

The impact of credit risk on the financial stability of commercial banks in Vietnam

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ABSTRACT

This study investigates the impact of credit risk on the financial stability of Vietnamese commercial banks. The paper uses the Z-score to proxy the financial stability of banks. We use the data of 27 Vietnamese commercial banks on BankScope, during 2010 - 2019. The paper applied a dynamic panel data approach; the selected method is the difference GMM (DGMM). The key question discussed is which factor impacts on Z-score. Analysis results show the negative effect of non-performing loans on the financial stability of banks. When commercial banks have higher non-performing loans, the lower the financial stability is. Additionally, bank-specific variables such as equity on asset ratio, the return on equity, the size of the bank and set of macroeconomic variables affect the bank's financial stability. Based on the analysis results, we imply relevant policies for the State Bank of Vietnam and commercial banks.

1. Introduction

The banking system plays an important role in the economy. Many studies have shown the role of the banking system in national economic development. Therefore, if the banking system failure that will cause many adverse reactions and possibly lead to financial crises. Especially the problem of credit risk effects on financial stability (Altman & Sanders, 1998). Credit risk causes losses to banks such as increasing costs, reducing profits, and reducing the bank's reputation (Aduda & Gitonga, 2011; Berger & DeYoung, 1997; Li & Zou, 2014; Million, Matewos, & Sujata, 2015; Sabeza, Shukla, & Bajpai, 2015). The proof is that since the world financial crisis in 2008, the issue of financial stability has been concerned more and more. Many studies on bank stability have shown that banking performance has an impact on bank stability, such as Ioana-Raluca and Dumitru-Cristian (2015), Ioana-Raluca and Dumitru-Cristian (2014); research on the effects of credit risk on bank stability through empirical research (A. T. H. Nguyen & Le, 2020; P. T. Nguyen, 2020). There are many papers to investigate the impact of liquidity risk, credit risk, and competition on bank stability through the Z-score, such as Xiaoqing, Lin, and Molyneux (2014), Yiwei (2014), Phan, Anwar, Alexander, and Phan (2018), Vo and Dang (2016).

According to World Bank (2019), the Credit on GDP ratios in Vietnam in the period of 2013 - 2019, increased from 96.8% to 137.9%. It means that the economy depends heavily on credit, whereas compared with the total product was produced. It shows a higher tendency to borrow with product made. This is also potentially risky. On the other hand, when the credit balance is too high, it will lead to many risks of loss if many unfavorable conditions occur, such as macro conditions, interest rates, unemployment rate, etc.

In addition, from the perspective of commercial banks, credit activities are still the basic activities in order to contribute a large of to the total revenue. Credit growth is about 12.5% (World Bank, 2019), demonstrating non-performing loan data from CIC in the period of 2010 to 2019, illustrating that the credit quality of the Vietnamese commercial banking system is not good as expected. The Non-Performing Loan (NPL) ratio, as shown through the financial statement, has decreased but not significantly. The NPL of the commercial banks in Vietnam, during 2010 - 2019, have potential problems. Specifically: the NPL ratio has decreased slightly, from 2.093% to 1.63% (World Bank, 2019). And when considering the explanation of the cause, it is possible: due to the denominator (credit balance) increase; or sell the debt to VAMC to reduce the numerator. However, during this period, the State Bank has made many positive actions related to the on-performing loan settlement, but the resolution has not been effective. The problem that should be proved is that non-performing loans impact the financial stability of commercial banks? And if this situation occurs continuously throughout the system, there is a forecast threat to the financial stability of the bank, set in the context with the macro goal of sustainable development of the banking system to 2030. Therefore, the assessment of the impact of NPL on banking and financial stability is important and necessary. This proves that the credit risk management activities of the Vietnamese commercial banks still have many issues that need to be faced.

The Z-score rate of 27 commercial banks in the period 2010 - 2019 decreased from 13.7% in 2010 to 10.63% in 2019. In which, this rate reached the highest rate during the study period of 14.86% in 2014, and the lowest was 9.59%. In the following period decreased steadily and increased again from 2018, 2019. If this index represents financial and banking stability, then in the 2010 - 2019 period, compared with the analysis of the relevant indexes, the index's decline after 2012 is due to what factors. Especially in the framework of presenting the above issues, special questions: Do credit risks affect the financial stability of banks? Do macro factors affect the financial stability of a bank? To answer these questions, empirical research that approaches related research models with reliable data needs to be performed.

Based on the mentioned issues, researching the impact of credit risks on the financial stability of commercial banks, although not entirely new, is still a critical issue for research in various contexts. Different scenes and stages. Because, before the evolution of the economy, as well as the macro conditions, are always affected by many factors, the empirical research by the forecasting model to make a valid recommendation is still valuable.

2. Literature review

“Credit risk is most simply defined as the potential that a bank borrower or counterparty will fail to meet its obligations in accordance with agreed terms. The goal of credit risk management is to maximize a bank’s risk-adjusted rate of return by maintaining credit risk exposure within acceptable parameters” (Basel for International Settlements, n.d., p. 3).

Financial stability is defined as the ability of the financial system to facilitate and enhance economic processes, manage risks, and absorb shocks. Moreover, financial stability is considered a continuum, changeable over time, and consistent with multiple combinations of finance’s constituent elements (IMF, 2004).

According to ECB (European Central Bank, n.d.), financial stability can be defined as a condition in which the financial system - which comprises financial intermediaries, markets, and market infrastructures - is capable of withstanding shocks and unravelling financial imbalances.

Jahn and Thomas (2014) refer to the concept of banking financial stability as follows; The financial stability of the banking system is a steady state in which the banking system

performs its functions. Effectively involves allocating resources, distributing risks, and distributing income.

Through the mentioned approaches, the concept of banking financial stability is understood as the situation in which a bank can operate smoothly, effectively and, of course, can perform its functions well such as payment and credit intermediaries. Moreover, the bank must be able to withstand shocks from the external environment, and the banks themselves do not create other shocks that negatively affect the economy.

Many studies have been conducted to evaluate the stability of banks/bank's financial stability through the Z-score (Roy, 1952). The approach from the financial crisis reduces bank stability. The approach used at the micro level to capture financial stability is through the Z-score. This index reflects the overall level risk of the bank, or its probability of default. It is calculated based on parameters in the bank's balance sheet.

$$Z\text{-score}_{it} = \left(\frac{ROA_{it} + E/A_{it}}{\delta (ROA_{it})} \right) \quad (1)$$

With:

Z-score_{it}: stand for the financial stability of *i* bank at time *t*;

ROA_{it}: return on assets of bank *i* at the time *t*, $i = \{1 \dots 27\}$; $t = \{2010 \dots 2019\}$;

E/A_{it}: the equity on total assets of bank *i* with year *t*;

σ (ROA): standard deviation of the ROA value. There are many approaches to taking the value of the standard deviation by quarter, year, period. Particularly in the article, the author approaches calculating the standard deviation of the ROA for the whole research period. (Djatche, 2019; Niu, 2012).

It implies that the higher the Z-score, the more stability of bank. Furthermore, 76% of banks' probability of failure can be predicted by Z-score (Laura, Ettore, & Federica, 2015).

The literature generally researches factors that can influence the bank's financial stability: credit risk, bank-specific and macro elements.

Mark, Srobona, and DeLisle (2007) used multivariate regression to evaluate the impact of credit risk, market risk, liquidity, and macroeconomic factors on European Union banks and 08 banks in countries period 1997 - 2004. The results showed that: rapid credit growth destabilized banks; provisioning has a positive effect on banking stability by explaining that spending on provisioning costs for bad debts decreases bank profits, inconsistency in liquidity risk effects on bank stability, and banks with low equity are risky than large equity banks.

Similarly, Ghenimi, Chaibi, and Omri (2017) used dynamic panel data during 2006 - 2013 to explore the impact of liquidity risk and credit risk on bank stability. The credit risk independent variable is the ratio of bad debt to the total outstanding loan. Besides, specific variables are independent variables: size, ROE, NIM, liquidity risk variable, crisis variable, etc. The results show the impact of credit risk on banking stability. When credit risk increases, banking stability decreases. Besides, liquidity risk has a negative impact on banking stability. It implies that a bank with high liquidity is stronger. Policy implications related to credit risk and liquidity risk management to increase banking stability. It is recommended to apply the Basel III framework in risk management.

On the other hand, Chaibi and Ftiti (2015), studies the factors that determine the credit risk of banks in France (representing the market-based market) and Germany (representing the bank-based type). The study uses panel data regression during 2005 - 2011. The dependent

variable is the NPL (non-performing loan) variable. Independent variables are bank-specific. Besides, the study also uses a set of macroeconomic variables inflation, GDP, unemployment rate, interest rate, and exchange rate. The results show that the independent variables affect the NPL, and these effects vary in different markets. In fact, LLP (French commercial banks); variable lever, and bank size have a positive impact on NPL. Macroeconomic variables except for inflation have the same effect as the NPL. On the contrary, non-interest income, ROE, inflation variable, and GDP growth rate negatively affect NPL. From the impact results of the dependent variables, the author recommends relevant policies.

Ioana-Raluca and Dumitru (2015) research the determinants of banking stability. The author performed the research by evaluating the determinant of profit, measured by ROA (return on assets), and financial stability assessment as measured by the variable z-score. The data used are from 34 countries in the period 2008 - 2013. The independent variables used in the research paper to include in the regression model include LA (loan to asset ratio), LD (loan to deposit ratio), EA (equity to asset), OEA (operating account to total assets ratio), salary expense, GDP. Research results show: variables LA, EA have the same impact on both profitability and stability, variables OEA have negative effects on both profitability and stability. Meanwhile, the variable GDP has an impact on profits but not on stability. Lending has a positive impact on profits, but stability, it has the opposite meaning. From the analysis results, the author proposes relevant policies to improve banking stability.

3. Econometric modeling and data

According to the research model of Ghenimi et al. (2017). Our baseline empirical model therefore reads:

$$Z - SCORE_{it} = \beta_0 + \beta_1 Z11_{it} + \beta_2 NPL_{it} + \beta_3 LLR_{it} + \beta_4 ROE_{it} + \beta_5 EA_{it} + \beta_6 LA_{it} + \beta_7 SIZE_{it} + \beta_8 GDP_{it} + \beta_9 INF_{it} + u_{it} \quad (2)$$

Table 1

Variables in the model

| Name | Explanation | Measure | Expected correlation with Z-SCORE |
|---------|--------------------------|---|-----------------------------------|
| Z-SCORE | Financial stability bank | $Z - SCORE = \frac{ROA + E/A}{\sigma(ROA)}$ | |
| Z11 | The lag of Z-SCORE | | +/- |
| NPL | Non-performing loan | $NPL = \frac{\text{Non - performing loan}}{\text{Total lending}}$ | - |
| LLR | Loan loss reserve | $LLR = \frac{\text{Loan loss reserve}}{\text{Total loan}}$ | - |
| EA | Equity on total asset | $EA = \frac{\text{Total equity}}{\text{Total assets}}$ | + |
| LA | Loan on total assets | $LA = \frac{\text{Total gross loan}}{\text{Total assets}}$ | - |
| ROE | Return on equity | $ROE = \frac{\text{Net income}}{\text{Total of equity}}$ | + |

| Name | Explanation | Measure | Expected correlation with Z-SCORE |
|------|---------------------------|-------------------------------------|-----------------------------------|
| SIZE | Logarithm of total assets | $SIZE = Ln(\text{total of assets})$ | +/- |
| GDP | Real Growth GDP | | +/- |
| INF | Consumer Price index | | +/- |

Source: The researcher’s data analysis

3.1. Data

We use the data of 27 Vietnamese commercial banks on BankScope, from 2010 to 2019. All the statistical information was formed based on data provided by the World Bank, such as GDP growth, inflation.

3.2. Summary statistics of the variables

Table 2

Summary statistics of variables

```

sum ZSCORE EA NPL LLR ROEA LA GDP INF SIZE
-----+-----
Variable |      Obs      Mean    Std. Dev.    Min      Max
-----+-----
ZSCORE |      250     11.92461    5.184981    3.452655    32.04069
EA |      253     9.018625    3.997793     2.82     23.93
NPL |      244     2.271992    1.531376     .02     11.4
LLR |      266     1.343914    .4955753     .543     3.15
ROEA |      261     9.606011    8.321811    -56.33    29.237
-----+-----
LA |      263     55.12211    13.11491    14.48    78.59
GDP |      270     6.311     .595704     5.25     7.08
INF |      270     6.081     4.978849     .63    18.68
SIZE |      266     25.34691    1.667885    16.61147    28.92922
    
```

Source: Data analysis from Stata software, version 15.0

NPL has a mean of 2.27, the minimum value is 0.02, and the maximum is 11.4, so the variation between the maximum, the average and the minimum is quite large. And from this result, we see a significant disparity in NPLs of banks in the data set studied.

ROE has the largest data variation compared to the variables, the amplitude of the minimum and the maximum value variation is very large from -56.23 to 29.237. In the period 2010 - 2019, there is a vast difference between commercial banks in terms of profits. This reflects the business performance of commercial banks that have clear segments in the data set.

LA, mean value is 55.12, the minimum value is 14.48, the maximum value is 78.59. Thus, it can be seen that the ratio of loans to total assets of commercial banks fluctuates quite high. This can be seen, the difference if compared according to criteria of total assets (denominator) or loan ratio (numerator) of commercial banks is quite different.

EA, mean value is 9.01, the minimum value is 2.82, the maximum value is 23.98. Equity over total assets also has many differences between commercial banks.

SIZE represents the size of the bank, calculated in Neper Lograrit of total assets, with the minimum value of 16.61, the maximum of 29,237.

ZSCORE proxy the financial stability bank, the minimum value is 3.45 and the maximum at 32.04. Thus, it can be seen that the variable value of ZSCORE fluctuates in the data set with quite a long amplitude, proving that there are many differences between commercial banks in the data set.

GDP, mean value is 6.11, the minimum value is 5.25 and the maximum value at 7.08. During the research period, the GDP variable did not change much.

INF (consumer price index), the minimum value is 0.63 and the maximum at 18.68. Thus, it can be seen that in the period 2010 - 2019, high inflation rate volatility. In particular, there are five rates below 1%, partly reflecting the effectiveness of the SBV's macro policy management.

3.3. Testing and choosing the model

The research data in the article is designed in the form of a panel (panel data), so it is necessary to choose a suitable estimation method.

Performing Breusch and Pagan Lagrangian stances. From the test results, look at p-value ≤ 0.05 . thus rejecting the hypothesis H_0 : the appropriate OLS model. From there, we choose the FEM (fixed estimation model) model.

Using Hausman test to perform FEM or REM selection, result: FEM selected.

3.4. Testing for autocorrelation

From the results of the Wooldridge test, p-value = $0.003 < 0.05$. Therefore, the hypothesis H_0 : the model does not have autocorrelation, accept hypothesis H_1 : the model has autocorrelation. From there, the model concludes the autocorrelation phenomenon.

Table 3

Result of autocorrelation test

```
Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
F( 1, 25) = 10.802
Prob > F = 0.0030
```

Source: Data analysis from Stata software, version 15.0

Heteroscedasticity test: using the Hausman test to detect the pattern of variable variance that occurred.

Test the multi-collinearity phenomenon: Look at the VIF (Variance inflation factor) < 2 . Conclusion: The model does not have a multi-collinearity phenomenon (Gujarati, 2003).

Table 4

Results of the multi-collinearity test

```
. vif
Variable |      VIF      1/VIF
-----+-----
EA |      3.58      0.279340
Z11 |      3.20      0.312501
SIZE |      1.85      0.540044
GDP |      1.62      0.618354
```

```

. vif
Variable |          VIF      1/VIF
-----+-----
      INF |          1.56    0.639914
      ROEA |          1.43    0.698442
      NPL  |          1.43    0.699033
      LLR  |          1.40    0.715380
      LA   |          1.25    0.799678
-----+-----
Mean VIF |          1.92
    
```

Source: Data analysis from Stata software, version 15.0

The results of overcoming model defects by estimating Generalized Least Square (GLS) (generalized least square) and Generalized Moment Method (GMM).

Table 5

Results of FEM, REM, GLS, and GMM regression

| | (FEM) ZSCORE | (REM) ZSCORE | (GLS) ZSCORE | (GMM) ZSCORE |
|-------|-----------------------|-----------------------|-----------------------|----------------------|
| Z11 | -0.0496*** (-7.20) | -0.0516*** (-7.76) | -0.0183** (-2.87) | 0.00292 (0.48) |
| EA | 1.361*** (125.39) | 1.353*** (142.34) | 1.312*** (142.72) | 1.283*** (125.04) |
| NPL | -0.00489 (-0.28) | -0.00428 (-0.26) | 0.00944 (1.01) | -0.0211** (-3.12) |
| LLR | -0.00887 (-0.16) | -0.0594 (-1.23) | -0.107*** (-3.34) | -0.0659* (-2.26) |
| ROEA | 0.103*** (26.74) | 0.101*** (30.84) | 0.0964*** (40.41) | 0.0904*** (23.41) |
| LA | -0.00704* (-2.46) | -0.00444* (-2.29) | -0.00444** (-3.20) | -0.00205 (-1.44) |
| GDP | 0.0110 (0.25) | -0.0269 (-0.68) | -0.0111 (-0.46) | -0.00387 (-0.26) |
| INF | -0.00467 (-0.85) | -0.000868 (-0.17) | 0.00348 (0.98) | 0.00917* (2.21) |
| SIZE | -0.0533* (-2.15) | -0.0329 (-1.82) | -0.0230 (-1.82) | -0.0453 (-1.85) |
| _cons | 0.950 (1.34) | 0.685 (1.18) | 0.357 (0.93) | 0.797 (1.11) |
| N | 219 | 219 | 219 | 219 |

t statistics in parentheses

* p < 0.05, ** p < 0.01, *** p < 0.001

Source: Data analysis from Stata software, version 15.0

Correcting the model defect by using differential regression (Difference GMM), the way of introducing endogenous variables often uses the delay variable of the dependent variable and the appropriate instrumental variables. In this paper, the author uses the Z11 variable as the lag of the Z-Score.

Table 6**Results of D-GMM regression**

Dynamic panel-data estimation, two-step system GMM

```
-----
Group variable: BANK                Number of obs   =    186
Time variable: YEAR                Number of groups =    26
Number of instruments = 53          Obs per group:  min =    3
Wald chi2(9) = 330831.72           avg =    7.15
Prob > chi2 = 0.000                max =    9
-----
```

| D.ZSCORE | Coef. | Std. Err. | z | P> z | [95% Conf. Interval] | |
|----------|-----------|-----------|--------|-------|----------------------|-----------|
| Z11 | | | | | | |
| D1. | -.0069146 | .0034235 | -2.02 | 0.043 | -.0136245 | -.0002048 |
| EA | | | | | | |
| D1. | 1.273723 | .0061637 | 206.65 | 0.000 | 1.261642 | 1.285803 |
| NPL | | | | | | |
| D1. | -.0288493 | .0110089 | -2.62 | 0.009 | -.0504262 | -.0072723 |
| LLR | | | | | | |
| D1. | .013732 | .0446904 | 0.31 | 0.759 | -.0738596 | .1013237 |
| ROEA | | | | | | |
| D1. | .0864254 | .0028906 | 29.90 | 0.000 | .08076 | .0920909 |
| LA | | | | | | |
| D1. | -.0008342 | .0019387 | -0.43 | 0.667 | -.0046341 | .0029656 |
| GDP | | | | | | |
| D1. | -.0252709 | .0114691 | -2.20 | 0.028 | -.0477499 | -.0027919 |
| INF | | | | | | |
| D1. | .0103893 | .0027784 | 3.74 | 0.000 | .0049438 | .0158349 |
| SIZE | | | | | | |
| D1. | -.0563412 | .0148253 | -3.80 | 0.000 | -.0853983 | -.0272842 |
| _cons | .0056697 | .0093816 | 0.60 | 0.546 | -.0127179 | .0240574 |

```
-----
Arellano-Bond test for AR(1) in first differences: z = -2.15 Pr > z = 0.032
Arellano-Bond test for AR(2) in first differences: z = 0.13 Pr > z = 0.896
-----
```

```
Sargan test of overid. restrictions: chi2(43) = 95.60 Prob > chi2 = 0.000
(Not robust, but not weakened by many instruments.)
```

```
Hansen test of overid. restrictions: chi2(43) = 19.63 Prob > chi2 = 0.999
(Robust, but can be weakened by many instruments.)
```

Difference-in-Hansen tests of exogeneity of instrument subsets:

GMM instruments for levels

Hansen test excluding group: chi2(35) = 15.71 Prob > chi2 = 0.998

Difference (null H = exogenous): chi2(8) = 3.93 Prob > chi2 = 0.864

iv(D.EA D.NPL D.LLR D.ROEA D.LA D.SIZE D.GDP D.INF)

Hansen test excluding group: chi2(35) = 15.09 Prob > chi2 = 0.999

Difference (null H = exogenous): chi2(8) = 4.54 Prob > chi2 = 0.806

Source: Data analysis from Stata software, version 15.0

Based on the results, the calculated appropriateness of the recovery process by the GMM method was evaluated through Wald, Sargan, and Arellano-Bond (AR) tests. The F-test examines the statistical significance of a numerical system. Hansen test checks for over-identifying restrictions and checking the AR second-order serial correlation.

Using Hansen's test to check the instrument validity, with p-value for Hansen J-statistic greater than 0.1. We should accept the hypothesis H_0 : the model is correctly defined, the variation representation is reasonable. The F-test statistic (p-value) = 0.000 < 0.1, thus we reject the hypothesis H_0 : all the estimation systems in the method are equal to 0, so the estimation systems of the solute like meaningful statistics.

The p-value for AR(1) = 0.032 < 0.05 should reject hypothesis H_0 : there is no correlation of the first order series Conclusion: The model has the correlation of the first- order series.

The p-value for AR(2) is 0.896 > 0.1 should accept the hypothesis H_0 : there is no correlation of the second-order series in the remainder of the regression model, Basu (2008).

Estimated results by the DGMM method show that the model does not have any defects. Specifically, the test of residual cointegration showed that there was a first-order correlation (the p-value for AR (1) was less than the significance level 5%) and there was no second-degree cointegration (the p-value for AR (2) is 5% greater than significance level). Hansen's test all have p-value greater than the significance level of 5%, showing that the model and the representative variables used are suitable.

4. Results and discussion

According to the study of Mark et al. (2007), Cho, Fu, and Yu (2012), increasing bad debt, higher provisioning will make banks unstable and reduce profits, leading to a risk of bankruptcy. This research support previous researches and have the same result. In fact, the variable NPL has a negative effect on the Z-score with statistically significant, and has the significance at level $\alpha = 1\%$. This can be explained, when NPL has a negative effect on the Z-score or, in other words, a negative effect on bank stability. Because there exist too many unresolved NPL, causing losses to the bank, and in the long run, it affects the bank's liquidity. The worst consequence is bankruptcy. This result provides clear evidence impact of NPLs on financial stability. According to World Bank, the credit to GDP ratio tends to be different in the period 2010 - 2012 to decrease; in the next period from 2013 to 2019, it increased from 96.8% to 137.9%. The reason for this, in the increasing period, shows that the economy depends more on credit; and if compared with the total product produced, it offers a higher tendency to borrow with created products. Although, when compared to developed economies, the ratio of outstanding credit on GDP is still high. Still, compared to the Vietnamese economy in the stage of development, this is also potentially risky. Because when the credit balance is too high, it will lead to many risks of loss when many unfavorable conditions take place, such as macro conditions, interest rates, etc. Besides, when the credit increases, it is possible that the capital flow function will easily be deviated into the portfolio of high-risk credit: real estate, consumption, while for production activities, credit demand is limited because it depends on efficiency. Because of this, instead of focusing on product development and sustainable economic growth, credit focuses on non-major activities.

EA is positively significant to Z-score, with significance at 1% level. It implies that low-equity banks will have more stability problems than high-equity commercial banks. In fact, base on data of 27 commercial banks, shows during 2010 - 2019, commercial banks increased their size banks, which can be seen through the index of total assets. Commercial banks have a strategy to increase their total assets. In 2011, the total assets of commercial banks decreased compared to

2010. Due to the bankruptcy of a number of weak banks, the situation in this period was merged. From 2011 to 2019, the total assets of the commercial banking system have steadily increased by nearly three times, proving that the bank's strategy of scale development has been concerned. However, during 2010 - 2019, the equity on total assets of commercial banks decreased from 9.69% in 2010 to 7.77% in 2019. In which, the highest rate of 11.44% in 2012 and the lowest 7.27% in 2017. In the following years, this rate increased again, reaching 7.77% in 2019. (World Bank, 2019). Indeed, as mentioned in the introduction, the z-score in this paragraph, the uptrend is similar to the EA index. This illustrates more clearly the effects of EA in the research model. This can be explained: when EA increases, it means total equity and total assets higher, payable decrease. This result is the clock with the headers of the author Mark et al. (2007).

ROE has statistically significant at level $\alpha = 1\%$. Effects in the same direction on the Z-score. When a bank is operating profitable, it will create a source of money to be able to conduct investment activities and high liquidity. When operating effectively and profitable, financial resources will be stable, improving stability. This result is similar to Adusei (2015), Valentina, Calvin, and Liliana (2009) studies.

SIZE has a negative effect on Z-score, with significant at level $\alpha = 1\%$. This explains when an increase in total bank assets does not mean an increase in stability. Because when the bank expands in scale, it requires an adequate and effective management capacity level to promote operational efficiency rather than the mechanical increase in total assets. This result is supported by previous studies, such as Shrieves and Dahl (1992) and Yong and Christos (2013).

GDP has a negative effect on bank stability, having statistical significance at the level $\alpha = 5\%$. It implies that when GDP growth, with the capital needs of businesses and individuals to serve production activities. This can lead to laxity in credit, threatening banking stability (Imbierowicz & Rauch, 2014).

The inflation variable is statistically significant, at the level of $\alpha = 1\%$. Inflation is positively correlated with banking stability. In this period, inflation remained relatively stable in 2011, a sudden period with the inflation rate increasing to 18.68%. In the following years, inflation gradually decreased to the lowest level of the whole period of 0.63% in 2015. In the following years, inflation increased again, reaching 2.8% in 2019, keeping the target inflation below 4%. (World Bank, 2019). The bank bases on inflation rates to adjust interest rates or manage operating costs effectively, thereby, increasing the bank's income and ensuring stability Samir (2013). Research by Putranto, Herwany, and Sumirat (2014) showed that the inflation rate positively affects the profitability of banks (Yiwei, 2014). There are many different views on the impact of inflation on banking and financial stability. However, the issues of controlling inflation need to be considered carefully and have a harmonious policy.

5. Conclusion and policy implications

Firstly, from empirical research results, we show the negative impact of bad debt on the financial stability of commercial banks. Therefore, requirements related to bad debt issues, including prevention, limitation, and handling of non-performing loans should be considered.

In terms of conditions, credit activity is still an important activity that contributed a great deal of revenue to commercial banks. Then the requirement to improve credit risk management capacity must be done by commercial banks. Credit growth must be accompanied by credit quality that must be guaranteed such as diversification of credit portfolio, demonstrating diversification of industries and areas to invest, implementing diversified borrowers, avoiding the case of gathering turning with certain customers, diversifying loan terms, ensuring regulations on the ratio of mobilized capital for medium and long-term loans, promote M&A

activities, carry out a review of weak and ineffective banks, well implemented banking restructuring activities.

As a manager, the SBV needs to continue implementing the project of restructuring credit institutions, controlling problem banks, acquiring weak banks, allowing weak banks to merge with big banks, gradually handling bad debts for the bank to operate more and more stably. Promulgate strict policies and legal corridors in dealing with bad debts, Referring to specific instructions on dealing with bad debts in the next stage, creating a strictly legal basis for activities related to bad debt handling: debt trading, securitization, promoting the role of VAMCs, strengthening debt trading activities, strengthening debt pricing and auction activities.

Continue to regulate safety indicators in operations for commercial banks such as capital adequacy ratio, liquidity ratio, credit growth, etc. recommend approaching to improve risk management according to international standards (Basel). By doing so, new commercial banks will increase financial stability and increase competitiveness in international markets. Issuing guidelines related to credit risk management. Continue to recommend research and application of international standards (Basel), depending on each condition; banks choose the appropriate approach: basic method, standard method, advanced method, and inappropriate interested route, not scratching by all commercial banks.

Secondly, the study also shows the impact of equity ratio, return on equity, and bank size also affects the financial stability of commercial banks. This implies the problem of cost management, equity management, and expansion strategy. In essence, the research results present an interesting problem for commercial banks because the variables impact different trends on financial stability. Indeed, while equity ratios and equity returns change financial stability, bank size has a negative effect on financial stability. Because of this, there are different strategic scenarios: i) scale down, to increase the EA coefficient, increase financial stability; ii) increase the size and increase equity so that EA also holds or increases and increases ROE to increases financial stability. However, depending on the strategy and capacity, every commercial bank will have a good plan.

For the bank size, the State Bank needs to control and supervise the process of expanding the scale of commercial banks according to economic development.

Banks need to improve their capacity to properly assess capital adequacy; allocating and managing capital more effectively and saving capital; measure performance and management based on equity value.

Finally, the results highlight the impact of GDP and inflation on the bank's financial stability. This is not difficult to understand because commercial banks are directly affected by the management of the Vietnam State Bank and include the positions of the State Bank in the political system. Precisely from this issue, the requirements for effective monetary policy management in the coming time should continue to be promoted: raising the CPI of the State Bank, promoting the independence of the State Bank in operating the national monetary policy. The request to solve the problem of economic growth, along with curbing inflation before the requirement of reducing financial instability, is not a small challenge for the State Bank of Vietnam.

For the national economy to develop stably, requiring flexible management of the Government utilizing tools to regulate the macroeconomy stably, of which one of the most important tools is monetary policy. Monetary policy and the banking system are essential to the economy as the vascular system of the living organism, especially for a market economy that has been deeply integrated into the world economy gender. The administration of the State Bank's

monetary policy is to achieve the goals of stability and economic growth - such as curbing inflation, maintaining exchange rate stability, achieving full employment or growth economy.

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