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BANK-SPECIFIC DETERMINANTS OF CREDIT RISK: EMPIRICAL EVIDENCE FROM INDONESIAN BANKING INDUSTRY

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***Abstract*— High credit risk levels could impose systemic risk on the banking system which then leads into harming the overall economic condition of a country. Therefore, it is essential to discover whether the same theory is actually applicable in Indonesia. This research is aimed to find the determinants of credit risk in Indonesian banks. Specifically, bank-specific variables will be used as the determinants and to find out whether the bank ownership structure as one of the bank-specific variables influence the level of credit risk. Annual financial data selected from 2002 until 2013 will be used in this research.**

***Index Terms*— bank-specific determinants, banking, loan default, non-performing loan**

I. INTRODUCTION

One of the core business activities of bank is to provide loans. Inevitably, bank will be imposed to the uncertainty of loan borrowers' ability to repay the loan or otherwise called credit risk. According to Bassel Committee on Banking Supervision, 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.

Healthy financial sector is one of the key to stable economic performance of a country. High credit risk levels could impose systemic risk on the banking system which then leads into harming the overall economic condition of a country. Bassel Committee on Banking Supervision argues that to maintain bank profitability it is essential to implement credit risk management, as the credit risk exposure will be maintained through up-to-standard constraints. As bank gain most of its income from interest income, higher amount of credit issued by a bank will likely to increase its income. However, high number of credit will impose higher credit risk to a bank. Thus, effective risk management is essential in banking business.

[10] studied the relationship between credit risk and bank specific determinants in Ethiopia. They considered bank ownership as one of the bank-specific determinants. The study found out that credit growth and banks size have negative impact on credit risk (lowering the credit risk). While operating inefficiency have positive impact on credit risk (increasing the credit risk) and that government banks were more risky than private bank. However, capital adequacy and bank liquidity have no strong impact on the credit risk.

Similarly, [12] investigated credit risk determinants in Tunisia during 1995 – 2008. They included ownership structure as one of the microeconomic factors along with macroeconomic factors and the result suggested that the main credit risk determinants in Tunisia are ownership structure, prudential regulation of capital profitability, and macroeconomic indicators. More previous studies pointed out that credit risk level in banks could be explained by microeconomic variables and macroeconomic variables. Microeconomic variables used in previous studies usually move in the direction of bank-specific determinants. However, only a few studies that examine whether the credit risk determinants is affected by bank ownership structure.

II. LITERATURE REVIEW

Non-performing Loan as Credit Risk Indicator

This study will use NPL as an indicator for credit risk in Indonesia. In previous studies [2], [3], [5], [7], [8], NPL has been used to measure credit risk level in banking industry. According to Central Bank of Indonesia (BI), loan could be classified as NPL if the loan has not been paid 90 days or more past its due. Naturally, higher number of NPL indicates that there is higher probability that the credit will be defaulted. BI classifies quality of credit into 4 categories, which are Pass, Special Mention, Substandard, Doubtful, and Loss. The classification is based on the punctuality of credit payment and/or the debtor's ability to repay the loan. Credit is considered problematic once it is classified into Substandard, Doubtful, and Loss. Non-performing loan is calculated by dividing problematic credit by the total credit.

Determining Relationship Between Credit Risk and Bank-specific Variables

In 2014, [10] studies the bank-specific determinants of credit risk in Ethiopian commercial banks. They used panel data of 10 commercial banks including state-owned and private owned during 2007 until 2011. Variables analyzed in this study are credit risk, bank size, profitability, capital adequacy, bank liquidity, credit growth, operating inefficiency, and ownership

The data later was analyzed using GLS (Generalized Least Squares). The findings suggest that credit growth and banks size have negative impact on credit risk (lowering the credit risk). While operating inefficiency have positive impact on credit risk (increasing the credit risk) and that government banks were more risky than private bank.

[7] examined the influence of bank specific determinants on credit risk for commercial banks in Bosnia and Herzegovina. He used a sample of seventeen out of twenty eight planned banks over the period of 2002 to 2012. Later, multivariate panel regression model was employed to find out if a significant relationship exists between credit risk and the bank-specific variables. Bank-specific variables used in this research are inefficiency, profitability, credit growth and deposit rate , solvency, loans to deposit ratio, market power, profitability and reserve ratio. The findings from the study showed that banking credit risk is negatively affected by inefficiency and credit growth.

In another study by [1], the bank specific determinants of NPLs were investigated. In which, 6 years panel data from 2006 to 2011 of 30 banks in Pakistan were used and analyzed using panel regression analysis. Variables used in this research are: inefficiency, solvency, loans to deposit ratio, market power, ROA, ROE, Credit growth, liabilities to income, deposit rate, and reserve ratio. As the result shows that extensive lending could lead to increase in the riskiness of loan portfolio, therefore banks should consider the loan to deposit ratio.

[11] studied whether there is a significant relationship between macroeconomic indicators, bank-level factors and non-performing loan ratio in Turkey from January 2007 and March 2013. They employed linear regression models and co-integration analysis to find out if there are significant relations. The results of this study showed that industrial production index, Istanbul Stock Exchange 100 Index, inefficiency ratio of all banks negatively affect NPL ratio while unemployment rate, return on equity and capital adequacy ratio positively affect NPL ratio. Whereas debt ratio, loan to asset ratio, real sector confidence index, consumer price index, EURO/ Turkish lira rate, USD/ Turkish lira rate, money supply change, interest rate, Turkey's GDP growth, the Euro Zone's GDP growth and volatility of the Standard & Poor's 500 stock market index does not have significant effect to explain NPL ratio on multivariate perspective.

[8] applied a dynamic panel data approach to examine the determinants of non-performing loans (NPLs) of commercial banks in a market-based economy, represented by France, compared to a bank-based economy, represented by Germany, during 2005–2011. The main question asked in the paper is which credit risk determinants are important for both countries. The results indicate all macroeconomic variables used in the paper influence the NPL level in both countries expect for inflation rate. In addition to that, the study also discovered that compared to Germany, the French economy is more vulnerable to bank-specific determinants.

[13] in their study tried to identify the factors affecting the non-performing loans rate (NPL) of Eurozone's banking systems for the period 2000-2008 (before the recession period). In the paper, they look at macroeconomic variables as well as microeconomic variables (bank-specific variables) and investigate which variables determine the level of NPL. Macroeconomic variables analyzed in this research are annual percentage growth rate of gross domestic product, government budget deficit or surplus as % of GDP, public debt as % of gross domestic product, inflation rate, and unemployment. As for the microeconomic variables, they examined bank capital and reserves to total asset, loans to deposits ratio, return on assets, and return on equity. The result showed that there is strong correlations between NPL and macroeconomic factors which are public debt, unemployment, annual percentage growth rate of gross domestic product. Aside from macroeconomic factor, they also find correlation between NPL and bank-specific factors such as capital adequacy ratio, rate of nonperforming loans of the previous year and return on equity.

III. METHODOLOGY

A. Research Design and Problem Identification

In this section the research methodology used in the study is described. The scope in which the study was conducted, the study design and the population and sample are described. The data collection methods as well as methods implemented to maintain validity and reliability of the instrument are described as well.

Initially this research was inspired by Souza's (2011) research towards the macroeconomic determinants and bank-specific determinants on credit risk in Brazil. However as the time progress, the research was focused on analyzing the bank-specific credit risk determinants. There are plenty of similar researches conducted in many other countries; however there are not many researches that are conducted in Indonesia. Moreover, there are not many that include bank ownership structure to differentiate the bank-specific impact on private bank credit risk and state-owned bank credit risk. Thus this research is aimed to analyze the relationship between bank-specific variables and credit risk and to see whether bank-ownership structure plays any role in the credit-risk level.

B. Data Collection and Data Processing

The data collected for this research are secondary data. The data used in this research are obtained from Bank Indonesia's website. The period of study for this research is from December 2002 till December 2012, due to data availability. Thus, 10 years of annual data from 69 commercial banks in Indonesia is used due to publication of available data in this research are published annually.

After data collection, the data collected will be processed in data processing; in which, the dependent and independent variables will be established.

Non-performing loan is set up as the credit risk level indicator in this study. As mentioned before credit risk can be influenced by both macroeconomic as well as microeconomic variable. This study relies on microeconomic variables which

are described by bank-specific factors. The selection of variables relies on the literatures review as well as the data availability. The definition of the dependent and the independent variables are defined in the table below.

TABLE I. VARIABLES AND DEFINITIONS

Variables	Symbols	Definition
Non-performing Loan	NPL	Problematic Loan / Total Loan
Return on Asset	ROA	Income before tax / Total Asset
Return on Equity	ROE	Income after tax / Total Equity
Capital Adequacy Ratio	CAR	Capital / Risk Weighted Asset
Loan to Deposit Ratio	LDR	Credit / Third-party Fund
Credit Growth	CGRO	Natural logarithm of credit in period t to t-1
Operating Inefficiecy	BOPO	Operational Expense / Operational Income
Dummy Variables	DDEV	dummy variable that takes value one if in year t bank i is foreign exchange bank
	DNDEV	dummy variable that takes value one if in year t bank i is non-foreign exchange bank
	DMIX	dummy variable that takes value one if in year t bank i is mixed owned bank
	DFOR	dummy variable that takes value one if in year t bank i is foreign bank
	DREG	dummy variable that takes value one if in year t bank i is regional bank

This research follows the subsequent model

$$NPL_{i,t} = \beta_0 + \beta_1 SIZE_{i,t} + \beta_2 ROA_{i,t} + \beta_3 ROE_{i,t} + \beta_4 CAR_{i,t} + \beta_5 CGRO_{i,t} + \beta_6 LDR_{i,t} + \beta_7 BOPO_{i,t} + \beta_8 DDEV_{i,t} + \beta_9 DNDEV_{i,t} + \beta_{10} DMIX_{i,t} + \beta_{11} DFOR_{i,t} + \beta_{12} DREG_{i,t} + \varepsilon_t \quad (1)$$

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8, \beta_9, \beta_{10}$ are respective coefficient terms for each independent variables, the variable symbols are described in Table 1.

IV. RESULT

Initially in this research, OLS regression would be used to test out the hypotheses. Before conducting the OLS regression, there are a few assumptions that must be fulfilled.

A. Testing for Normality Assumption

To test whether the residuals are normally distributed or not, Shapiro-Wilk test is used. The Shapiro-Wilk score of .0000 indicated that the residuals are not normally distributed (details see Appendix, Figure 1).

B. Testing for Multicollinearity Assumption

There are no VIF (Variance Inflation Factor) value that is larger than 6.899. Multicollinearity is present when the VIF value is larger than 10. Therefore, in this case, there is no multicollinearity that exists between the variables (details see Appendix, Figure 2).

C. Testing for Autocollinearity Assumption

To discover if there is any correlation between variables in period t with the variables in the period t-1, the Durbin Watson test can be used to test the existence of autocorrelation.The value of d is 1.742 whereas the dL is 1.82028 and dU 1.88404. Thus d < dL, this means the autocollinearity is present (details see Appendix, Figure 3).

D. Testing for Heteroscedasticity

In this research, scatter plot will be used to plot ZPRED (the standardized predicted value) and SRESID (studentized residuals). When the plotting are evenly distributed, meaning no plot collected in the middle, left, or right part of the scatter plot, the data is considered suitable. However in reality, the data tend to group together in one part of the scatterplot (see Appendix, Figure 4).

As seen from the result of the classical assumption test results, we cannot perform the OLS regression for this method because the normality, heteroscedasticity, autocorrelation assumptions were not fulfilled. Outlier removal and data transformation, i.e. log transformation, was performed. After this transformation, the normality assumption was fulfilled. However, the problem of heteroscedasticity and autocorrelation still persist.

V. CONCLUSION

This research is deemed unfit for OLS regression because of failures in fulfilling the classical assumptions, i.e. normality. heteroskedasticity, and autocorelation. Outliers removal and log transformation was performed however, only normality problem that managed to be solved. In the future, the authors would try out testing out the data using GLS regression using panel data. Based on previous research [10], the problem of heteroskedasticity and autocorrelation can actually be controlled using clustered robust standard error. Lastly, additional tests must be conducted to find out the right model for the GLS regression, i.e. Breusch-Pagan test as well as Hausman test.

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APPENDIX

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Unstandardized Residual	.232	690	.000	.321	690	.000

a. Lilliefors Significance Correction

Figure 1. Shapiro-Wilk Test of Normality Result

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	.011	.047		.232	.817	-.081	.103		
	SIZE	-.001	.002	-.017	-.287	.774	-.004	.003	.423	2.362
	ROA	-.017	.141	-.006	-.118	.906	-.293	.260	.538	1.860
	ROE	.043	.025	.105	1.760	.079	-.005	.091	.392	2.550
	CAR	.019	.019	.049	.968	.333	-.019	.057	.547	1.828
	CGRO	-.016	.008	-.076	-1.975	.049	-.032	.000	.954	1.048
	BOPO	.041	.022	.109	1.876	.061	-.002	.084	.412	2.428
	LDR	.009	.006	.071	1.622	.105	-.002	.020	.741	1.349
	DDEV	-.024	.011	-.172	-2.112	.035	-.046	-.002	.212	4.717
	DNDEV	-.017	.014	-.119	-1.244	.214	-.044	.010	.154	6.507
	DMIX	-.006	.013	-.033	-.480	.632	-.032	.019	.289	3.466
	DFOR	.001	.012	.007	.106	.916	-.023	.026	.363	2.753
	DREG	-.031	.012	-.261	-2.656	.008	-.053	-.008	.145	6.899

a. Dependent Variable: NPL

Figure 2. Multicollinearity Test Result

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.227[a]	.052	.035	.05544910	1.742

a. Predictors: (Constant), DREG, SIZE, CGRO, LDR, DFOR, CAR, ROA, DDEV, DMIX, BOPO, ROE, DNDEV

b. Dependent Variable: NPL

Figure 3. Autocorrelation Test Result

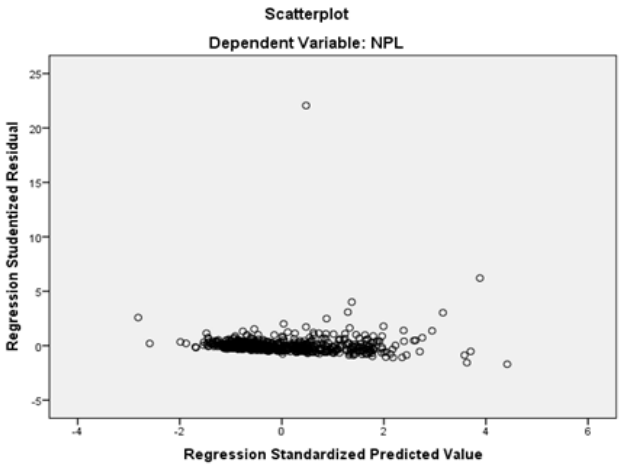

Figure 4. Heteroskedasticity scatterplot