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Article

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BANKING & FINANCE | RESEARCH ARTICLE

Does leverage fit non-performing loans in the COVID-19 pandemic – evidence from the Vietnamese banking system

Nguyen Kim Quoc Trung^{1*}

Abstract: The study aims to estimate the effect of leverage on non-performing loans in Vietnamese commercial banks from 2010 to 2020. This article uses qualitative (expert interviews, namely senior credit officers' and credit managers' surveys to find out the expert consensus coefficient) and quantitative research methods (Generalized Method of Moments to solve the endogeneity). The findings show that leverage is a statistically significant factor and negatively affects non-performing loans. In line with corporate governance theories, such as agency theory and stakeholder theory, this study emphasizes the significant role of the leverage ratio in dealing with non-performing loans at commercial banks in Vietnam during the COVID-19 pandemic. Besides, the study also highlights effective mechanisms to control and mitigate non-performing loans in the credit granting process.

Subjects: Banking & Finance Law; Finance; Banking; Business, Management and Accounting; Risk Management

Keywords: COVID-19; commercial banks; leverage ratio; non-performing loans; SGMM; Vietnam



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PUBLIC INTEREST STATEMENT

The Bank is also a particular business category in which shareholders invest in the banks to maximize profits or increase the earnings per share. The study aims to estimate the effect of leverage on non-performing loans in Vietnamese commercial banks from 2010 to 2020. This article uses qualitative (expert interviews, namely senior credit officers' and credit managers' surveys to find out the expert consensus coefficient) and quantitative research methods (Generalized Method of Moments to solve the endogeneity). The findings show that leverage is a statistically significant factor and negatively affects non-performing loans. In line with corporate governance theories, such as agency theory and stakeholder theory, this study emphasizes the significant role of the leverage ratio in dealing with non-performing loans at commercial banks in Vietnam during the COVID-19 pandemic. Besides, the study also highlights effective mechanisms to control and mitigate non-performing loans in the credit granting process.

JEL code: M10; G21; H81

1. Introduction

The main activities of commercial banks focus on mobilizing capital from idle capital and granting credit to customers. *Loans* are a significant investment portfolio that provides the highest profit percentage for commercial banks. However, credit activities contain risks controlled strictly by the banking system to limit them. Hence, an increase in non-performing loans (NPLs) is mitigated to protect the shareholders.

The International Monetary Fund-IMF (2006) defines an NPL as any loan whose interest and principal payments are over 90 days overdue. Also, Petersson and Wadman (2004) and Asari et al. (2011) defined NPLs as unpayable loans that did not benefit the banking sector. NPLs, in the same sense, may reflect borrowers' inability to repay their loans (Balgova et al., 2016). Moreover, the global financial crisis in 2007 was rooted in the accumulation of NPLs, which has reduced the ability of commercial banks to grant credit. In this context, Basel (in Basel III) introduces leverage ratios as a management tool to reduce the risk of such write-offs and bad debts in creating a stable financial system. Leverage also aims to reinforce risk-based capital requirements, considered a risk-free "backstop" (Hannoun, 2010). The leverage ratio is defined as a tier 1 capital measure divided by the exposure measure (percentage). Therefore, this minimum ratio is applied to the practical bank to be higher than 3%. The banks must hold more capital than the minimum risk-weighted Tier 1 capital ratio of 8.5% (Gómez, 2016).

The global financial crisis has also affected Vietnam's financial system, which has led to a sharp increase in NPLs from the end of 2011 (Chau, 2017). In Vietnam, NPLs are defined based on Circular No. 02/2013/TT-NHNN that NPLs have been classified as those in Groups 3 (sub-standard debts), Groups 4 (doubtful debts) and Groups 5 (potentially irrecoverable debts). According to Nguyen (2020), in 2018, the NPLs ratio exceeded the preceding year's levels. Concretely, 23 banks in Vietnam have accumulated over 83,200 billion VND of NPLs, representing a 19% increase from the previous year. In 2018, the acceleration of fifth group debts (i.e., potentially irrecoverable debts) increased by 31%, enhancing the sharp increase of NPLs. As of August 2019, the NPL ratio of banks in Vietnam reached 1.91% (Nguyen, 2020). The COVID-19 outbreak by the end of 2019 has negatively affected the entire economies of the world. As a result, the borrowers have suffered from significantly reduced cash flows, which negatively influenced their ability to repay their debts. The State Bank of Vietnam announced that given the impact of COVID-19, NPLs might increase by 3.67% at the end of 2020 compared with the 1.89% growth recorded in the past year and increases in 2021 (Phu Hung Securities Corporation, 2020). Hence, this problem is a shadow that obscures the stability and efficiency of the Vietnamese banking system. After the year of the COVID-19 pandemic, Vietnam's GDP growth slowed down (2.91% in 2020), which is the lowest growth rate in the past 20 years. However, credit growth of about 13% is still a highlight and supports the economy and macroeconomic indicators. At the end of 2020, NPLs of the banking system continued to be controlled and maintained at less than 3%. However, there is an increase in the possibility of an NPL ratio in the following year.

Based on empirical studies, the existence of NPLs is a predictor of banking failure (Barr & Siems, 1994). So, NPL management is the responsibility and obligation of the board of directors and managers of commercial banks with the aim of ensuring the safety of credit activities and protecting the bank's growth. In order to be able to control, handle, and maintain NPLs at an acceptable level, banks must conduct bad debt management effectively by identifying, analysing and measuring the factors affecting non-performing loans. In this detail, the effect of leverage, which is required by Basel III, on NPLs.

As a result, some studies have demonstrated the effect of leverage on NPLs in the banking system in the normal economic situation (Radivojevic & Jovovic, 2017; Muratbek, 2017; Waqas

et al., 2017; Isaev & Masih, 2017; Pham & Nguyen, 2018; Nguyen, 2019; Nguyen, 2020). While Hardiyanti and Aziz (2021); Žunić et al. (2021) explore the effect of COVID-19 on NPLs in Malaysia; Bosnia and Herzegovina, respectively.

In Vietnam, Bui (2012), Nguyen (2012) analyze and assess the empirical status of NPLs at some Vietnamese banks based on the data taken from the financial statements of banks without using the model. While the studies by T. H. Nguyen (2017), Chau (2017), and Pham and Nguyen (2018), Nguyen (2019), Nguyen et al. (2020), Nguyen (2020) have examined the effect of bank-specific and macroeconomic factors on NPLs in the Vietnamese banking system by using the multiple linear regression model with secondary data under the “Too big to fail” theory for the explanation in the recovery economic with the improved cycle stage.

In summary, the given empirical studies have applied the “too big to fail” theory to explain the effect of leverage on NPLs in normal economic conditions. While the present study seeks to fill the gap by empirically analysing the leverage-NPL relationship in the COVID-19 pandemic on the platform of corporate governance theories. In this direction, the study aims to identify the statistically significant link between leverage and NPLs during the pandemic. In order to obtain the objective, the research question is formulated as follows: “Does leverage affect non-performing loans at joint-stock commercial banks in Vietnam during the COVID-19 pandemic?”.

After introduction as section 1, section 2 shows the literature review and empirical studies to develop the hypotheses. Section 3 describes the sample, proposed model, and research methodology. Section 4 displays the findings and discussions. Finally, section 5 includes conclusions and some limitations of the research.

2. Literature review and hypotheses development

2.1. Literature review

2.1.1. Agency theory

The managers’ presence in the entity has accelerated the conflicts of interests between owners and managers (Shah, 2014). That is considered a platform of agency theory, found by Jensen and Meckling (1976) and developed later by Fama and Jensen (1983). The core of this theory is the arrangement of conflicting interests through the separation of ownership and control of the organization (management rights). Moreover, Jensen and Meckling (1976) have empirically revealed how to assign shares between managers and owners. The owners want to increase their share values while the managers focus on salaries, incentives and another career development. As a result, the managers must reconcile the principal-agency interests to avoid their potential conflicts.

In the agency theory, the bank uses the deposits as the main resources to make investments including loans. Aiming to attract depositors, banks can face with many potential risks. So, ensure the efficient performance, Eisenhardt (1989) emphasized that an appropriate corporate governance system can reduce conflicts within the agency problem. Several mechanisms are used to reduce conflict in the owner-manager relationship, including leverage ratio and debt (Frierman & Viswanath, 1994) and the market for corporate control (Kini et al., 2004). The use of debt decreases agency cost (Grossman and Hart 1882; Ang et al., 2000). High leverage reduces agency costs between owner and managers. Interest payments to debt holders also reduce available resource for investments. So, using debt enables banks to monitor borrowers so that they have to control their profitable businesses in order to meet maturing obligations (Ang et al., 2000). As the results, banks can limit the NPLs.

2.1.2. Stakeholder theory

Freeman (1984) states that stakeholder theory focuses on broader stakeholder groups with differential interests. Stakeholder theory establishes a framework to determine the relationships

between all interested parties in combining and ensuring stakeholders' values. The theory focuses on the critical role of managers in incorporating their values into the benefits of related parties. With a high leverage tendency, the bank must establish appropriate actions to protect their customers, including depositors and borrowers (Bae et al., 2019), and avoid the default risk. It means that the banks always guarantee interest payments for depositors obtained from investment activities. Besides, the banks also control and keep track of the borrowers to ensure their ability to repay principal and interest. Thus, banks can maintain and lower non-performance loans.

In addition, all stakeholders have a right to know about the firm's activities (Omran & Ramdhony, 2015). Therefore, an increase in the leverage ratio indicates that banks have increased the number of customer deposits, which is a liability for banks. This forces creditors or related parties to have mechanisms in place to strictly control and supervise the use of leverage in order to make effective investments, even they may join the bank's board of directors.

2.1.3. *Asymmetric information theory*

Starting with the agency problem, the principals cannot monitor and measure their agents' behavior because of information asymmetry, which is defined by Klein et al. (2002) as the number of unbalanced information managers have compared to other parties. As a result, the different competing interests exist among the separate individual and groups (Morgado & Pindado, 2003). Hence, the mechanisms in corporate governance to limit or minimize agency costs applied by the board of directors are using outside directors, debt policy, and managerial strategies (Deshmukh, 2005; Rutherford & Buchholtz, 2007; W.-P. Chen et al., 2007).

It is obvious that the asymmetric information issues between lenders and borrowers are the reasons that cause NPLs. Those loans with low credit ratings lead to an increase in the probability of occurrence in NPLs. Under asymmetric information, the banks (lenders) are likely to lack adequate data and information concerning the borrowers to accurately assess their ability to repay loans (Edwards & Turnbull, 1994). Another study by Binks and Ennew (1997) has emphasized that the borrowers may be limited to bank loans if their information is not transparent and truthful, regardless of the business's size. The problem of asymmetry information is now increasing remarkably in developing countries, as credit information quality is limited due to effective information management mechanisms and credit information connections between banks. With insufficient data or information related to borrowers, potential risks and ethical risks exist (Edwards & Turnbull, 1994). Asymmetric information and ineffective control over the credit contract enforcement process will bring the credit market equilibrium below the optimal level (Stiglitz & Weiss, 1981). This is a dominant problem in developing countries, such as Vietnam.

2.2. *Empirical studies*

The empirical research results have highlighted the determinants of NPLs in commercial banks, divided them into two groups of factors: bank-specific factors and macroeconomic factors. According to Boulila Taktak et al. (2010), Kastrati (2011), D. P. Louzis et al. (2012), Messai and Jouini (2013), Klein (2013), Baholli et al. (2015), Kupčinskas and Paškevičius (2017), and Zheng et al. (2019), and Žunić et al. (2021), and Foglia (2022), and T. H. Nguyen (2017), Pham and Nguyen (2018), Nguyen (2019), and Nguyen (2020), the former group include lagged NPLs, bank performance, cost management, loan loss provision, capital adequacy ratio, bank size, loans-to-deposits ratio, internal control, liquidity ratio, and leverage ratio. While the later one involves GDP growth rate, unemployment rate, industrial production index, consumer price index (inflation rate), interest rates, and money supply growth rate, COVID-19.

Most studies have concentrated on the causes of NPL as well as explored factors affecting the NPLs of the commercial banks. However, there are still gaps in research on NPLs because currently no research has conducted and examined the effect of leverage on NPLs during the COVID-19 pandemic. Based on the studies by Pham and Nguyen (2018), D.P. Louzis et al. (2010), D. P. Louzis et al. (2012), Chaibi and Ftiti (2015), and Muratbek (2017), and Nguyen (2019), and Nguyen (2020),

some bank-specific factors, especially the leverage ratio, have been examined their influence on NPLs in the normal economic condition.

Therefore, the paper focuses on the effect of leverage on NPLs under corporate governance theories incurred during the COVID-19 pandemic for Vietnamese banking system that emphasize effective mechanisms to control and limit non-performing loans in the credit granting process.

2.3. Factors affect non-performing loans

- The latency of NPL: is a year lag of NPL. This shows whether the bank's NPL management is effective or not (Mohanty, 2018; Muratbek, 2017). According to the research results of Curak et al. (2013); Shah (2014); Makri et al. (2014), Ghosh (2015), and Radivojevic and Jovovic (2017); Isaev and Masih (2017); Bayar (2019); Pham and Nguyen (2018), there is a negative relationship between the latency of NPL and NPL of current year. However, this relationship proved to be the positive in the research results of D. P. Louzis et al. (2012); Abdioglu & Aytakin (2016). From the above discussion, the author proposes the hypothesis is as follows.

Hypothesis 1: the lag of NPLs has a positive effect to NPLs in Vietnamese banking system.

- Leverage ratio: Financial leverage ratio refers to the combination of debt and equity in the management of a bank's financial policy. Leverage also in banking sector has a significant impact on credit risk (Waqas et al., 2017). Bank leverage is the same as corporate leverage, as this indicator predicts the optimal capital structure indicating which institutions have a proportion of equity ownership and the rest of creditors. According to the study by Chaibi and Ftiti (2015), there is a positive and significant correlation between leverage ratio and NPLs. Radivojevic and Jovovic (2017) also shows a positive and statistically significant relationship between financial leverage ratio and NPLs.

Hypothesis 2: leverage ratio affects NPLs positively in Vietnamese banking system.

-COVID-19: COVID-19 pandemic, a crisis creates an adverse effect on the economy in the world. According to the trade-off 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, lower profitability, poorer asset quality, and lower credit growth (Hardiyanti & Aziz, 2021; Žunić et al., 2021).

Several studies have researched the effect of COVID-19 on NPLs, such as Tiwu (2020), Goodell (2020), Žunić et al. (2021), and Hardiyanti and Aziz (2021). They confirm that the COVID-19 pandemic leads to an increase in non-performing loans and deterioration of the quality of the loan portfolio at banking system. Besides, unprecedented crises, such as the COVID-19 pandemic have negative consequences for the business. Ding et al. (2021) conclude that firms using their equity for operations perform better than those taking external fundings during the pandemic.

Hypothesis 3: the COVID-19 has a positive effect to NPLs in Vietnamese banking system.

3. Research methodology and proposed model

3.1. Sample

For primary data, the study is then used as the basis of a survey among 50 credit management experts who work at joint-stock commercial banks in Vietnam. These interviewees have over 5 working experiences and knowledgeable in banking and finance.

At the end of 2020, the Vietnamese commercial banking system included 4 State-owned commercial banks, 31 joint-stock commercial banks, 9 full-foreign owned banks, 2 joint-venture banks. However, this research only focuses on the commercial banks, so the sample size used for the regression model is 35 commercial banks¹ compared to 43 banks in Vietnam. Because the dataset involves a large number of banks ($N = 35$) and a small number of years ($T = 11$), the Arellano Bond estimation is also suitable for $T < N$. Research data is equal to $35 * 11 = 385$ observations.

3.2. Proposed model

With a dynamic specification, the proposed model is as follows:

$$npl_{i,t} = \beta_0 + \beta_1 npl_{i,t-1} + \beta_2 leverage_{i,t} + \beta_3 Covid_t + \sum_{i=4}^n \beta_i control_variables_{i,t} + \mu_{it} \quad (1)$$

From Equation [1], the modified model is as follows (Equation [2]):

$$npl_{i,t} = \beta_0 + \beta_1 npl_{i,t-1} + \beta_2 lev_{i,t} + \beta_3 car_{i,t} + \beta_4 ldr_{i,t} + \beta_5 llp_{i,t} + \beta_6 gr_loan_{i,t} + \beta_7 cir_{i,t} + \beta_8 inf_t + \beta_9 gdp_t + \beta_{10} covid_t + \mu_{it} \quad (2)$$

Where:

$npl_{i,t}$: non-performing loans of bank i at time t

$npl_{i,t-1}$: non-performing loans of bank i at time $t-1$

$lev_{i,t}$: leverage of bank i at time t

$car_{i,t}$: capital adequacy ratio of bank i at time t

$ldr_{i,t}$: loan to deposit ratio of bank i at time t

$llp_{i,t}$: loan loss provision of bank i at time t

$gr_loan_{i,t}$: the growth of loans of bank i at time t compared to time $t-1$

$cir_{i,t}$: cost to income ratio of bank i at time t

inf_t : inflation rate at time t

gdp_t : gross domestic product at time t

$covid_t$: COVID-19 at time t

The details of variables in model [2] are presented in [Table 1](#) below.

3.3. Research methodology

Using qualitative (expert interviews, namely senior credit officers and credit managers' survey) aims to adjust and supplement the presence of variables that affect NPLs built in the proposed model. First, preliminary qualitative and quantitative research is conducted. The preliminary quantitative study calculated the expert consensus coefficient to generate strong evidence to support these variables' presence. According to Hayes and Krippendorff (2007), a consensus coefficient of 67% or even 60% is considered satisfactory if the results, such as objective decision interviews, are appropriately coded (Hayes & Krippendorff, 2007). Therefore, only those variables with an expert consensus rate of greater than 60% are retained for the analysis. Second, preliminary quantitative research is conducted based on the exchange with the experts. The results are then used as the basis of a survey among 50 credit

Table 1. Variables in the proposed model

STT	Variable	Index	Calculation/ Source	Source(s)
Dependent variable				
1	non-performing loans	npl	$\frac{\text{nonperforming loans}_{i,t}}{\text{total loans}_{i,t}}$	
Instrument variable				
2	latency of non-performing loans	$npl_{i,t-1}$	$\frac{\text{nonperforming loans}_{i,t-1}}{\text{total loans}_{i,t-1}}$	Curak et al. (2013); Makri et al. (2014); Ghosh (2015); Radivojevic and Jovovic (2017); Kupčinskas and Paškevičius (2017); Bayar (2019); Pham and Nguyen (2018).
Independent variable				
3	leverage	lev	$\frac{\text{total liabilities}_{i,t}}{\text{total equity}_{i,t}}$	Altman (1968); Hillegeist et al. (2004); Boulila Taktak et al. (2010); Pham and Nguyen (2018).
4	COVID-19	covid	covid is dummy variable; covid = 1: the year has covid-19; covid = 0 otherwise	Tiwu (2020), Goodell (2020), Goodell (2020), Asmoro (2020), Goodell (2020), Žunić et al. (2021), Hardiyanti and Aziz (2021)
Control variables				
5	capital adequacy ratio	car	Financial statements	Sinkey and Greenawalt (1991); Shrikes and Dahl (1995); Afriyie and Akotey (2013); Abdioglu & Aytekin (2016); Koju et al. (2018); Yulianti et al. (2018)
6	loan to deposit ratio	ldr	$\frac{\text{total loans}_{i,t}}{\text{total deposits}_{i,t}}$	Mishkin (2006); Ellis and Jordi (2015 & 2016)
7	loan loss provision	llp	Financial statements	Sinkey & Greenawalt (1991); Al-Smadi and Ahmad (2009); Boulila Taktak et al. (2010); Ghosh (2015); Radivojevic and Jovovic (2017)
8	credit growth	gr_loan	$\frac{\text{total loan}_{i,t} - \text{total loan}_{i,t-1}}{\text{total loan}_{i,t-1}}$	Keeton (1999); De Bock and Demyanets (2012); Muriithi (2014); Ghosh (2015); Abdioglu & Aytekin (2016); Kupčinskas and Paškevičius (2017)

(Continued)

Table 1. (Continued)

STT	Variable	Index	Calculation/ Source	Source(s)
9	cost management	cir	Financial statements	Berger and DeYoung (1997); Lin et al. (2009); Karim et al. (2010); D. P. Louzis et al. (2012)
10	inflation rate	inf	World bank	Curak et al. (2013); Klein (2013); Skarica (2014); Ghosh (2015)
11	gross domestic product growth	gdp	World bank	Mileris (2012); Alexandri and Santoso (2015); Chaibi and Ftiti (2015); Reddy (2015); Mohanty (2018)

management experts regarding those variables that affect NPLs in Vietnam. This step demonstrates that the variables that satisfied the expert consensus condition are leverage ratio, COVID-19 and control variables includes capital adequacy ratio, lag (NPLs), loan loss provision, loan to deposit ratio, credit growth, cost-to-income ratio, GDP and inflation.

After the qualitative methods, the author applies quantitative research methods (System Generalized Method of Moments—SGMM) to estimate the effect of leverage and Covid 19 on NPLs at commercial banks in Vietnam.

Given the lagged dependent variable and endogeneity, the least square estimator becomes biased and inconsistent. Therefore, the Arellano-Bond two-step difference SGMM estimator with robust standard errors is adopted (Arellano & Bond, 1991). The Arellano-Bond estimator uses the lag of dependent variables and the lagged exogenous variables' values as instrumental variables. The Arellano-Bond estimator (1991) is also suitable for datasets with a large number of banks and a small number of years. This paper uses the secondary data of 35 commercial banks (spatial range-N) for the years 2010 to 2020 (time range-T, where T < N).

According to Roodman (2009), one rule of thumb in GMM is that the “number of instruments should not be larger than the number of groups”. AR (1) and AR (2) denoted the Arellano-Bond tests for the first-and second-order autocorrelation of the residuals. One should reject the null hypothesis of no first-order serial correlation and support the null hypothesis of no second-order serial correlation of the residuals.

4. Research results and discussions

4.1. Research results

The descriptive statistics of all the variables are summarized in Table 2. The mean value of NPLs in this table is 0.0233, with minimum and maximum values of 0.0001 and 0.1140, respectively. Also, its standard deviation is 0.0154. In the sample data, the highest NPLs rate belongs to Saigon Joint Stock Commercial Bank (SCB) in 2010, and the lowest value came from Bao Viet Joint Stock Commercial Bank-BVB (2010).

The leverage factor takes the minimum and maximum values to be in the order of 2.0085 and 27.8760. The covid is a dummy variable, which has a maximum value of 1 and a minimum value of

Table 2. Descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
npl	385	0.0233	0.0154	0.0001	0.1140
lev	385	11.1146	4.4644	2.0085	27.8760
ldr	385	0.9466	0.7642	0.3719	10.4129
llp	385	0.0135	0.0057	0.0029	0.0327
car	385	0.1441	0.0601	0.0640	0.4511
gr_loan	385	0.2960	0.2732	-0.2218	1.4806
cir	385	-0.5177	0.1337	-1.1152	-0.2251
inf	385	0.0721	0.0511	0.0060	0.1870
gdp	385	0.0601	0.0055	0.0520	0.0680
covid	385	0.1844	0.3883	0.0000	1.0000

0. COVID equals one indicates the year has had the COVID-19 pandemic, which is the year of 2019 and 2020.

Next section presents the test of multi-collinear phenomenon, autocorrelation and heteroskedasticity after running the OLS between npl (dependent variable) and all independent variables.

Hair et al. (1995) demonstrated that a VIF coefficient of less than 10 is acceptable, meaning there is no multicollinearity in the model (Choi, 2001). Alternatively, if VIF values are less than 5, there is confirmation that multicollinearity does not exist in the model (Afriyie & Akotey, 2013). According to Table 3, all VIF values are smaller than 10. Thus, there is evidence of the absence of multi-collinear phenomena.

As shown in Table 3, after removing the variables that have correlation coefficients greater than 0.8, the remaining correlation coefficients are all less than 0.8. Thus, the model has no defects of multicollinearity. Table 4 presents the results of the autocorrelation and heteroskedasticity tests. These tests are used to claim that the residuals are independent of each other, and no systematic change is evident in the spread of the residuals over the range of measured values.

In the Wooldridge test for autocorrelation in the panel data (Table 4), the p-value is smaller than 5%; thus, we have enough evidence to reject H0: "There is no autocorrelation". It means the model contains the autocorrelation issue. Furthermore, the p-value of variance change test (Breusch-Pagan/Cook-Weisberg test) has a value smaller than 5%; thus, H0: "Residuals with variance unchanged" has sufficient evidence to be rejected. Therefore, heteroskedasticity exists in the model.

The next section will present the regression results based on SGMM 2-step method with the lag of NPLs as instrumental variables to solve endogeneity. Table 5 presents the SGMM results with seven statistically significant variables because their p-values are higher than 5%.

Table 5 shows the p-value obtained from AR(2) is 0.638 which is higher than 5%, null hypothesis "H0: No autocorrelation of order 2" is thereby supporting H0. Hence, we can conclude that no autocorrelation was detected in the model.

Moreover, the Sargan and Hansen tests in Table 4, which aim to detect an overidentifying restrictions problem related to the heterogeneity of the subsets of the instrumental variables and support the validity and reliability of the SGMM 2-step results. All the p-values are higher than 5%, therefore, no sufficient evidence could be found to reject hypothesis H0.

Table 3. Correlation matrix and VIF

	npl	lev	covid	ldr	llp	car	gr_loan	cir	inf	gdp	VIF
npl	1										
lev	-0.1278	1									1.09
covid	0.0652	0.0982	1								1.22
ldr	0.2994	0.0992	0.0268	1							1.17
llp	0.0104	0.1033	-0.0428	-0.2239	1						1.08
car	-0.6324	-0.1969	-0.0546	-0.2934	-0.011	1					1.16
gr_loan	0.0009	0.1523	0.3853	-0.0923	0.0842	0.036	1				1.22
cir	-0.1124	-0.0328	0.0228	-0.0351	0.0043	0.0567	0.0383	1			1.01
inf	0.4376	0.0243	-0.0528	0.0466	-0.0145	-0.1408	-0.0433	-0.0202	1		1.03
gdp	-0.0579	0.0050	0.1493	0.0167	-0.0067	0.0071	0.0444	0.005	0.0116	1	1.02

In addition, in this paper, the number of instruments is 16, which is less than the number of observations at 35 (Table 4). It means that the rule of thumb is satisfied (Al Marzouqi et al., 2015; Roodman, 2009). Hence, the instrument variables adequately deal with the endogeneity (Ding et al., 2021).

4.2. Discussions

The validity of the instrumental variables used in SGMM was proven by conducting two tests: the endogenous test of Sargan (1958) and the autocorrelation test of Arellano and Bond (1991). The endogenous test of Sargan (1958) has the null hypothesis, “H0: The instrumental variables are exogenous (not correlated with error).” The model was estimated reliably and with no bias, and seven factors, particularly leverage ratio and COVID-19, reached the 1% level of statistical significance.

First, the leverage ratio is statistically significant at the 95% confidence level. The paper’s results show that the reverse impact of the leverage ratio on NPLs and their relationships is the opposite of the proposed hypothesis, based on previous research studies. This paper also highlights the difference in the correlation between leverage ratio and NPLs by focusing on the corporate management mechanism used to describe and evaluate performance and the reliability of the banking system management. In the international integration environment, most banks need to keep sufficient resources and effort to deal with their NPLs (Suhaimi et al., 2017). An effective corporate management mechanism can promote these organizations’ transparency and credibility and improve their financial statements, thereby promoting investment efficiency (Chau, 2017; Husnin et al., 2016; Jais et al., 2016). Good corporate management can promote highly effective economic and investment decisions and indirectly increase the value of organizations (V. Chen et al., 2011). Previous empirical studies have highlighted the importance of the corporate management mechanism in managing the NPLs of the banking system (Ahmad et al., 2016). Donaldson and Davis (1991) asserted that corporate management (such as oversight of management, independent internal audits, and the structure of the board of directors into levels of responsibility and internal control) is the mechanism by which the highest management level within an organization belongs to the board of directors. Corporate management is controlled through monitoring programs and other binding policies. Tricker (1994) added that a management board should include the owner and those interested in a company’s work or financial situation, such as creditors, loan mobilizers, analysts, and business managers. Shleifer and Vishny (1997) have argued that a corporate management mechanism shows how a company’s sponsors (e.g., creditors, shareholders, and investors) ensure that they can receive returns on their investments. If the leverage ratio is high, the commercial banks need to have strict corporate management to limit the risks. It means that creditors or related parties have the mechanisms to control, monitor, and even participate in the board of directors to supervise how these banks use loans to repay the insert rate deposits to customers and maximize their performance and profitability, according to corporate governance theory.

Second, for commercial banks in Vietnam, the COVID-19 factor is used as an external indicator of the rise in non-performing loans. This demonstrates that the COVID-19 case is one sign of a natural disaster beyond human ability that affects commercial banks’ NPL levels. The findings of this study are consistent with those of Hardiyanti and Aziz (2021), Žunić et al. (2021). In Vietnam, based on the General Statistics Office’s reports 2020, the banking system’s credit growth in 2020 will reach 10.14%, lower than the 12.14% in 2019, but this is still the lowest growth rate from 2013 to 2020. The banking system’s NPL ratio in 2019–2021 (percentage of total outstanding loans) is 1.6%, 1.7%, and 1.9% (The State Bank of Vietnam, 2022). In order to limit the increase in NPLs in the following years because of the late impact of COVID-19, the Vietnamese government has issued policies to support customers facing difficulties. Specifically, on 4 March 2020, the government issued a credit package worth VND 250,000 billion according to the directive 11/CT-TTg of the Prime Minister (urgent solution to remove difficulties for production and business, ensuring social security in response to the COVID-19 epidemic). On 13 March 2020, the

Table 4. Test for autocorrelation and heteroskedasticity

No.	Test	F-statistic	p-values	H0
1	Wooldridge test for autocorrelation in panel data	63.294	0.000	Reject
2	Breusch-Pagan/ Cook-Weisberg test for heteroskedasticity	679.90	0.000	Reject

Table 5. SGMM results

npl_{it}	SGMM		
	Beta coefficient	p-value	Decision on p-values
npl_{it-1}	-0.1482	0.004**	Accept
lev	-0.0006	0.000***	Accept
car	-0.0047	0.008**	Accept
ldr	0.0004	0.546	Reject
llp	1.5840	0.000***	Accept
gr_loan	-0.0028	0.006**	Accept
cir	-0.0042	0.372	Reject
inf	0.0587	0.081	Reject
gdp	-0.0002	0.000***	Accept
covid	0.0018	0.000***	Accept

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

Arellano-Bond test for AR(1) in first differences: $z = -1.15$ $Pr > z = 0.007$

Arellano-Bond test for AR(2) in first differences: $z = -0.08$ $Pr > z = 0.638$

Sargan test of overid. restrictions: $\chi^2(42) = 27.981$ $Prob > \chi^2 = 0.716$

Hansen test of overid. restrictions: $\chi^2(42) = 10.382$ $Prob > \chi^2 = 1.000$

Number of instruments = 16

Number of groups = 35

Where: npl_{it-1} is the lag of non-performing loans; lev is leverage ratio; car is capital adequacy ratio; ldr is loan to deposit ratio; llp is loan loss provision; gr_loan is loan growth; cir is cost-to-income ratio (cost management); inf is inflation rate; gdp is gross domestic product; covid is COVID-19.

government issued Circular 01/2020/TT-NHNN stipulating that credit institutions and foreign bank branches restructure debt repayment terms, exempt or reduce interest (including service fees), and maintain the debt group to support customers affected by the COVID-19 epidemic. On 17 March 2020, the State Bank of Vietnam (SBV) cut the policy interest rate by 100 basis points. On 8 April 2020, the government issued a fiscal support package by deferring tax payments and social insurance (about 1% of GDP). On 9 September 2021, the government issued Resolution 105/NQ-CP on supporting businesses, cooperatives, and business households in the context of the COVID-19 epidemic. Besides, to facilitate loans for businesses, the SBV needs to provide a detailed guideline framework and propose responsibilities for each agency to coordinate to support businesses, ensuring that the right customers receive support packages at an incentive interest rate. In addition, the SBV needs to inspect the debt restructuring strictly, and require commercial banks to report the quantity, the limitation, and the reason for the extension of the loan terms, to ensure that the support policy is objective, transparent, and applied using the suitable object. Moreover, for small and medium-sized enterprises, which are also affected by the pandemic, SBV should continue to have a policy of extending debt and reducing lending interest rates for them. Besides, fiscal policy should be strengthened to stimulate demand and promote economic growth.

5. Conclusions and limitations

This study clarifies the linkage between leverage and NPLs at joint-stock commercial banks in Vietnam and highlights the relationship in the COVID-19 pandemic. Using qualitative and quantitative methods, the reverse relationship is explained under corporate governance theories such as agency and stakeholder theories. According to the asymmetric information theory, banks must be concerned about the information issues between lenders and borrowers. Because of a lack of adequate data and information concerning borrowers with low credit ratings, NPLs are more likely to occur. Hence, the commercial banks can control the granting credit effectively, which aim to prevent and reduce the level of NPLs.

From a banking standpoint, the liabilities originating from customer deposits should be exploited to take advantage of their investment activities, including loans. Furthermore, banks must strictly monitor and supervise lending activities to limit the occurrence of NPLs, balance lending-mobilizing interest rates, ensure profit growth, and maintain and stabilize banking system liquidity.

Although some findings have been achieved in the paper, certain limitations still exist. First, the study does not mention the effect of the board of directors as a mediating or moderating factor on the leverage-NPLs relationship. Second, the study needs to consider the cross-country data, especially in developing countries, to examine how different the effects of leverage on NPLs in those countries are. Thirdly, the study has examined limited indicators as determinants of NPLs, such as leverage and COVID-19. Finally, COVID-19 can be quantified using other metrics such as the number of deaths and infected people.

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Note

1. According to State Bank of Vietnam at 31/12/2020 (<https://www.sbv.gov.vn>)

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