000	0.0000	0.0000	0.0000
roa	0.0000	0.0000	0.0000	0.0000
tax	0.0000	0.0000	0.0000	0.0000
gro	0.0000	0.0000	0.0008	0.0000
indus	0.0002	0.0000	0.0000	0.0000
gdp	0.0000	0.0000	0.0000	0.0000
inf	0.0000	0.0000	0.0000	0.0000

Table 2. Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
lev	825	0.529	0.363	0.001	0.995
covid	825	0.182	0.386	0.000	1.000
size	825	27.375	3.457	11.227	30.282
age	825	9.252	3.485	5.000	23.000
tang	825	0.726	0.179	0.035	0.995
roa	825	0.290	0.151	0.025	0.589
tax	825	0.148	0.168	0.0001	0.652
gro	825	0.969	0.422	0.014	2.870
indus	825	1.907	0.836	1.000	3.000
gdp	825	0.060	0.011	0.029	0.071
inf	825	0.058	0.048	0.006	0.187

variables. Based on the OLS results, the author tests the multicollinearity. According to Table 3, all VIF coefficients of variables are smaller than 10 (Hair & Anderson, 1995; Jermakowicz et al., 2007; Montgomery et al., 2021; Taurigana & Adjapong Afrifa, 2013). Thus, there is evidence of the absence of multicollinearity. Besides, to confirm the problem does not exist in the model, the author examines the correlation coefficient matrix (Table 3).

As shown in Table 3, after removing the variables that have correlation coefficients greater than 0.8 and the remaining correlation coefficients are all less than 0.8, the model has no defects of multicollinearity (Taurigana & Adjapong Afrifa, 2013). The next section presents the results of testing autocorrelation and heteroskedasticity.

Table 4 shows the Wooldridge test for autocorrelation in panel data, the p-value is smaller than 5%, and thus, we have enough evidence to reject H0: "There is no autocorrelation". It means the model contains the autocorrelation problem. Furthermore, the p-value of variance change test (Breusch-Pagan/Cook-Weisberg test) has a value smaller than 5%, and thus, H0: "Residuals with variance unchanged" has sufficient evidence to be rejected. Therefore, the heteroskedasticity phenomenon does not exist.

Where: lev is leverage which measures capital structure; llev is the latency of leverage; size is SMEs' size; tang is the asset structure; roa is profitability; tax is tax; gro is revenue growth; age is the SMEs' age; indus is the industry; gdp is gross domestic product growth; inf is inflation rate; covid is COVID-19.

Table 5 shows that AR(2) error test in the Arellano-Bond model has a p-value of 0.330, which is higher than 0.05. As a result, the model can confirm the absence of serial autocorrelation in the errors (Quoc Trung, 2022). In addition, the Sargan and Hansen tests (Table 5), which aim to detect an overidentifying restriction problem related to the heterogeneity of the subsets of the instrumental variables and support the validity and reliability of the SGMM 2-step results. The p-value in the Sargan test is significant (p-value = 0.181). Therefore, no sufficient evidence could be found to reject hypothesis H0. Besides, in this paper, the number of instruments is 51, which is less than the number of observations at 75. Therefore, the rule of thumb is satisfied (Almarzoqi et al., 2015; Roodman, 2009). Hence, the instrument variables adequately deal with the endogeneity. Furthermore, robustness checks involve notifying alternative specifications that test the same hypothesis are confirmed because the regression results from OLS and GMM methods are consistent.

4.2. Discussions

The findings show 11 statistically significant variables at 5%, including the latency of capital structure (llev), tangible assets (tang), profitability (roa), tax (tax), revenue growth (gro), firm age (age), and macro-economic factors: gross domestic product (gdp), inflation rate (inf) and COVID-19 (covid). These factors positively affect the capital structure of SMEs in Vietnam, except for profitability, revenue growth, inflation rate and COVID-19.

First, an unpredictable and uncontrollable external factor that has a statistically significant adverse effect on the capital structure of SMEs in Vietnam is COVID-19. Other factors remain constant when COVID-19 rises by one unit, leading to a decrease in capital structure by 0.328 units. The results are in line with the studies by (Badawy, 2020; Demirgüç-Kunt et al., 2020; Ding et al., 2021; D'amato, 2020; Hotchkiss et al., 2020). Furthermore, the trade-off theory explains the reverse relationship in the pandemic period. The theory asserts that SMEs cannot repay loans when their cash flows have deteriorated. Besides, according to Demirgüç-Kunt et al. (2020), because of the ambiguity of information, SMEs rely on specific banking relationships to access loans granted by commercial banks, which are more affected during economic shocks such as COVID-19.

Second, tangible assets have a coefficient of 0.061 which is higher than 0, so, it positively affects the capital structure of SMEs in Vietnam. Other factors remain constant, when tangible assets increase by one unit, the capital structure of SMEs in Vietnam rises by 0.061 units. The findings are supported by the agency theory and pecking order theory. Also, the previous research studies (Camisón et al., 2022; Frank & Goyal, 2009; Khaki & Akin, 2020) are in line with the findings. When tangible assets are provided as collateral, it will create a positive signal for creditors. Because of SMEs' inherent limitations (such as limited capital, small fixed assets, low reputation, low management level, etc.), they must have more fixed assets to secure their loans in order to access external loans.

Third, profitability has a negative effect on the capital structure of SMEs in Vietnam because its coefficient is less than 0 (−0.127). Other factors remain constant when profitability increases by one unit, and the capital structure of SMEs in Vietnam decreases by 0.127 units. The relationship can be explained based on the agency cost theory and the pecking order theory, which state that firms earn more profitably, they use retained earnings to operate their new business cycle instead of leverage (Atiyet, 2012; Myers & Majluf, 1984; Shyam-Sunder & Myers, 1999). Furthermore, the findings are consistent with the studies by Biger et al. (2007); T. D. K. Nguyen and Ramachandran (2006) which are conducted in Vietnam.

Table 3. Correlation matrix

	lev	size	tang	roa	tax	gro	age	indus	gdp	inf	covid	VIF
lev	1.000											
size	-0.218	1.000										1.19
tang	-0.663	0.334	1.000									1.13
roa	0.130	0.035	-0.069	1.000								1.03
tax	0.361	-0.166	-0.393	0.113	1.000							1.09
gro	-0.485	0.229	0.424	0.048	-0.357	1.000						1.04
age	-0.058	-0.047	0.153	-0.072	-0.632	0.068	1.000					1.01
indus	-0.311	0.655	0.218	0.160	-0.094	0.431	-0.130	1.000				1.13
gdp	0.587	-0.022	-0.741	0.046	0.231	-0.162	-0.179	-0.013	1.000			1.28
inf	0.063	0.090	0.031	-0.023	-0.017	-0.077	0.050	-0.034	-0.003	1.000		1.63
covid	0.122	-0.002	-0.161	-0.050	0.054	-0.107	-0.073	0.007	0.159	0.030	1.000	1.51

Table 4. Test of autocorrelation and heteroskedasticity

No.	Test	F-statistic	p-values	H ₀
1	Wooldridge test for autocorrelation in panel data	311.321	0.000	Reject
2	Breusch-Pagan /Cook-Weisberg test for heteroskedasticity	49.62	0.000	Reject

Table 5. OLS & GMM results

Factor	OLS		GMM	
lev	Coef.	P>z	Coef.	P>z
llev			0.469	0.035*
covid	−0.119	0.049*	−0.328	0.036*
size	−0.001	0.693	−0.035	0.117
tang	0.148	0.000***	0.063	0.004**
roa	−0.011	0.004**	−0.127	0.000***
tax	0.318	0.000***	0.864	0.014*
gro	−0.318	0.000***	−0.601	0.001***
age	0.028	0.000***	0.125	0.016*
indus	0.173	0.078	0.551	0.147
gdp	0.707	0.000***	0.621	0.000***
inf	−0.001	0.018*	−0.003	0.015*

Number of instruments = 51

Number of groups = 75

legend: * $p < .05$; ** $p < .01$; *** $p < .001$

Arellano–Bond test for AR(1) in first differences: $z = -2.18$ $\Pr > z = 0.029$

Arellano–Bond test for AR(2) in first differences: $z = -1.08$ $\Pr > z = 0.330$

Sargan test of overid. restrictions: $\chi^2(36) = 43.55$ $\text{Prob} > \chi^2 = 0.181$

Hansen test of overid. restrictions: $\chi^2(36) = 39.74$ $\text{Prob} > \chi^2 = 0.307$

Fourth, we find a significant positive relation between tax and the debt ratio (measures the capital structure of SMEs in Vietnam), because its coefficient is higher than 0 (0.964). Other factors remain constant when tax increases by one unit, the capital structure of SMEs in Vietnam increases by 0.964 units. The findings are explained based on the trade-off theory (Modigliani & Miller, 1963). Moreover, the previous studies give evidence to support the effect of tax on capital structure positively (Barakat & Rao, 2003; Barclay et al., 2013; Faccio & Xu, 2015; Heider & Ljungqvist, 2015).

The next factor negatively affecting the capital structure of SMEs in Vietnam is revenue growth because its coefficient is less than 0. Other factors remain constant when revenue growth increases by one unit, the capital structure of SMEs in Vietnam decreases by 0.614 units. The agency theory and the trade-off theory explain the reverse relationship, which is also confirmed by Andani and Al-Hassan (2012); Gurcharan (2010); Myers (1977); Singhania and Seth (2010). That means, firms with large growth opportunities tend to maintain a low debt ratio based on those theories.

Firm age is found to have a positive relationship to the capital structure of SMEs in Vietnam. Its coefficient is 0.075, higher than 0. Other factors remain constant when firm age increases by one

unit, the capital structure of SMEs in Vietnam rises by 0.075 units. Because of their long-standing reputation (Dewaelheyns & Van Hulle, 2010; Sakai et al., 2010), older firms, unlike newer ones, may limit adverse selection and moral hazard issues (Bernasconi et al., 2005). Petersen and Rajan (1994) say that older businesses should keep their leverage high because they have an advantage in a lender–borrower relationship.

Gross domestic product has a positive and significant relationship with the capital structure of SMEs in Vietnam. Other factors remain constant when GDP rises by one unit, it leads to an increase in the capital structure of SMEs in Vietnam by 0.921 units. The findings are in line with the studies by (Frank & Goyal, 2009; Hanousek & Shamshur, 2011; Stulz, 1990). They admit that the higher the economic growth rate, the more favorable conditions for enterprises' increased production and business activities.

Inflation is another external factor that widely investigated its connection with capital structure. The findings show an increase of inflation by one unit, while the capital structure of SMEs in Vietnam drops by 0.003 units. The effect has confirmed by (Beck et al., 2008; Chipeta & Mbululu, 2013; Gajurel, 2006; Muthama et al., 2013).

5. Conclusions and limitations

This paper investigates the effect of COVID-19 on Vietnamese listed SMEs' capital structures based on the data collected over 11 years (2010–2020). Using the quantitative method (2-step SGMM), we find evidence that firm-specific and macro-economic factors affect the leveraging of listed SMEs. These factors are the latency of capital structure, tangible assets, profitability, tax, revenue growth, firm age, gross domestic product, inflation, and COVID-19.

In line with signalling theory, we provide new empirical evidence regarding the impact of COVID-19 on SMEs' capital structures in Vietnam. In addition, under the agency theory, trade-off theory and pecking order theory, our findings show that SMEs' capital structure in Vietnam is positively related to tangible assets, tax, and firm age. While it is negatively driven by profitability and revenue growth.

Although the consideration points are highlighted, the study has some limitations. First, some factors, including firm-specific and external factors, are not considered. Second, besides the ratio of total debt to total assets used as an index to measure the capital structure, this indicator needs to be split into the ratios of short-term debt to total assets and long-term debt to total assets so that their relationships to other factors can be examined

Author details

Quoc Trung Nguyen Kim¹

E-mail: nkq.trung@ufm.edu.vn

ORCID ID: <http://orcid.org/0000-0001-9756-6219>

¹ Faculty of Accounting – Auditing, University of Finance – Marketing, Ho Chi Minh, Vietnam.

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Appendix A1: Decree 39/2018/ND-CP providing guidance on the Law on support for Small and Medium Sized Enterprises (“SMEs”)

	Microenterprise	Small-sized enterprise	Medium-sized enterprise
Agriculture, forestry, aquaculture, industry and construction			
Annual average number of employees contributing Social Insurance	No more than 10 employees	No more than 100 employees (compared to no more than 200 employees under Decree 56)	No more than 200 employees (compared to no more than 300 employees under Decree 56)
Total capital Or Total revenue	No more than VND3 billion	No more than VND20 billion	No more than VND100 million
	No more than VND3 billion/year	No more than VND50 billion/year	No more than VND200 billion/year
Trading and Services			
Annual average number of employees contributing Social Insurance	No more than 10 employees	No more than 50 employees	No more than 100 employees
Total capital Or Total revenue	No more than VND3 billion	No more than VND50 billion (compared to no more than VND10 billion under Decree 56)	No more than VND100 billion (compared to no more than VND50 billion under Decree 56)
	No more than VND10 billion/year	No more than VND100 billion/year	Not more than 300 billion/year



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