


RESEARCH ON FACTORS AFFECTING CREDIT RISK OF JOINT STOCK COMMERCIAL BANKS ON VIETNAM STOCK MARKET

Van Binh Nguyen^A, Minh Viet Pham^B, Thi Hai Yen Doan^C, Thuc Quyen Doan^D, Thi Hoai Thu Ho^E



ARTICLE INFO	ABSTRACT
<p>Article history:</p> <p>Received 10 July 2023</p> <p>Accepted 12 October 2023</p>	<p>Design/methodology/approach: The article aims at identifying factors affecting credit risk of commercial banks in Vietnam. The study uses data collected from financial statements of 15 typical joint stock commercial banks out of a total of 27 joint stock commercial banks listed on the Vietnam stock exchange from 2012 to 2022 with panel data of 15 joint stock commercial banks for the period 2012 - 2022. The banks in the research data are the those with the largest total assets in the banking system. After collecting and processing data, research sample includes 165 observations and the study uses E-view software in quantitative analysis to build a regression model to determine the relationship and level of influence of Internal factors to credit risk of listed joint stock commercial banks.</p>
<p>Keywords:</p> <p>Commercial Banks; Credit Risk; Bad Debts; Stock Market.</p> <div data-bbox="172 987 480 1234">  </div>	<p>Findings: Research results indicate that factors affecting credit risk of listed joint stock commercial banks include: Ratio of equity to total assets, capital structure of the bank, and operational performance of the banks.</p> <p>Research, Practical & Social implications: These results confirm the importance of taking into account micro finance factors when making financing. Understanding the impact of these factors and relationships contributes to decision and risk management.</p> <p>Originality/value: In order to limit credit risk it is necessary to focus on: Ensuring reasonable equity; Stricter control over loan capital; Optimal use of resources.</p> <p>Doi: https://doi.org/10.26668/businessreview/2023.v8i10.3949</p>

PESQUISA SOBRE FATORES QUE AFETAM O RISCO DE CRÉDITO DE BANCOS COMERCIAIS DE AÇÕES CONJUNTAS NO MERCADO DE AÇÕES DO VIETNÃ

RESUMO

Concepção/metodologia/abordagem: O artigo visa identificar factores que afectam o risco de crédito dos bancos comerciais no Vietname. O estudo usa dados coletados de demonstrações financeiras de 15 bancos comerciais por ações típicos de um total de 27 bancos comerciais por ações listados na bolsa de valores do Vietnã de 2012 a 2022 com dados de painel de 15 bancos comerciais por ações para o período 2012-2022 Os bancos nos dados da investigação são aqueles com os maiores activos totais no sistema bancário. Após a coleta e processamento dos dados, a amostra da pesquisa inclui 165 observações e o estudo utiliza o software E-view na análise quantitativa para construir um modelo de regressão para determinar a relação e o nível de influência dos fatores internos no risco de crédito dos bancos comerciais de ações conjuntas listados.

^A PhD in Economics. Faculty of Public Finance, Academy of Finance. Vietnam.

E-mail: nguyenvanbinh@hvtc.edu.vn Orcid: <https://orcid.org/0009-0007-2289-7938>

^B PhD in Economics. Faculty of Economic Information Systems, Academy of Finance. Vietnam.

E-mail: phamminhviet@hvtc.edu.vn Orcid: <https://orcid.org/0009-0002-2501-7178>

^C PhD in Law. Lecturer. Faculty of Economics, Academy of Finance. Vietnam.

E-mail: doanhaiyen@hvtc.edu.vn Orcid: <https://orcid.org/0009-0009-5469-5884>

^D PhD in Economics. Lecturer. Faculty of Accounting - Trade Union University. Vietnam.

E-mail: quyendt@dhcd.edu.vn Orcid: <https://orcid.org/0000-0001-5084-3661>

^E PhD in Economics. Lecturer. Faculty of Economics - Academy of Finance, Vietnam.

E-mail: hothihoaitu@hvtc.edu.vn Orcid: <https://orcid.org/0000-0001-5084-3661>

Constatações: Os resultados da investigação indicam que os factores que afectam o risco de crédito dos bancos comerciais por acções cotados incluem: rácio entre o capital próprio e o activo total, a estrutura de capital do banco e o desempenho operacional dos bancos.

Implicações de investigação, práticas e sociais: Estes resultados confirmam a importância de ter em conta os factores microfinanceiros ao fazer financiamento. Compreender o impacto desses factores e relações contribui para a decisão e a gestão de riscos.

Originalidade/valor: Para limitar o risco de crédito é necessário focar em: Garantir um capital razoável; Controle mais rígido sobre o capital de empréstimo; Uso ideal de recursos.

Palavras-chave: Bancos Comerciais, Risco de Crédito, Inadimplência, Mercado de Ações.

INVESTIGACIÓN SOBRE LOS FACTORES QUE AFECTAN EL RIESGO CREDITICIO DE LOS BANCOS COMERCIALES POR ACCIONES EN EL MERCADO DE VALORES DE VIETNAM

RESUMEN

Diseño/metodología/enfoque: El artículo tiene como objetivo identificar los factores que afectan el riesgo crediticio de los bancos comerciales en Vietnam. El estudio utiliza datos recopilados de los estados financieros de 15 bancos comerciales por acciones típicos de un total de 27 bancos comerciales por acciones que cotizan en la bolsa de valores de Vietnam de 2012 a 2022 con datos de panel de 15 bancos comerciales por acciones para el período 2012 - 2022. Los bancos incluidos en los datos de la investigación son aquellos con los mayores activos totales en el sistema bancario. Después de recopilar y procesar datos, la muestra de investigación incluye 165 observaciones y el estudio utiliza el software E-view en análisis cuantitativo para construir un modelo de regresión para determinar la relación y el nivel de influencia de los factores internos con el riesgo crediticio de los bancos comerciales por acciones que cotizan en bolsa.

Hallazgos: Los resultados de la investigación indican que los factores que afectan el riesgo crediticio de los bancos comerciales por acciones que cotizan en bolsa incluyen: la relación entre el capital y los activos totales, la estructura de capital del banco y el desempeño operativo de los bancos.

Implicaciones de investigación, prácticas y sociales: Estos resultados confirman la importancia de tener en cuenta los factores de microfinanzas al realizar la financiación. Comprender el impacto de estos factores y relaciones contribuye a la toma de decisiones y la gestión de riesgos.

Originalidad/valor: Para limitar el riesgo crediticio es necesario centrarse en: Garantizar un capital razonable; Control estricto sobre el capital crediticio; Uso óptimo de los recursos.

Palabras clave: Bancos Comerciales, Riesgo de Crédito, Insolvencias, Mercado de Valores.

INTRODUCTION

Credit activities are basic activities that also contribute to the major and largest source of revenue for commercial banks. However, credit risk causes significantly large financial losses, leading to a bank's serious business losses or even bankruptcy. In addition, credit risk also affects clients and the national economy.

Credit risk is a type of risk that arises during the credit granting process of banks, reflected by the borrower's inability to repay debt to the lender. Credit risk is very diverse and it is related to the entire credit process of a bank with customers. Therefore, to manage credit risk well, one of the first steps is to identify influential factors. Normally, these factors are not completely the same for each banking system in different countries and in different periods (Chaibi & Ftiti, 2015). Therefore, in addition to many experimental studies conducted around the world, conducting a study in credit risk in Vietnam is still necessary.

Factors affecting credit risk are very diverse and related to the bank's credit process with customers. As a developing country, credit ratings at all levels in Vietnam still need to be improved. Therefore, finding appropriate factors affecting this type of risk has practical significance, in which the group of factors belonging to internal variables of banks plays a dominant role: Bank size; capital structure; credit scale; outstanding debt/mobilized capital ratio; bank profitability; net interest income ratio; operating expense ratio. With different levels of influence, fully considering those factors will help increase the effectiveness of credit risk management of commercial banks.

LITERATURE REVIEW AND HYPOTHESES

Literature Review

Salas, V and J. Saurina (2002) use panel data to compare the determinants of bad loans of Spanish commercial and savings banks in the period 1985-1997, taking into account the variables at the private banks and macroeconomic levels. Growth rate of GDP, company and family debts, past rapid credit or branch expansion, size, net interest margin, capital ratio and market forces are the variables used to explain for credit risk. However, there are significant differences between commercial banks and savings banks. This confirms the relevance of organizational form in credit risk management and bank supervision policy: Using internal variables as early warning indicators is an advantage of bank mergers from different regions and ownership in determining credit risk.

Ahmad, N. H., & Ariff, M. (2007) analyze the relationship between credit risk management and performance of financial institutions in South Sudan using performance measures of financial institutions. The ARDL model used shows that establishing Basel Accord compliance has a significant impact on the performance of financial institutions, while corporate credit risk monitoring and risk management environment do not affect the performance of South Sudan's financial institutions.

Das, Abhiman and Ghosh, Saibal (2007). The article addresses the factors that determine credit risk of banks in emerging economies. With advanced panel data techniques, the study sought to examine the factors influencing bad debts of Indian state-owned banks during 1994-2005 taking into account the variables both at the macro and micro levels. The results show that at the micro level: Real loan growth and bank size play an important role in influencing bad loans. At the same time, the study performed a number of checks on the

robustness of the results and provided implications for policy recommendations to limit credit risk in loans.

Mileris (2012) is a large-scale study with a sample of banks from 22 European countries, period 2008 - 2010 with 20 explanatory variables. The study was conducted to find out factors that significantly affect the change in credit risk of loan portfolios at banks and develop a statistical model to predict the rate of uncollectible accounts and bad debts. Research results show that the number of uncollectible accounts and bad debts at these banks depends greatly on money supply, GDP, inflation, interest rates, current balance, industrial production index and some other factors.

Tehulu and Olana (2014) evaluated the non-systematic factors that affect credit risk of commercial banks in Ethiopia in the period from 2007 to 2011. Quantitative research method was applied with balanced panel data of 10 state-owned commercial banks. Analytical study uses random effects GLS regression method. The regression results show that credit growth and bank size are two factors that have opposite impacts on credit risk. Performance and ownership have a positive impact. In addition, factors such as profitability, capital adequacy and bank liquidity are not statistically significant for credit risk.

Asamoah and Adjare (2015). This article studies the determinants of credit risk of commercial banks in Ghana from 2007-2014 using Robust Least Squares regression analysis. The results showed a positive relationship between credit risk and leverage but a negative relationship with profit. The author used data from the Ghana commercial banking system in the period 2007 - 2014, using the restricted least squares (RLS) regression method. Consequently, it shows that commercial banks need to continue diversifying lending activities towards production activities to minimize risks.

Chaibi, H., & Ftiti, Z. (2015). Research uses dynamic panel data to examine the factors that determine bad debt of commercial banks in a market-based economy (represented by France), compared to a bank-based economy (represented by Germany). The question is: what factors determine the credit risk of two countries? The results indicate that except for the inflation rate, a set of macroeconomic variables has an important influence on bad debt. In particular, the study shows that the French economy compared to Germany is more sensitive to micro factors. This highlights the impact of economic type (bank-based and market-based) on credit risk.

Zhao, Z. , Lan, Y. and Wu, X. (2016). The study uses the KMV model to test the effectiveness of the model in measuring the credit risk of financial institutions, and also shows

the impact of electronic banking on the credit risk of commercial banks. The results show: (1) The default gap based on the KMV model can well reflect banks' credit risk; (2) the development of electronic banking may increase credit risk due to lack of government and industry regulations; (3) Credit risk of banks in different systems all have their own characteristics that require clear delineation of risk control and monitoring responsibilities.

HYPOTHESES

The study proposes to measure the influence of the following factors: Bank size (SIZE); financial leverage (ETA), loan growth (LG); loan/deposit ratio (LDR); return on assets (ROA); net income margin (NIM); cost income ratio (CIR) to credit risk of commercial banks (represented by NPL bad debts).

Bank Size

Size is the market value of a bank and studies often measure it by the logarithm of a bank's total loan balance to adjust this variable to a value similar to other variables in the model. Bank size can affect credit risk either positively or negatively. Large banks can manage bad debts more effectively thanks to their superior ability to diversify their loan portfolios and credit risk management capabilities compared to small banks (Das & Saibal, 2007), so credit risk will be lower. However, large banks may also be willing to accept high risks due to the expectation of government protection if danger occurs, leading to higher credit risk.

H₁: Bank size has an impact on credit risk.

Financial Leverage

The capital structure of a commercial bank is a combination of debt (short-term debt and long-term debt) and equity in the total capital that the bank mobilizes to finance business activities (Saad, 2010). Previous studies often use the ratio of equity to total assets as a proxy variable for the level of capitalization. Delis, Tran, and Staikouras (2011) argue that higher leverage ratios, due to stricter capital requirements, imply that banks are more conservative in their lending behavior. On the contrary, a low financial leverage ratio leads to an increase in bad debts, because bank managers easily encourage moral hazard, increasing loan portfolios while banks are not sufficiently capitalized.

The hypothesis of the study is as follows:

H₂: Equity over total assets has a negative effect on credit risk.

Loan Growth

Loan growth rate is also considered one of the factors influencing and early warning of credit risk in banking business activities. When the economy grows and faces competitive pressure for development, banks can loosen credit approval conditions. This will accumulate risks and explode during economic recession. Research by Salas & Saurina (2002) shows that this impact can be with a lag of 1 to 4 years.

Based on the method of calculating expected credit risk proposed by the Basel Committee, if the bank grows with good loans (with low risk coefficient), the bank's credit risk not only does not increase but also tends to decrease. Keeton (1999) argues that credit growth can increase credit risk or reduce credit risk depending on the cause of loan growth. However, loan growth does not always increase credit risk. Loan growth can reduce credit risk for the entire loan balance if it does not originate from increased supply, but from increased credit demand or increased production output. The research hypothesis is:

H3: *Loan growth has an impact on credit risk*

Ratio of Outstanding Loans to Total Mobilized Capital

According to research by Zoubi and Khazali (2007) and Ashour (2011), the ratio of customer loans to total mobilized capital has an inverse relationship with the credit risk provision ratio. Studies show that when loans are higher than capital mobilized from customer deposits, to avoid appearing to want to attract capital from outside, banks will have an incentive to reduce the risk provision ratio. their. The hypothesis is:

H4: *The ratio of outstanding customer loans to total mobilized capital is negatively related to credit risk.*

Bank Profitability

Research often uses ROA (Return on Assets) to reflect how effectively management is using assets and equity to generate income. Many studies demonstrate a negative relationship between profitability and bad debt. Dimitrios et al (2010) argue that poor management is related to poor skills in credit scoring, collateral appraisal and commitment to monitoring debt customers. Meanwhile, Zribi et al. (2011) argue that a bank with high profitability has less incentive to generate income, therefore, is less constrained to engage in risky lending activities.

H5: *Bank profitability is negatively related to credit risk.*

Net Income Margin Ratio

Net income margin (NIM) is determined by dividing net interest income by total earning assets. Marginal net income plays a very important role because the majority of banks' income comes from net interest income. According to Hess et al. (2008), net income margin has an inverse relationship with the level of credit risk. However, research by Espinosa, Moreno, Gracia, (2011) shows that credit loss provisions (LLP) have a positive relationship with net income margin (NIM) and indicates that banks that lend much can face high risks, so they have to make large provisions, which forces them to calculate higher profits to compensate for the expected risks.

H₆: *Bank marginal net interest income has a positive effect on credit risk.*

Operating Expense Ratio

Berger & De Young (1997) examined the impact of cost efficiency on credit risk. The study found cost-effectiveness to be an important indicator of a bank's future bad debts and risk. Therefore, banks that operate inefficiently will be under great pressure from credit risks. Similarly, Hess et al. (2008) also chose CIR as one of the factors affecting credit risk to study. The results show that inefficient banks have higher credit risks than other banks.

H₇: *The ratio between operating expenses and operating income is positively related to credit risk*

RESEARCH METHODS

Research Data

The data used in the research is gathered from financial reports and other annual reports at the end of the year of Vietnamese commercial banks from the period 2012 - 2022. The data set is established on the basis of compliance with the accounting standards and have been audited.

The study uses quantitative methods, through the use of econometric models to test the influence of variables on credit risk (measured by bad debt ratio) of joint stock commercial banks listed on the stock market in Vietnam.

Overall Regression Model

The regression model is as follows:

$$Y = \beta_0 + \beta_t X_t + u_i$$

In which:

Y: is the dependent variable; X_t : is the independent variable that affects the dependent variable; β_0 : is the free coefficient; β_t : is the regression coefficient ($t = 1 \sim n$); u_i : is a random error.

In the specific regression model of the study, the dependent variable is the bad debt ratio of commercial banks represented by NPL - determining bad debt over total outstanding loans of commercial banks. Independent variables include: SIZE, LG, ETA, LDR, ROA, NIM, CIR.

Building and Testing the Research Model

The parameters of the regression model were estimated by E-view software.

Overall regression model:

$$NPL_i = \beta_0 + \beta_1 * SIZE + \beta_2 * ETA + \beta_3 * LG + \beta_4 * LDR + \beta_5 * ROA + \beta_6 * NIM + \beta_7 * CIR + u_i^*$$

Overall regression function:

$$NPL_i = \beta_0 + \beta_1 * SIZE + \beta_2 * ETA + \beta_3 * LG + \beta_4 * LDR + \beta_5 * ROA + \beta_6 * NIM + \beta_7 * CIR$$

In which:

1. Dependent variable in the NPL model (NPL is calculated as bad debt on the total loan balance of each commercial bank in 15 commercial banks listed on the Vietnam stock market in the period 2012 - 2022).

2. The group of independent variables in the model includes:

SIZE: Scale variable of bank i, measured by the logarithm of the asset value of bank i.

ETA: Variable financial leverage ratio of bank i, measured by equity on total assets of bank i.

LG: Variable credit growth of bank i, measured by the growth rate of total outstanding loans of bank i.

LDR: Variable ratio of outstanding loans to customers of bank i, measured by customer loans to total mobilized capital of bank i.

ROA: Variable profitability of bank i, measured by profit after tax on equity of bank i.

NIM: Variable interest income growth rate versus cost growth rate of bank i, measured as net interest income on average total interest earning assets of bank i.

CIR: The operational efficiency variable of bank i, measured by total operating expenses over total operating revenue of bank i

β_i : The partial regression coefficient measures the change in the mean of the dependent variable NPL when the independent variable changes by one unit and the other independent variable remains unchanged.

ui: random error of the model

Scale Test

The statistics are presented in the table below:

Table 1: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
SIZE	165	7,334	9,326	8,40425	,422516
ETA	165	,041	,170	,09166	,024832
LG	165	-,458	1,737	,20459	,213210
LDR	165	,830	,959	,91757	,027179
ROA	165	,000	,032	,01005	,007405
NIM	165	,012	,099	,03394	,015590
CIR	165	,227	,927	,49202	,154858
NPL	165	,005	,147	,02229	,016985
Valid N (listwise)	165				

Source: Calculated from Eview software

Data in table 1 shows:

- Bank size of joint stock commercial banks listed on the Vietnam stock market has a minimum value of 7.3341, a maximum value of 9.326 and an average value of 8.40425 with a standard deviation of 0.422510.
- Equity over total assets has the smallest value of 0.041; The maximum value is 0.170 and the average value is 0.09116 with a standard deviation of 0.024832. This shows that joint stock commercial banks listed on the Vietnam stock exchange use an average of 9.116% of equity to constitute assets. This ratio is lower than that of banks in Ghana, according to Amidu (2007). In Ghanaian banks it is about 13%.
- Asset growth rate of the above listed joint stock commercial banks on Vietnam's stock market has a minimum value of - 0.458, a maximum value of 1.737 and an average value of 0.2459 with a standard deviation of 0.213210. This shows that joint stock commercial banks listed on the stock market have an average asset growth rate of 24.59%, the highest growth rate is 173.7%.
- Customer loan balance over total mobilized capital has the minimum value of 0.830; The maximum value is 0.959 and the average value is 0.91751 with a standard deviation of 0.027179. This shows that joint stock commercial banks use an average of 91.751% of mobilized capital to lend to customers. This shows that the mobilized capital of listed joint stock commercial banks is not only capable of being balanced but can also support capital for the entire system.

- The ratio of profit after tax to total assets (ROA) of listed joint stock commercial banks in the period 2012-2022 is 0.01005. ROA has a positive average value, showing that for 100 VND of equity invested in business, the bank earns 1,0005 VND. This figure shows that banks have used shareholders' capital relatively effectively.
- Net interest income over total average interest-earning assets of banks has the smallest value of 0.012; The maximum value is 0.099 and the average value is 0.03394 with a standard deviation of 0.015590. This proves that listed commercial banks are operating profitably with an average NIM of 3.394%. In other words, the interest earned from lending is higher than the interest paid on deposits.
- The bank's operating efficiency has the smallest value of 0.227; The maximum value is 0.927 and the average value is 0.49202 with a standard deviation of 0.154858. This result shows that the operating costs of listed joint stock commercial banks have an average operating cost of 49.202% of the banks' income.

RESEARCH RESULTS

The study used E-view software and the method of least squares (OLS) to determine the regression coefficient β_i . On the basis of the results, the study proceeds to write equations of the influence of factors on credit risk of listed joint-stock commercial banks, then test the appropriateness of the model. That is, test β_i to know if the independent variable can explain the dependent variable or not? Evaluate the fit of the model through the adjusted coefficient of determination R² (Adjusted R Square) to show the explanatory power of the model in practice.

Research Results

Run the model with E software - view according to Panel date, the result is:

Table 2. Regression with Fixed effect

Dependent Variable: NPL
 Method: Panel Least Squares
 Date: 08/06/23 Time: 20:28
 Sample: 2012 2022
 Periods included: 11
 Cross-sections included: 15
 Total panel (balanced) observations: 165

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.458762	0.150761	3.042980	0.0028

SIZE	0.018916	0.017983	1.051843	0.2948
ETA	-0.380147	0.122182	-3.111317	0.0023
LG	0.000299	0.006215	0.048164	0.9617
LDR	-0.624002	0.121155	-5.150448	0.0000
ROA	-0.599963	0.384006	-1.562379	0.1206
NIM	-0.068594	0.136647	-0.501983	0.6165
CIR	0.041176	0.017270	2.384238	0.0185

Effects Specification

Cross-section fixed (dummy variables)
 Period fixed (dummy variables)

R-squared	0.438952	Mean dependent var	0.022292
Adjusted R-squared	0.308181	S.D. dependent var	0.016985
S.E. of regression	0.014127	Akaike info criterion	-5.509150
Sum squared resid	0.026544	Schwarz criterion	-4.906784
Log likelihood	486.5048	Hannan-Quinn criter.	-5.264629
F-statistic	3.356654	Durbin-Watson stat	1.686480
Prob(F-statistic)	0.000001		

Source: Calculated from Eview software

Regression with Random Effect Method

Table 3. Regression results with Random Effect

Dependent Variable: NPL
 Method: Panel EGLS (Cross-section random effects)
 Date: 08/06/23 Time: 20:30
 Sample: 2012 2022
 Periods included: 11
 Cross-sections included: 15
 Total panel (balanced) observations: 165
 Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.263736	0.075362	3.499593	0.0006
SIZE	0.001105	0.003938	0.280710	0.7793
ETA	-0.043494	0.069307	-0.627559	0.5312
LG	-0.001548	0.005484	-0.282304	0.7781
LDR	-0.281459	0.076338	-3.687029	0.0003
ROA	-0.669182	0.291562	-2.295162	0.0230
NIM	0.103424	0.094926	1.089518	0.2776
CIR	0.030563	0.012786	2.390276	0.0180

Effects Specification

	S.D.	Rho
Cross-section random	0.000000	0.0000
Idiosyncratic random	0.013978	1.0000

Weighted Statistics		
R-squared	0.232137	Mean dependent var0.022292
Adjusted R-squared	0.197901	S.D. dependent var 0.016985
S.E. of regression	0.015212	Sum squared resid 0.036328
F-statistic	6.780514	Durbin-Watson stat 1.331193
Prob(F-statistic)	0.000000	
Unweighted Statistics		
R-squared	0.232137	Mean dependent var0.022292
Sum squared resid	0.036328	Durbin-Watson stat 1.331193

Source: Calculated from Eview software

- Use the Hausman Test for model selection.

Test pair of hypotheses:

Ho: There is no correlation between the explanatory variables and the random component (choose RandomEffect)

H1: There is a correlation between explanatory variables and random components (choose FixedEffect)

Table 4. Hausman test results

Dependent Variable: NPL
 Correlated Random Effects - Hausman Test
 Equation: Untitled
 Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	38.098962	7	0.0000

Source: Calculated from Eview software

Prob. = 0.00000 <5% inferr assumed Fix Effects model

Test to remove 4 variables SIZE, LG, ROA, NIM from the original regression model:

Hypothesis testing:

$$\begin{cases} H_0: \beta_2 = \beta_4 = \beta_6 = \beta_7 = 0 \\ H_1: \beta_j \neq 0 \quad (j = (2,4,6,7)) \end{cases}$$

Table 5. Test results remove the variables SIZE, LG, ROA, NIM from the model
 Redundant Variables: SIZE LG ROA NIM

F-statistic	0.849083	Prob. F(4,133)	0.4966
Log likelihood ratio	4.160597	Prob. Chi-Square(4)	0.3847

Test Equation:
 Dependent Variable: NPL
 Method: Panel Least Squares
 Date: 08/06/23 Time: 20:36
 Sample: 2012 2022
 Periods included: 11
 Cross-sections included: 15
 Total panel (balanced) observations: 165

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.518734	0.104716	4.953727	0.0000
ETA	-0.368026	0.115566	-3.184560	0.0018
LDR	-0.531251	0.104594	-5.079167	0.0000
CIR	0.050303	0.015685	3.206973	0.0017

Effects Specification

Cross-section fixed (dummy variables)			
Period fixed (dummy variables)			
R-squared	0.524625	Mean dependent var	0.022292
Adjusted R-squared	0.411230	S.D. dependent var	0.016985
S.E. of regression	0.014096	Akaike info criterion	-5.532419
Sum squared resid	0.027222	Schwarz criterion	-5.005349
Log likelihood	484.4245	Hannan-Quinn criter.	-5.318463
F-statistic	3.744646	Durbin-Watson stat	1.703923
Prob(F-statistic)	0.000000		

Source: Calculated from Eview software

Prob. F = 0.4966 > 5% Not enough basis to reject Ho

So it is possible to remove the variable SIZE, LG, ROA, NIM from the model:

$$NPL = 0.518734 - 0.368026ETA - 0.531251LDR + 0.050303CIR$$

With Prob(F-statistic) = 0.0000 < 5%, the regression function is appropriate.

The model of factors affecting credit risk of a joint stock commercial bank listed on the stock market of Vietnam is:

- Regression model: $NPL_i = \alpha_0 - \alpha_1ETA - \alpha_2LDR + \alpha_3CIR$
- Regression function:

$$NPL_i = 0.518734 - 0.368026ETA - 0.531251LDR + 0.050303CIR$$

DISCUSSION AND RECOMMENDATIONS

In Table 5, the R^2 of NPL is 0.524625, indicating that in the regression model, the three main variables ETA, LDR and CIR have an influence on NPL, capable of explaining 52,4625% for NPL. In other words, changes in NPL are mainly caused by the influence of ETA, LDR and CIR variables, in which the ratio of credit outstanding to mobilized capital has the greatest influence, followed by return on total assets and cost to income index with coefficients of 0.53125 respectively; 0.368026 and 0.050303. Specifically:

$\alpha_1 = -0.368026$ reflects equity over total assets and has a negative impact on NPL bad debt of listed joint stock commercial banks. That is, when the equity of the banks increases, the bad debt of the bank will decrease and vice versa. Specifically, when ETA increased by 1%, NPL decreased by 0.368026%. This regression result is consistent with the study of Tehulu and Olana (2014).

$\alpha_2 = -0,531251$ reflects that outstanding customer loans on total mobilized capital has a negative impact on NPL bad debt. When customer loans increase by 1%, the bank's NPL decreases by 0.53125% and vice versa. This result is contrary to the research of Das, Abhiman and Ghosh, Saibal (2007). Messai & Jouini (2013) also had similar research results. However, this is true of the actual business situation of the Vietnamese banking industry. During the recent Covid pandemic, many Vietnamese businesses faced difficulties and crises, even going bankrupt. Therefore, to recover production and business activities, the need for capital is very necessary and research shows that with that source of loan capital, Vietnamese businesses have used it effectively, leading to reduced bad debts of commercial banks. At the same time, the economy gradually recovered, overcoming the recession period.

$\alpha_3 = 0,0510303$ reflects total operating expenses over total income and has a positive impact on NPL bad debt. That means when operating costs increase by 1%, the bank's NPL increases by 0.051303% and vice versa. This shows that a high CIR means a decrease in business efficiency of the bank and an increase in bad debt.

This study also shows that the SIZE, LG, ROA, and NIM are not statistically significant with NPL bad debts of joint stock commercial banks listed on the Vietnamese market.

CONCLUSION

The article analyzes the influence of factors on credit risk of joint-stock commercial banks listed on Vietnam stock exchange in the period 2012-2022. Through the data collected from 15 joint stock commercial banks listed on the Vietnam Stock Exchange, the empirical

model was built to show the correlation between the intrinsic factors and the bad debt of the bank. The regression model has reflected the actual activities of listed joint stock commercial banks in Vietnam over the past time, so the implementation of the above solutions is necessary. It not only contributes to reducing credit risk for banks, but also helps businesses access capital, boost the efficiency of business activities, and promote economic development.

RECOMMENDATIONS

Research results show that NPL is affected by three variables: ETA, LDR and CIR. Especially in the current period, increasing the ratio of outstanding loans to customers will not increase the bank's bad debt because businesses use capital effectively. Therefore, the problem is to determine the loan balance in a reasonable way to avoid liquidity risk. Besides, it is necessary to increase the scale and quality of assets to increase the loan limit.

These results will be an important research basis to propose solutions to reduce credit risk of joint stock commercial banks listed on Vietnam's stock market.

Firstly, optimize the capital structure appropriately; focus on supplementing equity.

Second, boost lending to priority areas to increase loan limits, so capital flows will be boosted into production. Strictly control loans to risky fields such as securities and real estate.

Third, use reasonable costs and specifically identify items that need to be cut costs; Combine technology application in each stage of operations to minimize costs.

REFERENCES

Ahmad, N. H., & Ariff, M. (2007). Multi-Country Study of Bank Credit Risk Determinants. *International Journal of Banking and Finance*, 5, 135-152. <https://doi.org/10.32890/ijbf2008.5.1.8362>.

Asamoah, L., & Adjare, D. (2015). Determinants of credit risk of commercial banks in Ghana. Retrieved May 10, 2021, from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=267910.

Ashour, M.O., (2011). Banks Loan Loss Provisions Role in Earnings and Capital Management: Evidence from Palestine. A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of Master in Accounting & Finance, Islamic University - Gaza Deanship of Post Graduate Studies Faculty of Commerce Accounting Department. <https://library.iugaza.edu.ps/thesis/98935.pdf>.

Berger, A., & De Yuong, R. (1997). Problem loans and Cost efficiency in commercial banks. *Journal of banking and finance*, 21, 849-870. [https://doi.org/10.1016/S0378-4266\(97\)00003-4](https://doi.org/10.1016/S0378-4266(97)00003-4).

Chaibi, H., & Ftiti, Z. (2015). Credit risk determinants: Evidence from a cross-country study. *Research in International Business and Finance*, 33(C), p.1-16.

Das, Abhiman and Ghosh, Saibal (2007): Determinants of Credit Risk in Indian State-owned Banks: An Empirical Investigation. Published in: *Economic Issues*, Vol. 12, No. 2, pp. 48-66. <http://www.economicissues.org.uk/Files207/Das.pdf>.

Dimitrios, Louisz & Vouldis, Angelos & Metaxas, Vasilios. (2010). Macroeconomic and Bank-Specific Determinants of Non-Performing Loans in Greece: A Comparative Study of Mortgage, Business and Consumer Loan Portfolios. *Journal of Banking & Finance*. 36. 10.2139/ssrn.1703026. <https://doi.org/10.1016/j.jbankfin.2011.10.012>.

Espinosa, P., Merno, A., & Gracia, F. (2011). Banks' Net Interest Margin in the 2000s: A Macro-Accounting International Perspective. *Facultad de Ciencias Economicas y Empresariales. Working Paper n° 11/11*. <https://doi.org/10.1016/j.jimonfin.2011.06.001>.

Hess, K., Grimes, A., & Holmes, M. J. (2009). Credit losses in Australian banking. *Economic Record*, 85, 331-343. <https://hdl.handle.net/10289/1588>.

Keeton, W. R. (1999). Does faster loan growth lead to higher loan losses?. *Federal Reserve Bank of Kansas City Economic Review* 1999, 53-78. <https://econpapers.repec.org/RePEc:fip:fedker:y:1999:i:qii:p:57-75:n:v.84no.2>.

Messai, Ahlem Selma, & Fathi Jouini (2013), Micro and Macro Determinants of Non-performing Loan. *International Journal of Economics and Financial Issues, Econjournals*. 3(4), 852-860. <http://www.econjournals.com/index.php/ijefi/articledownload/517/pdf>.

Mileris, R. (2012). Macroeconomic determinants of loan portfolio credit risk in banks. *Engineering Economics*, 23(5), 496-504. <https://doi.org/10.5755/j01.ee.23.5.1890>.

Salas, V and J. Saurina (2002), Credit risk in two institutional regimes: Spanish commercial and savings banks. *Journal of Financial Services Research*, 22, 203-224. <https://doi.org/10.1016/j.econmod.2013.01.027>.

Tehulu, T. A., & Olana, D. R. (2014). Bank-specific determinants of credit risk: Empirical evidence from Ethiopian banks. *Research Journal of Finance and Accounting*, 5(7), 80-85. http://www.Academia.edu/32102832/Bank_Specific_Determinants_of_credit_risk:Empirical_evidenc_from_Ethiopian_banks.

Yusuf, A. A., Santi, N., & Rismaya, E. (2021). The Efficiency of Islamic Banks: Empirical Evidence from Indonesia. *Journal of Asian Finance, Economics and Business*, Vol 8 Issue 4, 2021, pp.239-247. <https://doi.org/10.13106/jafeb.2021.vol8.no4.0239>.

Zhao, Z. , Lan, Y. and Wu, X. (2016) The Impact of Electronic Banking on the Credit Risk of Commercial Banks —An Empirical Study Based on KMV Model. *Journal of Mathematical Finance*, 6, 778-791. doi: 10.4236/jmf.2016.65054.

Zoubi, T. A. & Al-Khazali, O., (2007). Empirical testing of the loss provisions of banks in the GCC region. *Managerial Finance*, 33 (7): 50. <http://dx.doi.org/10.1108/03074350710753771>.

Zribi, Nabila & Boujelbène, Younes. (2011), The factors influencing bank credit risk: The case of Tunisia. J. Account. Tax. 3.
<https://econpapers.repec.org/RePEc/icf/icfjbm:v:11:y:2012:i:1:p:47-69>.