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The Determinants of the Credit Risk in Developing Countries: An Empirical Study on Vietnamese Listed Banking Sector

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Abstract The research study is focusing on the determinants of credit risk in developing countries, Vietnam is one the most fastest growing economies in the world with the rate of roughtly 7 percent during the period of1986 – 2018. The bank system in the country has widely been expanded both quantity and quality. Using the secondary data in the period of 2009 – 2018 retrieving from Ho Chi Minh City Stock Exchange (HOSE), Hanoi Stock Exchange (HNX), and General Statistics Office with the theoretical framework of bank's non-performance loans (so-called credit risk), the results demonstrate that that real GDP growth rate is significantly and negatively correlated with the credit risk in the bank system. Loan growth in the current year and a previous year can negatively generate non-performing loans in this year. In addition, a larger bank can perfectly have a lower level of bankruptcy cost and a higher level of growth rate related to a lower level of credit risk. Further, the bad debt, inflation, and net interest margin can positively generate credit risk.

Keywords: *credit risk, loan growth, GDP, inflation, bad debt*

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1. Introduction

In the context of the economic development in each country, the expansion of the banking system has significantly contributed a great value to the economy. Banks and financial institutions have played an important role in determine economic performance for each country. The efficiency of banks is reasonable important to maintain the development of the financial markets.

Despite of the history of Vietnam had been dominated by war lasting 30-year-long struggle to achieve independence in the 20th century, the conflict had escalated during the sixties but since launching in 1986, under Doimoi (economic reform), Vietnam has transformed both politics and economics. Vietnam has maintained rapid economic growth with the goal of the development the country to be a socialist-oriented market economy in connection to a lower middle-income country since 2011 and expectation of over $3000 per capita by 2020. Real GDP growth rate increased by 7.10% during 1990 to 2018, in which, foreign direct investment firms have been identified as an important energy of financing for a developing country like Vietnam. It enhances economic growth and growth model reform [1,2]. Vietnam has greatly experienced such a huge FDI inflows, export performance and business community development.

Economic growth is closely related to the development of banking sector regarding both quantity and quality. In the case of Vietnam, the number of banks has widely expanded in recent years to be the strongest banks in the region. As suggested in the Asian Banker yearly release, a strong bank describes the long-term profitability from its core businesses and ability to overpass the struggle in operation.

It is evident that a bank has to keep deposit of others and can use the money for loans for making the profit. The performance of banks is predominantly associated with banks' success. The determinants of credit risk have frequently inspired academics to find a number of empirical studies in both developing countries and developed countries. Indeed, finding factors that influence the risk of credit has been at the center of the relevant previous studies [3,4,5,6,7]. In which, macroeconomics has been focused on numerous empirical studies based on Awad and Karaki [3], Jovic [4], Mpofu and Nikolaidou [8], Gila-Gourgoura and Nikolaidou [9], Lin et al. [5] and Liang and Reichert [13]. As presented in some recent studies, the relationship of credit growth and bad debt on the credit risk of a bank has been focused [10,11,12]. In respect to bank performance, Shkodra and Ismajli [10] conduct on a study on Kosovo, and Gila-Gourgoura and Nikolaidou [9] in Spain.

The paper focuses on one of the fastest growing economies in Asia Pacific and Asia, named Vietnam. The

general objective of the study is to examine the determinants of credit risk such as macroeconomic factors of economic growth rate, inflation, and credit growth, bad debt, bank performance and bank size in the Vietnamese listed companies over the 2009 – 2018period. By employing the FEM and REM approach in the period of 2009 – 2018. Therefore, the main aim of this study is to examine the most important factors that impact on bank's credit risk. The importance of the paper is to provide to the researchers, policy makers and especially the banks, Vietnamese government the determinants of the credit risk in a developing country.

The rest of the paper is organized as follows: Section 2 presents a review of the literature whereas Section 3 discusses the data and constructs methodology as the model specification and estimation techniques. Further, Section 4 presents the results and then Section 5 gives the main recommendations.

2. Literature Review

In the context of economic development in every country, the banking system and operations of financial institutions are the "lifeblood" of the nation's economy. Firstly, the banking system is the section of the economy saving the financial assets of other parts as business, firm, people and all the country. Secondly, a bank has to keep deposit of others and can use the money for loans for making the profit.

The determinants of the credit risk has been widely discussed in developing and developed countries as well as countries in transition. A number of empirical studies have confirmed the relationship between macroeconomic factors such as gross domestic growth, inflation and credit risk [4,5,6,7].

Economic growth is one of the most important ultimate goals of economies in the world. Economic growth is closely consistent with the development of banking sector and viewed as a lifeblood in the each economy. The banking sector has significantly played an important role in the modern economic world, especially in the fourth industrial revolution that is widely happened on every corner of the social life. Banks exactly collect individuals' savings and lend them out to business-people, manufacturers and lenders. A number of manufacturers have borrowed from banks the money needed for the raw materials purchase and to make other requirements such as working capital in operation [13]. As shown by Awad and Karaki [3], a higher level of credits supported by banks are considered to generate a positive effect on economic growth.

In the study on Serbian banks, Jovic [4] describes that a bank can successfully expand the volume of credit level in the period of crisis due to expansionary monetary policy of each economy in order to support more energy to the economy recovering reaching to the potential output. In a decline segment of business cycle, dropping in GDP growth rate can significantly and negatively impact on the quality of the credit by increase in risk. In addition, the depreciation of domestic currency in the years of the economic crisis can significantly generate the credit risk.

Lin et al. [5] conduct on a study in Indonesia during the period of 2008– 2015. Indonesia has the largest Muslim population in the world with roughly 210 million Muslim inhabitants. By this convenience, in general, Islamic banks experienced maximum NPL and NPF 51% and 18.07% respectively which are representative for credit risk. The study describes that Islamic banks are able to strongly resist during crisis. Further, through central bank policy, money supply has a significant impact on credit risk with a negative effect at the level of significance of 10% but inflation has not any impact. By contrast, in connection to conventional banks, inflation has a significant impact on credit risk in Indonesia. Estimating the financial crisis and its impact on the risk of credit, it has an impact on credit risk of conventional Banks but not for Islamic banks.

Shkodra and Ismajli [10] conduct on a study on Kosovo – a developing country in European. According to the study, the determinants of credit risk in the banking sector in a developing country have significantly limited data to examine and limited contribution the results in literature. The banking sector in Kosovo is beginning in development in region, it is comparable with banking sector to neighboring countries in the regions, for example Albania, Serbia, Montenegro, Macedonia, Bosnia and Herzegovina, etc. Defining by non-performing loans (NPL) for the credit risk in Kosovo with the main purpose to classify some major factors that affect credit risk in financial institutions in Kosovo. Using seven banks in the 2006–2015 period and the software of Statistical Program for Social Sciences (SPSS), based on a regression model of multivariate panel. The empirical results indicates that a significant relationship can be found between credit risk and the following factors: the bank performance (ROE and ROA), inefficiency (IE), loans to deposit ratio (LDR), credit growth (CG) and deposit rate (DR).

Mpofu and Nikolaidou [8] conduct in a study about the impact of macroeconomic factors on credit risk in the 22 Sub-Saharan African banks. Using dynamic panel data during the period 2000–2016, results describe that a higher level of real GDP growth rate has a statistically and positively significant reducing the proportion of non-performing loans to total gross loans. In addition, inflation rate, the contribution of domestic credit to private firm by a percent of GDP, trade openness, and the effect of global volatility, all have positive and significant effect on credit risk.

Gila-Gourgoura and Nikolaidou [9] have a study in Spanish banking sector, using a data between 1997 and 2015 and covering the post-crises interval in Spain. The data is retrieved from from the Central Bank of Spain and from the European Central Bank. The method of the analysis is based on ARDL approach to clarify the existence of both long and short-run relationship between credit risk and a number of couple of macroeconomic indicators, bank-related as well as country-specific indicators. The results describe that all indicators such as macroeconomics, bank-specific and finally interest rates are major determinants of credit risk in Spanish banking sector. More specifically, real GDP growth rate, and bank performance, the total credit granted by the Spanish banks and their capital to assets ratio have significantly explained credit risk in Spain in the short and the long term.

3. Data Sources and Methodology

The findings of the study always depend on data diversification and data quality. It affects the quality of analytics and research results. This section contains descriptions of the data sources and methods used in the study.

3.1. Data Sources

This study has estimated based on the secondary data in the period of 2009 – 2018. The data is retrieved from Ho Chi Minh City Stock Exchange (HOSE) and Hanoi Stock Exchange (HNX). The data of a firm is retrieved from balance sheet, income statement and annual reports each year. The financial data of a firm is frequently published at HOSE and HNX. Further, GDP growth rate as well as inflation in Vietnam is extracted from General Statistics Office of Ministry of Planning and Investment.

3.2. Methodology

Numerous of functional forms have been examined the determinants of credit risk in a developing country like Vietnam. In this study, we have used a model of Jovic [4]; Lin et al. [5]; Ali [6]; Salas and Saurina [7], Pattarathammas and Mongkonkiattichai [12], and other previous studies, as follows:

$$Y = C0 + C1X1 + C2X2 + C3X3 + C4X4 + C5X5 + C6X6 + C7X7 + \varepsilon \quad (1)$$

$$CREDIT_{i,t} = C0 + C1\ CREDIT_{i,t-1} + C21\ GROW_{i,t} + C22\ GROW_{i,t-1} + C3\ DEBT_{i,t} + C4\ NIM_{i,t} + C5\ SIZE_{i,t} + C6\ GDP_t + C7\ INF_t + \varepsilon \quad (2)$$

Where

CREDITi,t = so-call credit risk, the loss provision for credit risk, is measured by the quotient of cost of loss provision for credit risk to the banki's total amount of loans for the time t.

CREDITi,t = Loss provision for credit risk, is measured by the quotient of cost of loss provision for credit risk to the banki's total amount of loans for the time t-1. The expected sign is positive.

GROWi,t = the growth of credit of bank i at the time t, is calculated by the quotient of total loans at the time t to total loans at the time t-1. This proxy was exactly used by Shkodra and Ismajli [10] conduct on a study on Kosovo banking system; Kashif [11] in the case of Pakistani banking system, Pattarathammas and Mongkonkiattichai [12] in Asian financial institutions. The expected sign is positive.

GROWi,t-1 = the growth of credit of bank i at the time t - 1, is calculated by the quotient of total loans at the time t-1 to total loans at the time t-2. The expected sign is positive.

DEBTi,t = the rate of bad debt in the banki at the time t, is measured by the quotient of total amount of bad debt to total loans, a proxy that is used in the studies of Gila-Gourgoura and Nikolaidou [9] The expected sign is also positive.

NIMi,t = net interest margin, is a measure of the difference between the interest income generated by banki and the amount of interest paid out to their lenders at the time t. This variable is exactly calculated by the percentage of net interest income to average interest-earning assets during a specified period (at the time t). This proxy was used by Shkodra and Ismajli [10] conduct on a study on Kosovo, and Gila-Gourgoura and Nikolaidou [9] in Spain. The expected sign is also negative.

SIZEi,t = is measured for the size of a banki at the time t. To be precise, FIRMSIZEi,t. This proxy was used by Gila-Gourgoura and Nikolaidou [9]. The expected sign is also negative.

GDP_t = GDP growth rate in Vietnam, is measured for real GDP growth rate at the time t, this proxy was used by Awad and Karaki [3] and based on Liang and Reichert [13], Jovic [4], Mpofu and Nikolaidou [8], Gila-Gourgoura and Nikolaidou [9]. The expected sign is also negative.

INFt = is measured by the annual inflation in Vietnam. This indicator can be explained for the impact of inflation on credit risk in a firm. This proxy was used by Lin et al. [5], Mpofu and Nikolaidou [8]. The expected sign is also positive.

$\varepsilon =$ *a vector of errors term.*

4. Results and Discussion

4.1. Correlation Analysis

Table 1. Correlation Matrix

	$CREDIT_{i,t}$	$CREDIT_{i,t-1}$	$GROW_{i,t}$	$GROW_{i,t-1}$	$DEBT_{i,t}$
$CREDIT_{i,t}$	1.000				
$CREDIT_{i,t-1}$	0.452	1.000			
$GROW_{i,t}$	0.101	-0.068	1.000		
$GROW_{i,t-1}$	0.210	0.088	0.017	1.000	
$DEBT_{i,t}$	0.073	-0.035	-0.112	0.035	1.000
$NIM_{i,t}$	0.236	0.168	-0.128	-0.123	0.045
$SIZE_{i,t}$	-0.213	0.268	-0.231	-0.215	-0.216
GDP_t	-0.069	0.169	-0.032	0.152	-0.253
INF_t	0.235	-0.123	-0.065	0.365	0.025

	$NIM_{i,t}$	$SIZE_{i,t}$	GDP_t	INF_t
$NIM_{i,t}$	1.000			
$SIZE_{i,t}$	-0.076	1.000		
GDP_t	-0.075	0.132	1.000	
INF_t	0.012	-0.233	-0.03	1.000

Source: Calculated by the author.

The best model will appear if OLS estimators are blue. In general, multicollinearity can exactly occur if two or more predictors are significantly correlated in the model. Hair et al. [14] emphasized that multicollinearity might be examined by variance inflation factors (VIF). More specifically, VIF is the division of the variance with multiple terms by the variance of a model with one term alone in a specific model. In general, VIF is used for

testing for multicollinearity in the analysis of ordinary least squares regression. If VIF value is excess of 4.0, a problem with multicollinearity can be found. In the assessment on VIF, many previous studies have argued that a VIF<10 is acceptable. In addition to Gujarati [15] who said that detection of multi-collinearity if the correlation is 0.8 and more, severe multicollinearity may be present whereby in absolute value of pairwise correlations among independent variables may be somewhat high. Table 1 shows the correlation matrix among variables using in the model. All correlation coefficients are less than 0.8 so that the multi-collinearity is not present.

4.2. Estimation Model

FEM and REM

Followed by the models of Jovic [4]; Lin et al. [5]; Ali [6]; Salas and Saurina [7], Pattarathammas and Mongkonkiattichai [12], the estimation model can be applied by either Fixed-effect model (FEM) or Random-effects model (REM). In respect to FEM, individual specific effect is significantly correlated with the independent variables, assuming that there is a true effect size which underlines all studies in the study, and differences in observed effects are due to sampling error. In connection to REM, the true effect can exactly vary from study to study. In general, the effect size may be either higher or lower in studies. Due to the difference in the mixes of participants and in the implementations of interventions, and other reasons, it is evident to recognize that there might be different effect sizes underlying different analyses. To correct the effects, Hausman tests have been mentioned how to select the best model between FEM and REM. To be precise, the selection between the two models is based on the inter-variance and intra-variability. The select model is FEM if Pro>Chi2, otherwise is REM.

H0: The null hypothesis is that the preferred model is random effects

Ha: The alternate hypothesis is that the model is fixed effects

Estimation Results

Table 2 presents the estimation results of FEM and REM with dependent variable of credit risk CREDITi,t.

Table 2. Estimation Results

Variable	FEM	REM
Constant	-0.107 (-0.023)*	-0.123 (-0.020)*
$CREDIT_{i,t-1}$	0.185 (0.049)*	0.136 (0.042)*
$GROW_{i,t}$	0.062 (0.002)*	0.065 (0.012)*
$GROW_{i,t-1}$	0.001 (0.001)*	0.001 (0.001)*
$DEBT_{i,t}$	0.065 (0.056)**	0.046 (0.036)*
$NIM_{i,t}$	0.538 (0.074)**	0.523 (0.061)**
$SIZE_{i,t}$	-0.001 (-0.002)*	-0.001 (-0.001)*
GDP_t	-0.147 (-0.076)**	-0.152 (-0.049)*
INF_t	0.028 (0.012)*	0.012 (0.023)*
Adjusted R^2	55.61%	54.36%
Wald test	12.56	12.35

Notes: * significance at 5% level, ** significance at 10% level.

Hausman tests can choose either a fixed effects model or a random effects model. Using Stata 14, we find that REM is the select model. Based on REM model with the explanatory variable of credit risk, the study describes that the coefficients of CREDIT, GROW, DEBT, NIM, SIZE, GDP and INF are statistically significant. Further, except from INF estimation coefficient is negative, other coefficients of CREDIT, GROW, DEBT, NIM, SIZE, GDP are positive. The study indicates that all variables may impact on credit risk in the case of Vietnamese listed banking sector. The following regression equation is written:

$$\begin{aligned} CREDIT_{i,t} &= -0.123 + 0.136\ CREDIT_{i,t-1} \\ &+0.065\ GROW_{i,t} + 0.001\ GROW_{i,t-1} + 0.046\ DEBT_{i,t} \\ &+0.523\ NIM_{i,t} + 0.001 SIZE_{i,t} + 0.152\ GDPt \\ &-0.012\ INFt + \varepsilon. \end{aligned} \quad (3)$$

4.3. Interpretation of the Results

Regarding the estimation results, indicating that the determinants of credit risk in the listed banking sector in Vietnam, as follows:

Credit risk with a lag of a year has a significant and positive impact on the risk of credit in case of Vietnamese listed banks. It means that the quality of credit this year may be affected by the loans of the last year. In respect to credit growth, the growth significantly increases the credit risk in the bank in Vietnam, particular the credit growth in the previous year continuously impacts on credit growth at the current year. It is evident that loan activity at the previous year may not only affect the credit risk at that time, but also last to affect this year, further, this effect is lesser.

It is in line with Kashif [11] in the case of Pakistani banking system, the economic development in connection to the growth of dramatic loan in Pakistan in mid-2000, it has contributed to a significant set of borrowers and lenders growth. A major finding in the study is described that loan growth in a previous year can negatively generate non-performing loans and can negatively affect the bank solvency with a time lag of many years later because of existence of a weak prudential regulation among bank competitors, the asymmetric information among the borrowers and lenders, and underestimating the credit risk in the policy of lending during credit expansion and economic development. Pattarathammas and Mongkonkiattichai [12] also concludes a similar finding between loan growth and credit risk of Asian financial institutions

Bad debt has a greater impact on the risk of credit at the bank. It said that that a higher level of the bad debt in a bank has a significantly positive impact on credit risk. In fact, a bank with a higher bad debt has continually generated in the wake of a higher level of credit growth in risky business segments. In Vietnam, debts are classified into five groups based on the risk status, such as: Standard Debt (StD), Debt Needing Special Attention (DNSA), Subprime Debt (SD), Doubtful Debt (DB), and Potentially Irrecoverable Debt (PID). Bad debt includes SD, DB, and PID. Due to the profitability of a bank, some managers could follow in increasing loans and causing more bad

debt. It is somewhat risky to the bank. In terms of bank size, Gila-Gourgoura and Nikolaidou [9] conduct in a study in the banking system in Sub-Saharan Africa, a larger bank with a scope of economies can frequently have a lower cost of bankruptcy and a higher growth rate related to a higher performance. Further, a large bank is generally willing to take more encourage in doing business
and market expansion, technological enhancement, in particular to make more profit and its effectiveness.

Based on estimation result, it also indicates that the net interest margin in the bank positively impacts on the risk of credit during the years of 2009-2018. With a higher level of net interest margin, a bank is able to make more profit for the shareholders' equity and easy to do the payment for debtors. Further, it helps a bank more confident to support more loans for the borrowers. A higher rising of net interest margin can exactly generate more credit risk of the banks. The possibility, noted by Shkodra and Ismajli [10] conduct on a study on Kosovo, Gila-Gourgoura and Nikolaidou [9] in Spain, a firm with a higher net interest margin can have a higher profitability in doing business. As shown by Crino and Epifani [16], indicating that developing countries cannot easily attract more R&D and technology because of the technology gap between them and developed countries. Net interest margin shows the amount of money that a bank is exactly earning in interest on loans compared to the amount it is frequently paying in interest to depositors, in a developing country, NIM has been higher than a developed country because of a higher level of credit rating.

Regarding the GDP growth on credit risk, the study demonstrates that GDP growth rate is significantly and negatively associated with a bank's credit risk. Specifically, a bank doing in the period of time of a drop in gross domestic product growth in decline stage of business cycle can negatively affect credit quality but it has an increase in credit risk in the period of a business cycle. This evidence is consistent with the study of Salas and Saurina [7] conduct in Spain's commercial and savings banks as well as in the study of Rajan and Dahl [17] in India's public sector banks. As suggested in the study in Serbia, Jovic [4] indicates that the banks can easily absorb the increase of credit level in the period of crisis, perhaps, this period the country had conducted expansionary monetary policy in order to pour more energy to the economy recovering reaching to the potential output. Further, Lin et al. [5] study on both conventional and Islamic banks in Indonesia, in which, exchange rate as well as macroeconomic factors are significant to Islamic banks' credit risk.

In respect to how inflation impact on the risk of a bank, the study indicates that the depreciation of local currency of Vietnam can significantly associate with the effectiveness of a bank in credit through a negative effect. In Vietnam, a few years the country had maintained such a high inflation, because of much more vulnerable to the economy in front of shocks of high inflation, the risk of credit is increasingly high. Further, in the banking sector, the bank and other financial institutions have been viewed as a very important source in the economic development each country, a bank is able to down their profit during economic crisis and depreciation. It is line in the study on Serbian banks, the depreciation of domestic currency in the years of the economic crisis can have a robustness of credit risk [4]. Many previous studies have also been examined on business cycle, which has been concluded a systemic factor of credit risk increase. Similarly, Salas and Saurina [7] also found the same finding in Spanish commercial and savings banks, Lin et al. [5] in Indonesia.

5. Conclusion

The banking system and operations of financial institutions are the "lifeblood" of the nation's economy. The determinants of the credit risk has been widely discussed in developing and developed countries as well as countries in transition. During the operation, the banking system has sometimes encountered a number of prolems of credit risk. In general, a credit risk is the risk of debt that may raise from a borrower or lender failing to repay the required payments. In the first stuck, the risk is happened if the lender has lost principal and interest payment, block to cash flows, and negatively increased collection costs.

Economic growth is closely consistent with the development of banking sector and viewed as a lifeblood in the each economy. The finding said that real GDP growth rate is significantly and negatively correlated with the credit risk in the bank system. Particularly, gross domestic product growth dropping in the end of business cycle can negatively affect credit quality. Further, inflation has a negative and significant effect on credit risk. In respect to credit growth, loan growth in the current year and a previous year can negatively generate non-performing loans in this year. Regarding bad debt, a higher level of bad debt in a bank has a significantly positive effect on credit risk.

Due to scope of economies, a larger bank might perfectly have a lower cost of bankruptcy and frequently generate a higher level of performance and less risk. In contrast, net interest margin in the bank positively impacts on the risk of credit.

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