

## **Bank-Specific Determinants of Loan Growth in Vietnam: Evidence from the CAMELS Approach\***

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### **Abstract**

The paper empirically examines the bank-specific determinants of loan growth in the Vietnamese banking system for the period from 2007 to 2019. We approach the CAMELS framework and employ the dynamic panel regression to determine the effects of each CAMELS factor on bank lending. To ensure the robustness of results, we also use alternative definitions of the variables and different specifications with and without full sets of CAMELS components. With these settings, we display multiple important results. (i) We find that a large capital buffer tends to boost bank lending expansion faster. (ii) High asset quality might positively contribute to high loan growth; in other words, banks subject to high credit risk are discouraged from making loans. (iii) Less efficiently managed banks are more likely to adopt an aggressive lending strategy, highlighting the moral hazard incentives of Vietnamese banks. (iv) More profitable banks with excellent competitive advantages could expand their lending activities to a larger extent. (v) Liquidity is positively related to the loan growth of banks. (vi) Perceived interest rate risk tends to suppress loan growth since interest-rate-sensitive banks might be concerned about the adverse effects of unpredictable adverse changes in interest rates in the future.

**Keywords:** CAMELS, Capital, Liquidity, Loan Growth, Management Efficiency

**JEL Classification Code:** G20,G21, G28

### **1. Introduction**

Studying potential determinants of bank lending has been a major research stream in the literature. This issue especially attracts increasing attention from academics and policymakers after numerous markets experienced considerable credit booms during the last decades (Dang,

2019). It is further essential to understand determinants of loan growth since it has been a critical driver of the economic growth in many emerging economies, where the capital market is somewhat immature and the burden is placed on the banking system (Vo, 2018).

Researchers have analyzed bank lending behavior theoretically and empirically. They frequently combine both internal and external factors to find the most comprehensive answer. However, potential determinants of bank lending remain unclear and appear to be complicated. Moreover, previous studies have generally not approached the problem in a systematic manner; instead, they mainly exploit each individual ingredient in different markets. Hence, to fill the literature gap on the current topic, we systematically focus on exploring multiple bank-specific characteristics that drive bank lending by using the CAMELS framework. Accordingly, we employ the research data of Vietnamese commercial banks from 2007 to 2019. This research period features various fluctuations in the credit supply of the banking sector in Vietnam, which provides a very suitable context for the analysis.

“CAMELS” stands for capital, asset quality, management, earnings, liquidity, and sensitivity to market

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risk. Since 2019, the State Bank of Vietnam (SBV) issued a bank rating framework based on CAMELS components. This international approach is meaningful to banks in assessing and improving their performance and helps the regulators carry out their inspection and supervision functions. The CAMELS parameters are thought to be suitable indicators to evaluate the financial soundness of the banking sector. Theoretically, many studies also show that CAMELS components have substantial impacts on bank lending (see section 2 for a review). From the viewpoint of the SBV, CAMELS is a set of regulatory management tools. As for banks themselves, it displays the standards for them to focus on in order to improve the efficiency and capacity of the business, in which loan growth is a crucial priority.

The paper contributes to the existing literature in some directions. First, it systematically examines the determinants of bank lending using bank balance sheet indicators inspired by the CAMELS framework. As far as we know, this work is the first to make use of the CAMELS rating system's spirit in this way. Second, this study enriches the literature strand on the impacts of rarely discussed factors, such as management efficiency and sensitivity to market risk, on bank lending. Though these are the critical drivers of loan growth theoretically, the empirical work done to verify their impacts has been very limited so far. Third, the study offers more insights into bank lending behavior in a small emerging market, where the economic development heavily depends on the funding sources from banks. Previous studies have mainly focused on developed markets with rich databases and leading positions that dominate the global financial market.

## 2. Literature Review

This section reviews the current debates, both theoretically and empirically proposed, in the literature on the determinants (individual CAMELS indicators) of bank lending.

### 2.1. Capital

There are two strands of theories on how capital influences bank lending. According to the "financial fragility-crowding out" hypothesis, Berger and Bouwman (2009) argue that shareholders are more reluctant to offer loans when they invest more money in their banks. They also become more cautious with their investment decisions. Thus, more-capitalized banks may supply fewer loans than less-capitalized banks. Conversely, the impacts of capital on bank

lending are positive according to the "risk absorption" theory. In this vein, holding a larger capital buffer improves the risk-bearing capacity and protects banks against any potential loss (Coval & Thakor, 2005; Repullo, 2004). So, banks will gain more incentives to adopt a faster loan growth strategy.

A large body of empirical studies has explored the effects of capital on bank lending. In early studies, many authors reveal that an increase in bank capital could result in faster loan growth to various degrees (Bernanke, Lown, & Friedman, 1991; Hancock & Wilcox, 1994). In more recent works, using the samples of the US, Europe, and even the globe, Carlson, Shan, and Warusawitharana (2013), Louhichi and Boujelbene (2017), and Košak, Li, Lončarski, and Marić (2015) respectively observe the positive relationship between bank capital and lending behavior. However, some mixed conclusions also emerged. Kim and Sohn (2017) claim that the US banks with more capital only expand their lending aggressively after they store enough liquidity. Focusing on banks in the euro area, Roulet (2018) finds that capital ratios induce negative impacts on retail lending in the post-2008 financial crisis time.

### 2.2. Asset Quality

As suggested in the literature, asset quality is considered as the key factor driving bank lending. A bank suffering high credit risk tends to concentrate on reinforcing risk supervision rather than granting increased loans (Altunbas, Gambacorta, & Marques-Ibanez, 2010; Bernanke & Blinder, 1988). Higher bad debt and loan loss provision ratios could cause greater caution among lenders, which possibly leads to tightened lending standards and thus diminishes lending activities (O'Brien & Browne, 1992). In this regard, Heid and Krüger (2011) attribute the decline in lending segments to banks' unwillingness to disburse loans due to the deterioration in loan quality. Moreover, this deterioration potentially puts numerous pressure on bank return, bank capital, and mitigate banks' desire and resources to lend to the economy (Ben Naceur, Marton, & Roulet, 2018).

A few empirical documents have directly determined the impact of asset quality on loan creation thus far. Using bank-level data, Delis, Kouretas, and Tsoumas (2014) reveal that lending of US banks falls when customers are anxious, especially when banks are subject to high credit risk. Capturing bank loan quality by loan loss provisions, Adesina (2019) suggests that the poor performance of asset portfolios hampers banks' capacity to make loans. In another route, Tracey and Leon (2011) figure out that banks react differently to the non-performing loan ratio depending on

a certain threshold, particularly risky banks with the non-performing loan ratio above the threshold considerably cut their lending. Contrary to these works highlighting the adverse effect of credit risk on lending, Aysan and Disli (2019) document that a rise in non-performing loans does not modify bank lending activities in Turkey. The authors explain that diversified funding could help banks survive the reduced returns from deteriorated investments.

### **2.3. Management Efficiency**

As Berger and DeYoung (1997) hypothesize, low cost efficiency is the primary signal of poor management systems, in which managers with limited experiences and expertise in credit scoring could easily grant a high volume of loans. Furthermore, according to the “moral hazard” hypothesis, bank managers might gain incentives to pursue more risky investments, especially when banks are more inefficient (Jeitschko & Jeung, 2005). So, poorly managed banks with more moral hazard incentives are more likely to select an aggressive lending schedule. As an alternative hypothesis, Berger and DeYoung (1997) claim that fewer operating expenses are sufficient to sustain the same volume of loans for the case of well-managed banks. Thus, banks may be motivated to improve revenues by raising the speed of loan growth thanks to the abundant resources.

Additionally, the present issue is closely related to the segment focusing on the pass-through mechanism of cost efficiency to interest rates on loans. Prior scholars have demonstrated that more efficient banks typically charge lower markups, thus mitigating lending rates for their customers (Gambacorta, 2008; Havranek, Irsova, & Lesanovska, 2016). In this respect, decreased borrowing costs may encourage loan demand (Ben Naceur et al., 2018).

### **2.4. Earnings**

Theoretically, the effect of bank profitability on lending is ambiguous. Some theoretical models indicate that banks could decrease the asymmetric information problem if they gain more profits (Holmstrom & Tirole, 1997; Mankiw, 1986). In this regard, these banks could take good use of competitive advantages in attracting funding from depositors and shareholders. As a result, this leads to a more substantial expansion in lending activities of high-profit banks, which are always ready with various loanable funds. Also, Dell’Ariccia and Marquez (2006) claim that banks might relax their lending standards or even lending

rates thanks to better comparative advantages in order to expand their lending segments. In sharp contrast, how well banks make earnings can lead to changes in risk appetite and business strategies. According to Rajan (2006), higher returns discourage banks from “searching for yield”, thus these banks become more reluctant to offer loans. Moreover, if the banking sector exhibits high competition, lower interest margins could result in higher loan growth (Laidroo, 2010).

The empirical analysis of bank earnings and loan growth is limited and should be extended. Using a large sample of 600 listed banks worldwide, Nier and Zicchino (2006) find that bank return (captured by return on equity) positively drives loan growth. The subsequent work of Bustamante, Cuba, and Nivin (2019) confirms this result for the banking system in Peru. Employing return on assets as a proxy for bank profits, Adesina (2019) reveals a pattern that challenges those obtained previously. Concretely, the author shows the negative linkage between bank profits and loan growth and interprets it by the mechanism that banks may cut loan supply while seeking a higher rate of return. Nevertheless, it should be noted that bank earnings are not the primary concern of these prior works.

### **2.5. Liquidity**

The precautionary motive could explain why highly liquid banks could stimulate their lending. Gennaioli, Martin, and Rossi (2014) propose a model showing that banks optimally opt to store liquidity by purchasing liquid assets to finance investments in the future. Furthermore, as it is difficult to disburse funds immediately after banks collect them from depositors, banks may temporarily invest in liquid asset sources that they could substitute by loans later (Broner, Erce, Martin, & Ventura, 2014). However, Cornett, McNutt, Strahan, and Tehranian (2011) suggest that banks have increased their liquidity positions to protect them from liquidity risk during stressed times, thereby curtailing investments in new loans. Former empirical studies usually apply assets and liabilities ratios to explore the association between liquidity positions and bank loan growth (Berrospide & Edge, 2010; Roulet, 2018). The results emphasize that storing more liquidity is a great motivation for banks to expand lending subsequently.

### **2.6. Sensitivity to Market Risk**

There exists little theoretical and empirical investigation on how bank lending responses to the sensitivity to market

risk. Focusing on a smaller scope, several theoretical documents suggest that more exposures to interest rate risk make lending activities more sensitive to shocks in interest rates (Van den Heuvel, 2002). Banks are concerned that in the presence of unpredictable adverse changes in interest rates, a banking profile with high interest rate risk might cause potential losses and deplete bank equity capital. Since this source of funding is costly, banks may choose to cut lending to comply with regulators' safety obligations. Conducting a rare empirical analysis on the topic, Beutler, Bichsel, Bruhin, and Danton (2020) find evidence in favor of this notion. Precisely, they conclude that interest rate risk explains the decline in the cumulative loan growth of Swiss banks from 2001Q2 to 2013Q3.

### 3. Data and Research Methods

#### 3.1. Model, Variables, and Estimation Technique

To investigate the determinants of bank lending for Vietnamese commercial banks, we approach the dynamic panel model that is widely employed in the banking literature, especially in the stream focusing on bank lending behavior (e.g., Dahir, Mahat, Razak, & Bany-Arifin, 2019; Delis et al., 2014; Vo, 2018, among many others) CEOs (firms). Hence, our estimation equation is specified as follows:

$$\begin{aligned} \text{Loan growth}_{i,t} = & \alpha_0 + \alpha_1 \times \text{Loan growth}_{i,t-1} + \alpha_2 \\ & \times \text{CAMELS}_{i,t-1} + \alpha_3 \times \text{Macro}_t \\ & + u_{i,t} \end{aligned} \quad (1)$$

where the dependent variable  $\text{Loan growth}_{i,t}$  is the annual percentage change of gross customer loans by bank  $i$  in year  $t$ . We do not consider loans to other entities such as the government or financial institutions due to the heterogeneity in lending regimes and incentives.  $\text{CAMELS}$  is a vector of bank-specific factors defined using the CAMELS components.  $\text{Macro}$  is a vector of macroeconomic variables to control the external environment, including the business cycle of the economy (the growth rate of GDP) and the inflation (the annual rate of inflation).  $u_{i,t}$  is the error term. The lagged dependent variable is inserted on the right side of the equation to capture the dynamic feature of bank lending. Following Adesina (2019), Ben Naceur et al. (2018), and Roulet (2018), we take the one-period lags of all bank-specific variables since bank lending cannot respond immediately to changes in bank balance sheets.

Regarding our CAMELS explanatory variables of interest, we measure them in the following ways:

- Capital is captured by the ratio of equity to total assets (Dang, 2020). This ratio is the traditional measure for bank capital strength. Though other risk-weighted measures such as the capital adequacy ratio could

better represent bank capital safety, its data remain inaccessible in the situation of Vietnamese banks.

- Asset quality is approached from the aspect of credit portfolio quality. As a common practice, we apply the loan loss provisions and non-performing loans as shares of gross customer loans to gauge bank asset quality (Le & Diep, 2020). The higher these measures are, the poorer the asset quality is.
- Management is proxied in the dimension of cost management efficiency. We use two criteria, namely, operating expenses/total assets and non-interest expenses/total revenues (De Graeve, De Jonghe, & Vennet, 2007; Fiorentino, Karmann, & Koetter, 2011). These ratios reflect how efficient banks manage their costs corresponding to their assets and revenues. The higher the cost ratio is, the less efficient the bank management is.
- Earnings are displayed by the most common indicators, namely, return on assets (ROA), return on equity (ROE), and net interest margin (NIM)(Dao & Nguyen, 2020; Khanifah, Hardiningsih, Darmaryantiko, Iryantik, & Udin, 2020; Qayyum & Noreen 2019).
- Liquidity is calculated using two ratios, namely, liquid assets/total assets and loans/deposits (Dang, 2019). In some detail, liquid assets contain cash and deposits at the central bank and other financial institutions. We should also notice that the ratio of loan to deposits is the inverse measure of liquidity positions.
- Sensitivity to market risk is taken into account by the category of interest rate risk due to data scarcity (Gomez, Landier, Sraer, & Thesmar, 2020). Empirically, we approximate this respect by the difference between rate-sensitive assets and rate-sensitive liabilities relative to total assets. The gap indicates the extent to which banks' balance sheets are sensitive to changes in interest rates.

With the dynamic model specification proposed, we employ the two-step system GMM estimator to yield efficient results (Arellano & Bover, 1995; Blundell & Bond, 1998; Roodman, 2009). This estimator could well deal with the endogeneity problem via lagged variables in levels and differences as instruments, which are available inside the model. The consistency of the GMM estimator could be validated by two sets of conditions for the suitability of the instrument set and the second-order autocorrelation in the disturbance. Hence, we conduct the Hansen test for the former and the Arellano-Bond test for the latter.

#### 3.2. Data

We manually collect the research data from Vietnamese commercial banks' financial reports as our analysis

requires almost all the information on balance sheets. We obtain macroeconomic data from the World Development Indicators database. For the sample of commercial banks, we exclude those that are subject to special control or acquired entirely by the central bank as these banks exhibit different operation strategies and face strict constraints on their activities. Banks that do not meet our information criteria required for the calculation of specific variables will also be deleted. As a result, our final unbalanced panel dataset consists of 31 commercial banks from 2007 to 2019, covering approximately the entire banking system in Vietnam. Depending on individual variables constructed, the number of observations varies between 340 and 384 bank-year observations. To mitigate the impacts of extreme outliers, we winsorize all bank-specific variables at the 2.5th to 97.5th percentiles.

Table 1 presents the summary statistics, while Table 2 shows the correlation between each pair of variables. Vietnamese banks experienced a significant lending expansion over the period 2007–2019, illustrated by the average growth rate of customer loans equaling to 31.351% per year. The statistical distribution (large standard deviations and gaps between extreme values) of lending, along with other variables capturing CAMELS components, indicates that the bank sample is heterogeneous enough to produce efficient estimates for the decision-making purpose.

Moving on to the pairwise correlation matrix, we are confident that our selected model rules out the severe multicollinearity problem as there are only low correlations among explanatory variables of different CAMELS components. Besides, high correlations of variables proxying

the same aspect (e.g., asset quality or bank earnings) justify our setting when choosing them as alternative measures. As a note, we separate these variables in regressions.

#### 4. Results

To check the estimates' sensitivity, we first run regressions for each CAMELS component with macroeconomic control factors, and then we incorporate all CAMELS components into regressions. For brevity, the variables of interest capturing the same aspect with insignificant coefficients will not be used in the later stage.

As expected, we observe the persistence of loan growth, displayed by the consistently significant coefficient on the lagged dependent variable across all regressions. It is necessary to look into the results of diagnostic tests in the system GMM estimator. The Hansen test lends support to the overidentifying restriction, thus validating the choice of the instruments. The AR(2) test exhibits evidence in favor of the absence of the second-order autocorrelation in the disturbance. These results justify the application of the dynamic GMM estimator in this study.

Table 3 presents the estimates for bank capital, asset quality, and management efficiency. Column 1 indicates the significant positive coefficient on the capital ratio, implying that banks having a large capital buffer tends to expand lending faster. In some detail, a one percentage point increase in the capital ratio causes bank lending to rise by 1.338 percentage points. This finding is in line with most previous studies, which highlight that a larger capital buffer might improve the risk-bearing capacity of banks and protect them against any potential loss.

**Table 1:** Summary statistics

Variables	Observations	Mean	Standard deviation	Min	Max
Loan growth	384	31.351	33.928	-11.524	148.947
Equity/Assets (C)	384	10.009	4.842	4.384	25.267
Loan loss provisions/Loans (A)	384	1.261	0.543	0.351	2.763
Non-performing loans/Loans (A)	340	2.192	1.317	0.340	6.296
Non-interest expenses/Revenues (M)	384	21.440	6.015	10.935	34.269
Operating expenses/Assets (M)	384	1.730	0.501	0.822	3.025
ROA (E)	384	0.933	0.684	0.025	2.609
ROE (E)	384	9.968	7.235	0.336	27.482
NIM (E)	384	5.491	2.135	1.272	10.648
Liquid assets/Assets (L)	384	17.425	10.005	5.090	45.600
Loan/Deposit (L)	384	90.227	21.060	55.621	157.311
GAP (S)	384	5.220	7.023	-10.295	20.858
GDP	384	6.252	0.641	5.247	7.130
Inflation	384	7.346	6.100	0.631	23.115

Notes: The research sample covers the period of 2007–2019. All variables are expressed in percentages.

**Table 2:** Correlation coefficients matrix

	Loan growth	Equity/Assets (C)	Loan loss provisions/ Loans (A)	Non-performing loans/ Loans (A)	Non-interest expenses/ Revenues (M)	Operating expenses/ Assets (M)	ROA (E)	ROE (E)	NIM (E)	Liquid assets/Assets (L)	Loan/Deposit (L)	GAP (S)	GDP	Inflation
Loan growth	1.00													
Equity/Assets (C)	0.14	1.00												
Loan loss provisions/ Loans (A)	-0.38	-0.24	1.00											
Non-performing loans/ Loans (A)	-0.28	0.06	0.59	1.00										
Non-interest expenses/ Revenues (M)	-0.17	-0.01	0.08	0.03	1.00									
Operating expenses/ Assets (M)	-0.12	0.27	0.03	0.11	0.58	1.00								
ROA (E)	0.41	0.32	-0.19	-0.26	-0.20	0.21	1.00							
ROE (E)	0.23	-0.21	-0.02	-0.29	-0.16	0.11	0.79	1.00						
NIM (E)	-0.13	0.34	0.04	0.01	0.20	0.68	0.51	0.37	1.00					
Liquid assets/Assets (L)	0.36	0.25	-0.26	-0.17	-0.35	-0.25	0.36	0.19	-0.11	1.00				
Loan/Deposit (L)	0.11	0.32	-0.14	-0.04	-0.11	0.15	0.26	0.11	0.26	0.03	1.00			
GAP (S)	0.15	0.44	0.05	-0.03	0.07	0.23	0.42	0.26	0.41	0.21	0.41	1.00		
GDP	0.06	-0.24	-0.21	-0.31	0.12	-0.12	0.03	0.16	-0.14	-0.07	0.10	0.01	1.00	
Inflation	0.02	0.30	0.02	0.12	-0.48	0.03	0.29	0.16	0.19	0.44	0.22	0.15	-0.37	1.00

In columns 2–3 (Table 3), both loan loss provisions and non-performing loans enter the regressions significantly and negatively. Higher credit risk discourages banks from lending, or in other words, banks with lower asset quality grant loans less than banks with higher asset quality. Regarding the economic significance, for example, a one percentage point increase in the non-performing loan ratio may mitigate bank lending by 1.469 percentage points. Our result confirms the theoretical notion that a decline in asset quality causes greater caution among banks, leading to tightened lending standards and decreased loan growth (O'Brien & Browne, 1992).

Turning to columns 4–5 (Table 3), we realize that cost efficiency induces a significant and positive influence

on loan growth. This result reveals that banks with a higher cost ratio, alternatively speaking less efficiently managed banks, are more likely to experience a higher rate of loan growth. In terms of quantitative effect, if the ratio of operating expenses to total assets increases by one percentage point, then bank lending would rise by 4.997 percentage points on average. This pattern supports the “moral hazard” hypothesis, stating that more inefficient banks with more moral hazard incentives are more likely to prefer an aggressive lending strategy (Jeitschko & Jeung, 2005). However, our finding is only confirmed when we use the operating expenses indicator, whereas the coefficient is insignificant for the non-interest expenses ratio.

**Table 3:** Baseline estimation results for capital, asset quality, and management efficiency

	(1)	(2)	(3)	(4)	(5)
Lagged dependent variable	0.228*** (0.016)	0.201*** (0.009)	0.274*** (0.023)	0.250*** (0.011)	0.242*** (0.011)
Equity/Assets (C)	1.338*** (0.143)				
Loan loss provisions/Loans (A)		-6.431*** (1.419)			
Non-performing loans/Loans (A)			-1.469*** (0.390)		
Operating expenses/Assets (M)				4.997*** (1.097)	
Non-interest expenses/Revenues (M)					0.164 (0.122)
GDP	-5.831*** (0.827)	-9.305*** (1.091)	-10.648*** (0.683)	-8.018*** (0.870)	-11.572*** (1.014)
Inflation	-1.224*** (0.095)	-1.209*** (0.101)	-1.231*** (0.081)	-1.109*** (0.104)	-1.172*** (0.105)
Observations	353	353	313	353	353
AR(1) test	0.000	0.000	0.000	0.000	0.000
AR(2) test	0.358	0.217	0.535	0.271	0.285
Hansen test	0.178	0.153	0.189	0.165	0.183

Notes: The dependent variable is the rate of loan growth. Standard errors are reported in parentheses. \*, \*\*, and \*\*\* indicate the significance levels 10%, 5%, and 1%, respectively. The validity tests of the GMM estimator are shown with p-values.

Table 4 reports regression results for remaining CAMELS factors, namely, bank earnings, liquidity, and sensitivity to the market risk captured by the dimension of interest rate risk. Focusing on bank earnings, we find that overall returns have significant and positive impacts on loan growth (columns 6–7). However, the regression coefficient of the net interest margin is insignificant (column 8). We gain enough evidence to show that banks might grant more loans when they are more profitable. Based on column 6, for instance, we predict that an increase of one percentage point in return on assets could lead to a rise of 7.163 percentage points in loan growth. One potential explanation is that excellent competitive advantages of high-profit banks, such as various loanable funds, relaxed lending standards, and reduced lending rates, could contribute to the lending expansion to a larger extent (Dell’Ariccia & Marquez, 2006).

Regarding the liquidity characteristic, both measures employed exert significant impacts on bank lending. In more detail, the results suggest that banks holding a larger buffer of liquid assets/banks previously using fewer deposits to make loans would expand their lending activities more

aggressively. Speaking of the economic plausibility, a one percentage point increase in the liquidity ratio (column 9 of Table 4) might make up a rise of 0.913 percentage points in lending. Consistent with the view of Gennaioli et al. (2014), our finding demonstrates that banks may optimally choose to store liquidity to finance customer loans afterward.

Looking at column 11 (Table 4), we find that the coefficient on the interest rate risk variable is statistically insignificant. Accordingly, we do not have evidence to support the notion that bank lending reacts to interest rate risk. Possibly, a too parsimonious model could alleviate the power of estimation. So, we need to move to the next stage which combines all CAMELS variables to verify the robustness of our findings so far.

We display the regressions obtained by mixing full sets of CAMELS components in Table 5. Though the statistical significance of several variables (such as credit risk and cost efficiency) slightly diminishes in some regressions, in general we still gain strong evidence to believe that our main findings remain unchanged as previously reported. Interestingly, we observe the significant impacts of interest

**Table 4:** Baseline estimation results for earnings, liquidity, and sensitivity to market risk

	(6)	(7)	(8)	(9)	(10)	(11)
Lagged dependent variable	0.214*** (0.017)	0.249*** (0.010)	0.255*** (0.010)	0.219*** (0.014)	0.241*** (0.008)	0.256*** (0.010)
ROA (E)	7.163*** (0.756)					
ROE (E)		0.116* (0.070)				
NIM (E)			0.093 (0.331)			
Liquid assets/Assets (L)				0.913*** (0.077)		
Loan/Deposit (L)					-0.167*** (0.037)	
GAP (S)						-0.056 (0.112)
GDP	-8.160*** (1.069)	-8.378*** (0.889)	-8.232*** (0.961)	-5.164*** (1.047)	-8.515*** (0.865)	-8.601*** (0.871)
Inflation	-1.435*** (0.136)	-1.220*** (0.105)	-1.175*** (0.097)	-1.716*** (0.136)	-1.003*** (0.098)	-1.205*** (0.107)
Observations	353	353	353	353	353	353
AR(1) test	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) test	0.343	0.289	0.281	0.289	0.275	0.288
Hansen test	0.143	0.175	0.177	0.157	0.200	0.148

Notes: The dependent variable is the rate of loan growth. Standard errors are reported in parentheses. \*, \*\*, and \*\*\* indicate the significance levels 10%, 5%, and 1%, respectively. The validity tests of the GMM estimator are shown with p-values.

rate risk on bank lending across all columns in Table 5. These results consistently affirm that exposures to interest rate risk weaken the expansion of lending activities. A possible reason is that banks might be concerned about the adverse effects of unpredictable adverse changes in interest rates, making banks with high interest rate risk suffer potential losses and depleted equity capital (Van den Heuvel, 2002).

## 5. Conclusions

The study empirically examines the determinants of bank lending in the Vietnamese banking system over the period 2007–2019. We select the critical determinants based on the CAMELS approach and employ the dynamic panel regression to determine the effects of each component factor

on loan growth. Though there are many studies exploring bank lending behavior in the existing literature, our work is the first attempt to focus on bank-specific characteristics using the CAMELS framework. Theoretically, each CAMELS component is thought to considerably shape bank behavior in general and bank lending in particular. With these settings, we display multiple important empirical results to support the theoretical analysis reviewed. Among the CAMELS bank-specific determinants, we find that the essential factors, including bank capital, asset quality, liquidity, and market risk resilience, significantly contribute to the banks' capacity to sustain lending activities. Interestingly, our result indicates that banks with poorer management efficiency tend to expand lending faster than better managed banks.

**Table 5:** Estimation results with full sets of variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lagged dependent variable	0.196*** (0.019)	0.156*** (0.017)	0.208*** (0.020)	0.178*** (0.019)	0.236*** (0.027)	0.204*** (0.022)	0.251*** (0.030)	0.224*** (0.026)
Equity/Assets (C)	1.110*** (0.230)	1.261*** (0.238)	1.419*** (0.236)	1.818*** (0.250)	1.129*** (0.072)	1.155*** (0.236)	1.379*** (0.129)	1.594*** (0.288)
Loan loss provisions/Loans (A)	-0.847 (1.325)	-4.682*** (1.104)	-0.866 (1.109)	-4.920*** (1.143)				
Non-performing loans/Loans (A)					-0.663* (0.354)	-1.314*** (0.346)	-0.540* (0.327)	-1.232*** (0.320)
Operating expenses/Assets (M)	6.528*** (1.253)	2.562* (1.382)	6.699*** (1.455)	2.595* (1.444)	4.864*** (1.277)	2.200** (1.116)	4.549*** (1.281)	1.541 (1.052)
ROA (E)	3.517*** (0.931)	6.727*** (1.038)			2.420** (1.098)	4.042*** (1.259)		
ROE (E)			0.302*** (0.082)	0.539*** (0.067)			0.328*** (0.091)	0.523*** (0.088)
Liquid assets/Assets (L)	0.908*** (0.082)		0.902*** (0.078)		0.672*** (0.127)		0.655*** (0.132)	
Loan/Deposit (L)		-0.262*** (0.042)		-0.252*** (0.038)		-0.221*** (0.037)		-0.216*** (0.033)
GAP (S)	-0.631*** (0.142)	-0.286** (0.126)	-0.633*** (0.126)	-0.293** (0.123)	-0.736*** (0.106)	-0.459*** (0.095)	-0.789*** (0.089)	-0.553*** (0.094)
GDP	-3.167*** (0.811)	-6.334*** (0.719)	-2.983*** (0.823)	-6.305*** (0.694)	-4.976*** (0.738)	-7.555*** (0.729)	-5.000*** (0.703)	-7.792*** (0.716)
Inflation	-1.714*** (0.154)	-1.131*** (0.133)	-1.717*** (0.159)	-1.168*** (0.135)	-1.522*** (0.164)	-0.950*** (0.131)	-1.581*** (0.160)	-1.078*** (0.124)
Observations	353	353	353	353	313	313	313	313
AR(1) test	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.001
AR(2) test	0.318	0.331	0.346	0.416	0.565	0.657	0.468	0.505
Hansen test	0.167	0.176	0.175	0.162	0.228	0.194	0.268	0.215

Notes: The dependent variable is the rate of loan growth. Standard errors are reported in parentheses. \*, \*\*, and \*\*\* indicate the significance levels 10%, 5%, and 1%, respectively. The validity tests of the GMM estimator are shown with p-values.

Our findings draw several implications. From the banks' commercial perspective, improving bank soundness is quite necessary, especially in the context that the nascent banking market of Vietnam is currently operating under the guidelines of the Basel II standards and the supervision by the CAMELS framework. For policymakers, they should pay close attention to poorly managed banks' behavior to ensure the safety of the banking system, given the finding that these banks with more moral hazard incentives are more likely to expand lending aggressively.

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