“The impact of macroeconomic and bank-specific factors toward non-performing loan: evidence from Indonesian public banks”

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ARTICLE INFO	Hanifan Fajar and Umanto (2017). The impact of macroeconomic and bank-specific factors toward non-performing loan: evidence from Indonesian public banks. *Banks and Bank Systems*, *12*(1), 67-74. doi:10.21511/bbs.12(1).2017.08
DOI	http://dx.doi.org/10.21511/bbs.12(1).2017.08
RELEASED ON	Friday, 24 March 2017

JOURNAL	"Banks and Bank Systems"
ISSN PRINT	1816-7403
ISSN ONLINE	1991-7074
PUBLISHER	LLC “Consulting Publishing Company “Business Perspectives”
FOUNDER	LLC “Consulting Publishing Company “Business Perspectives”

NUMBER OF REFERENCES	NUMBER OF FIGURES	NUMBER OF TABLES
24	0	3

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The impact of macroeconomic and bank-specific factors toward non-performing loan: evidence from Indonesian public banks

Abstract

The present study focuses on the need for banking sector to be more reactive when facing globalization that could bring impact on banking industries complexity. Based on empirical studies, there is a need to analyze non performing loan determinants comprehensively using macroeconomic and bank-specific factors to make a good condition on bank, because combining macroeconomic and bank-specific variable as NPL determinants has made a big improvement to analyze NPL. The object of present study is 20 Banks listed in Indonesia Stock Exchange (IDX) between q12005-q42014. Using dynamic panel data GMM-system method shows that the previous period of NPL (non performing loan), change of PDB (Gross Domestic Product) and inflation rate have a significantly negative impact on NPL. However, BOPO (Operations Expenses to Operations Income) and ROE (Return on Equity) has a significantly positve relationship to NPL. On the other hand, this research does not find any significance on BI rate (interest rate), solvency ratio, and size to NPL. From the result, it can be concluded that combining macroeconomic and bank-specific variable could be an alternative method to analyze NPL determinants on bank.

Keywords: nonperforming loans, banks, credit risk, globalization, dynamic panel data, banking industries.
JEL Classification: G21, E44, E51, E5, F60.

Introduction

A globalization brings impact on the financial sector transformation. The changes in the global condition formulate an evaluation of a bank condition, which is increasingly more complex day by day. Therefore, the regulator realized that this complexity must be managed well so to create a good national banking performance.

The banking plays an important role as one of the economy agents and spurs on economic growth. At the macroeconomics level, bank is utilized as an instrument to stipulate policies by the government. The bank saving represents a form of the most liquid money and is used by the central bank to control the money circulation. In addtion, the economic aggregate is achieved by changing the credit availability at the depository institution. While at the microeconomic level, the bank is the main source of financing for small businesses and some people in need (Koch and Macdonald, 2015).

A banking has function as a finance intermediation institution that plays role in allocation process of surplus funds to the economic unit, which is deficit and needs funding. This function emerges due to the high of monitoring cost, liquidity cost, and price risk (Saunders and Garnett, 2008, p. 4). Saunders and Garnett (2008, pp. 5-8) outlines four bank functions as a financial intermediation institution, namely: (1) function as broker, (2) function as asset transformers, (3) role as delegated monitor, and (4) role as information producer.

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The intermediary function conducted by the banking in the end is able to stimulate the enchancement of number of credit. The enchancement of number of load or credit given by banking institution brings about amount of risks, especially non performing loan. Saunders and Cornett (2012) said that credit can not be separated from various risk, primarily borrower paying failure. A problem is in the quality of money distributed that could make banking to become insolvent, which causes declining of income and affects the profitability and its ability to compete with other banks.

A credit risk is a banking performance indicator. Credit risk can be reflected to number of non performing loans (NPL). The bank with high NPL number is considered less capable in managing its credit properly. Such complex financial condition is perceived could trigger the possibilities of higher NPL. [Author in this case thought that to face the situation of globalization, should be striven the way of nonperforming credit managing be better by conducting research of non-performing credit with the object of macroeconomic factor and bank-specific factor.] The research by those two factors is expected to gain a deep analysis to reduce the number of NPL as least as possible.

1. Theoretical framework

Louzis et. al. (2012) and Abid et. al. (2014) identified that NPL was namely caused by global economy slowdown. In this case, macroeconomics instrument was assumed being affected by global condition, however, number of studies confirmed that shifting of microeconomics instrument was considered affecting non-performing loan trend. These factors constrained the debtors to do consumption and pay their loans. On the other hand, from external perspective, this condition was driven by decreasing demand and commodity price. Therefore, the implication brought as massive default and disturbance to financial stability.

Previous studies demonstrated different results although most of the research generated non-performing loan (NPL) sample in aggregate. Many researchers studied influence of macroeconomics factors on non-performing loan. One of the studies was done by Rinaldi and Sanchis-Arellano (2006) with result of disposable income, unemployment rate and monetary condition affected non-performing loan in European household. In addition, Berge and Boye (2007) suggested that loans with high sensitivity against interest and unemployment rates of banks in Nordic region during 1993-2005 period.

Results from more recent empiric study by Macit (2012) have shown a significant link between bank's specific factors and macroeconomics with non-performing loan case in Turkey. Klein (2013) explained that result of his study in Europe is indicating significant link between bank's specific factors with macroeconomics factors towards NPL ratio. Skarica (2014) confirmed this condition using data over 2007-2012 period in Central and Eastern Europe regions and summarized a result of unemployment and inflation rates encouraged non-performing loan, while PDB growth submitted negative impact.

Other research groups more focused on previous banking specific factors. Berger and DeYoung (1997) explained relationship among banking specific factors, efficiency indicators and credit issues. The research observed period of 1985-1994, with result explaining cost efficiency will increase credit issues in the future. In line with this result, Podpiera and Weill (2008) continued the research and tested relationship between efficiency and non-performing loan experienced by banks in Czechoslovakia over 1994-2005 with similar result, confirming negative relationship between decreasing efficiency cost and upcoming non-performing loan.

On the other hand, Abid et. al. (2014) seek to combine macroeconomics and bank's specific factors. Abid et. al. (2014) summarized that macroeconomics factor such as Gross Domestic Product (GDP) had negative impact on NPL, meanwhile, inflation rate and real lending rate (RLR) or interest rate had positive and major impact on NPL case in Tunisia. Banking specific factors such as solvency ratio, ROE had negative and significant impacts, while INEF (Operations Expenses to Operations Income) ratio and size delivered positive and significant contribution for NPL.

This research was conducted as additional literature in banking sector due to limited research in this topic previously that analyzed macroeconomics and specific factors concurrently in Indonesia. The research was initated from a hypothesis that macroeconomics and banking specific factors should be tested simultaneously, because, to some extent, these factors influence each other and the research would be more comprehensive when testing these two factors at the same time. This research will examine macroeconomic and bank's specific factors relationship during the last 1-4 periods with current NPL ratio, this is done to generate dynamic impact of each factor. Sample of dynamic impact is bank's specific factors such as return on equity (ROE), BOPO (Operations Expenses to Operations Income) ratio, solvency ratio (SOLR)/capitali-zation ratio and size of bank's assets with overall sample (SIZE) during the last period with impact towards NPL ratio in the future. This research is expected to generate better conclusion and help the regulators in understanding current situation in Indonesia.

Therefore, this research is also expected to contribute sugestions for policy-makers by analyzing various macroeconomics indicators that influenced NPL. However, the bank's management will also further that influenced each of credit type, so that they will be able to better manage credit quality in the future, to maintain economic stability.

2. Hypotheses development

2.1. Previous period of NPL impact on current NPL. This variable is a NPL variable with previous *lag-quartel*. The variable is used to analyze dynamic impact of this panel. Louzis et. al. (2012) and Abid et. al. (2014) found that dependent lag variable NPL correlates negatively and significantly to the current NPL. The trend is NPL is likely to decline when previous period of increment occurs.

Hypothesis 1: NPL value in previous quarter has negative impact on the current NPL.

2.2. PDB impact on NPL. PDB (Produk Domestik Bruto) also known as Gross Domestic Product (GDP) is one of factors estimated that could affect NPL level in Indonesia. The research conducted by Salas and Saurina (2012) on bank in Spain shows that there's negative impact from GDP on NPL and signifies prompt impact of economic growth with the capability to pay the loans. When the growth rate is better, it will increase the borrower capability and when the ecnomomy is deteriorating, it will cause them difficulty to pay the loan to bank. In line with previous research, Abid et. al. (2014) concluded that GDP has a negative and significant correlation to NPL occuring in Tunisia. Two previous studies above have shown that the level of GDP has negative impact on NPL, therefore, it's considered that this affects the same to credit of working capital, investment credit, and consumer credit in Indonesia.

Hypothesis 2: PDB growth rate impacts negatively and significantly on NPL.

2.3. Inflation rate impact on NPL. The research of Abid et. al. (2014) found that variable inflation rate has a positive and significant impact on NPL. The impact of inflation rate is shown in its correlation with its credit payment pattern.

Hypothesis 3: The inflation rate has a positive and significant impact on NPL.

2.4. Bank Indonesia rate (BI Rate) impact on NPL. NPL can also be caused by the impact of interest rate that is published by central bank. Rinaldi and Sanchis-Arellano (2006) said that it is likely to occur because of positive correlation and significant impact on NPL. When the interest rate enchancement occurs, it will cause the enchancement of NPL level.

The coefficients of lending interest rates have a positive impact on NPL level in Tunisia. The NPL level is sensitive to the referred interest rate, because they use a floating system and for the debtors, it would be difficult to pay its own debt when interest rate tends to rise, therefore, it will be burdened (Abid et. al., 2014). In this research, will use BI rate as a term for lending rates.

Hypothesis 4: The level BI rate has a positive and significant impact on NPL.

2.5. BOPO (Operations Expenses to Operations Income) ratio impact on NPL. The measure of cost efficiency is usually followed by the enchancement of NPL. This is not only seen from an excess expenditure, but also from the unfavorable supervision practices. Berger and DeYoung (1997) disclosed that the biggest risk which bank would face is because of its internal factor. In line with it, Louzis et. al. (2012) found that coeficient in this variable is positive and significant to throughout NPL categories. A quantitative impact that occurs is likely to be the same in every NPL type. Abid et. al. (2014) also obtain the result that inefficiency has a positive correlation by the NPL occurence.

Hypothesis 5: There is a positive and significant correlation between independent BOPO and dependent NPL.

2.6. ROE ratio impact on NPL. A lower performance could be seen from the low expertise quality, which has a correlation to lending activity. This makes a negative correlation between past income and lending problem.

Louzis et al. (2012) expressed that the ROE indicator has a significant interest and negative correlation to NPL of housing and consumption sectors and it's not significant with NPL of business sector. It proves that management quality reflecting an efficiency of credit application procedure, which is usually built with a quantitative model technique, although the quality evaluation procedure is not different among different banks. Meanwhile, Abid et. al. (2014) expressed that ROE has a significant impact and has a negative correlation to NPL occurrence.

Hypothesis 6: ROE has a negative and significant correlation to NPL dependent variable.

2.7. Solvency ratio impact on NPL. Solvency ratio or capitalization ratio correlate to the manager's attitude who takes a big risk when other parties are actually unable to bear the risk. The bank that has low capital level is likely to increase their portfolio loans, whereas the decision will increase the non-performing loan in future (Berger and DeYoung, 1997). Abid et. al. (2014) stated that solvency ratio correlates negatively and significantly to NPL occurence.

Hypothesis 7: There is a negative and significant correlation between solvency ratio and NPL dependent variable.

2.8. Size impact on NPL. A bank diversification hypothesis has a correlation to lending qualilty. Salas and Saurina (2002) found the negative correlation between bank size and NPL, also argued that bigger size rather more allows the diversification possibility. A diversification also could be proxied by non-interest income as a share of total income, by a basis that the ratio is proxied by the correlation with other income type, except loans, and constitutes a diversification of income. While Abid et. al. (2014) expressed that size has a positive correlation so as the bigger size of bank with its capital size, the higher NPL number will occur to the bank.

Hypothesis 8: There is a negative and significant correlation between size independent variable and NPL dependent variable.

3. Research methods

The research uses a dynamic panel data regression with GMM-SYS method, which is established by Blundell and Bond (1998). In this type of dynamic panel method, unobserved level impacts (μ_i) have correlation with dependent variable lags. GMM-SYS model ('xtdpdsys' in command stata) is a development of Arellano-Bond (1991) estimator, which accomodates higher autoregressive parameters and larger variance ratio of panel-level impact on *error idiosyncratic* (ε_{it}) variance. The GMM-SYS method is also known as a Arellano-Bover (1995)/Blundell-Bond (1998) method with many panels and short period of time. Such a method assumed no autocorrelation in error idiosyncratic and expected that a panel-level impact does not correlate with first derivative from first observation in dependent variable. The moment condition for absence of correlation is $E[X_{it-s}\,\Delta\varepsilon_{it}] = 0$ t =3,….,T and for all s. It means that independent variable does not have a correlation of error.

The main purpose in GMM-SYS is to estimate a system, which consists of 'equation' in level (with first derivative lag as instrument) and 'equation' in first derivative (with level lag as instrument). The usage of this technique is to ensure that *endogeneity* problem and correlation in specific bank impact with error could be avoided. The usage of this method has also given a consistent result.

The method used in research is two-step GMM with such method is expected to get more efficient and consistent result. The research uses two models: first model, which will test macroeconomic factor that impact NPL, called baseline model and the second one is baseline model, which tests specific bank factor.

On the basis of the studies from Abid et. al. (2014), this paper is modifiying the model to accomodate the difference in some variables. The model below is used to answer the first research question and to answer the first hypothesis. The following model baseline is:

$$\Delta \mathrm{NPL}_{it} = \alpha \Delta \mathrm{NPL}_{it-1} + \sum_{j=1}^{2} \beta_{1\mathrm{j}}\, PDB_{\mathrm{t-j}} + \sum_{j=1}^{2} \beta_{2j}\, \Delta INFL_{\mathrm{t-j}} + \sum_{j=1}^{2} \beta_{3j}\, \Delta BIRATE_{t-j} + \mathcal{u}_{\mathrm{i}}^{\mathrm{h}} + \varepsilon_{\mathrm{it}}^{\mathrm{h}}.$$

Afterwards, to test the bank specific and a banking specific factor, respectively, will be inserted one by one to add model baseline to acknowledge an additional relation power. A number of cross sectional unit brings out restriction to a number of instrument that can be used to estimate and a number of exogenous variable that can be inserted in. Therefore, according to GMM procedure (Judson and Owen, 1999), the research only used limited lagged regressor as an instrument, as mentioned that in every time to put one specific banking variable. A number of instrument has been acknowledged so that it is not exceed the amount of cross section. Hence, the research added additional bank specific factors or macroecoomic variable into baseline model alternately, so that it will certainly created four different models to test macroeconomics variable with one bank-specific variable.

Following the research (Berger and DeYoung, 1997), this study used four lags in specific banking regressor to shoot the dynamic explanatory variable at earlier years. For size variable, is used only size of asset total in current year. It is because usually the bank size is inclined not to differ greatly from time to time.

Just like explained before, this paper uses baseline model from Abid et. al. (2014) as a basis. Each bank-specific factor would be added to the baseline model, and there would be 4 models to test bank-specific factors. Below are the models to test bank-specific variable:

Model 2:

$$\Delta \mathrm{NPL}_{it} = \alpha \Delta \mathrm{NPL}_{it-1} + \sum_{j=1}^{2} \beta_{1\mathrm{j}}\, PDB_{\mathrm{t-j}} + \sum_{j=1}^{2} \beta_{2j}\, \Delta INFL_{\mathrm{t-j}} + \sum_{j=1}^{2} \beta_{3j}\, \Delta BIRATE_{t-j} + + \sum_{j=1}^{4} \beta_{4j}\, BOPO + \mathcal{u}_{\mathrm{i}}^{\mathrm{h}} + \varepsilon_{\mathrm{it}}^{\mathrm{h}},$$

Model 3:

$$\Delta \mathrm{NPL}_{it} = \alpha \Delta \mathrm{NPL}_{it-1} + \sum_{j=1}^{2} \beta_{1\mathrm{j}}\, PDB_{\mathrm{t-j}} + + \sum_{j=1}^{2} \beta_{2j}\, \Delta INFL_{\mathrm{t-j}} + \sum_{j=1}^{2} \beta_{3j}\, \Delta BIRATE_{t-j} + + \sum_{j=1}^{4} \beta_{4j}\, ROE + \mathcal{u}_{\mathrm{i}}^{\mathrm{h}} + \varepsilon_{\mathrm{it}}^{\mathrm{h}},$$

Model 4:

$$\Delta \mathrm{NPL}_{it} = \alpha \Delta \mathrm{NPL}_{it-1} + \sum_{j=1}^{2} \beta_{1\mathrm{j}}\, PDB_{\mathrm{t-j}} + \sum_{j=1}^{2} \beta_{2j}\, \Delta INFL_{\mathrm{t-j}} + \sum_{j=1}^{2} \beta_{3j}\, \Delta BIRATE_{t-j} + + \sum_{j=1}^{4} \beta_{4j}\, SOLR + \mathcal{u}_{\mathrm{i}}^{\mathrm{h}} + \varepsilon_{\mathrm{it}}^{\mathrm{h}},$$

Model 5:

$$\Delta \mathrm{NPL}_{it} = \alpha \Delta \mathrm{NPL}_{it-1} + \sum_{j=1}^{2} \beta_{1\mathrm{j}}\, PDB_{\mathrm{t-j}} + \sum_{j=1}^{2} \beta_{2j}\, \Delta INFL_{\mathrm{t-j}} + \sum_{j=1}^{2} \beta_{3j}\, \Delta BIRATE_{t-j} + + \sum_{\mathrm{j=1}} \beta_{4\mathrm{j}}\, SIZE + \mathcal{u}_{\mathrm{i}}^{\mathrm{h}} + \varepsilon_{\mathrm{it}}^{\mathrm{h}}.$$

This paper is not considering a bank-specific variable as a exogenous, because there's a weak form exogenity at bank-specific variable, or it can be said that bank-specific variable is considered as predetermined variable. Therefore, it is perceived that there is an endogenity problem in present and past realization at error. Yet more than that, Bobba and Coviello (2007) stated that there was no correlation between bank-specific variable and a NPL dynamics in future. To fix the econometric issue, bank specific variable lag will be usedbased on the following condition of moment: based on Abid et. al. (2014) below is the model to fix econometric issue. $E[X_{it-s}\, \Delta\varepsilon_{it}]=0$, $t = 3,\ldots T$ and for all s.

4. The research result

In this part, data descriptive statistics will be explained, which is used for variables with total observation, mean, deviation standard, minimum and maximum value information.

Table 1. Descriptive statistic

	Mean	Std. Dev	Min	Max	Median	Mode
NPL	0.038015	0.047518	0.002	0.510	0.023	0.010
PDB	0.015094	0.022037	(0.036)	0.058	0.022	0.017
INFL	0.005596	0.005448	(0.001)	0.033	0.005	0.008
BIRATE	0.080688	0.017407	0.058	0.128	0.075	0.075
BOPO	0.834517	0.167265	0.050	2.310	0.840	0.890
ROE	0.118012	0.333558	(7.870)	0.850	0.130	0.120
SOLR	0.109002	0.035849	(0.121)	0.281	0.105	0.109
SIZE	0.049654	0.064431	0.001	0.256	0.023	0.148

Note: NPL is non performing loan. PDB (GDP) is Gross Domestic Product. INFL is inflation. BIRATE is Bank Indonesia rate. BOPO is Operations Expenses to Operations Income. ROE is return on equity. SOLR is solvency ratio. Size is capital size.

Table 1 shows that total observation in this research is 840, it is a result of cross section total(i) = 20 and time-series = 40, so that 20 x 40 = 800.

Table 2. Sample of Bank

No.	Nama Bank	Kode
1.	Bank BNI 46	BBNI
2	Bank BRI	BBRI
3	Bank Mandiri	BMRI
4	Bank BRI Agroniaga	AGRO
5	Bank MNC	BABP
6	Bank BCA	BBCA
7	Bank Nusantara Parahyangan	BBNP
8	Bank Danamon	BDMN
9	Bank Pundi	BEKS
10	Bank QNB Kesawan	BKSW
11	Bank CIMB Niaga	BNGA
12	Bank Maybank	BNII
13	Bank Permata	BNLI
14	Bank Of India Indonesia	BSWD
15	Bank Victoria International	BVIC
16	Bank Artha Graha	INPC
17	Bank Mayapada	MAYA
18	Bank Mega	MEGA
19	Bank OCBC NISP	NISP
20	Bank Panin	PNBN

Table 2 describes all 20 bank sample on this paper.

NPL variable is a dependent variable in this research. It can be seen that NPL mean is 3.8% with lowest value is 0.17% and the highest is 51% for 10 years testing. This signifies that NPL value in Indonesia from q12005 - q42014 is likely to be below the 5% limit that spitulated by Bank Indonesia. For NPL, deviation standard was around 4,7% and mode 1%. Smallest NPL data are 0.17% in Bank Nusantara Parahyangan (BBNP) q4 2005, whereas the largest NPL number is owned by Bank Pundi (BEKS) in q3 2010. In BEKS, there is a plenty of large enough of NPL number. Besides in q3-2010, there is many time where NPL BEKS is above 5% as in the q2-2010, q1-2010, q4-2009, and many more.

PDB Variable or Growth Domestic Product (in Indonesian term) is a macroeconomic independent variable in this research. The variable contains the level of quarter PDB growth based on the previous quarter, with a constant price in 2000. In the descriptive test result, this variable has mean 1.5%. According to those data, we can say that in every quarter there's at least PDB enchanment amount 1.5%. The PDB deviation standard is around 2.2% and mode 1.7%. The highest PDB growth value is in q3-2010, while the lowest is in q4-2008.

The INFL variable or inflation level is a macroeconomic independent variable in this research. The variable is obtained from calculation of Consumer Price Index, which was issued by Statistic Central Agency. The variable also based on quarter. In the descriptive statistic, result is generated that the mean of this variable is 0.57% with minimum value 0.05% in q3-2005 and maximum value 3.3% in q4 - 2005. It could be said that the inflation level in Indonesia is tends to be stable. A deviation standard value in this variable is 0.54% and mode 0.8%.

BIRATE variable or Bank Indonesia (BI) reference interest rate is a macroeconomic independent variable in this research. A descriptive result for this variable, i.e. The mean values is 8.08% with minimum value 5.8% in q3-2013 and maximum 12.8% in q1-2006. The deviation standard in this variable is 1.7% and mode 7.5%. BI rate is a monetary policy instrument issued by BI. The increasing of BI rate in 2005 is caused by several fundamental factors.

The first bank-specific independent variable is BOPO. The mean value of this variable is 83.4% with minimum value 5% in Bank BCA (BBCA) in q1-2008 and Bank CIMB Niaga (BNGA) in q2-2005. The ratio maximum value is 231% in Bank Pundi (BEKS) q2-2010. The deviation standard value is 16.7% and mode 89%. If we see the largest BOPO ratio data, in q1-2008, an economic crisis definitely occured at some countries in Europe and America.

After that is SOLR or Solvency Ratio, which is a bank specific independent variable. This variable is ratio from distribution (equity/total asset). In this variable, seems like that the mean value is 10.9% with minumum value -12.1% in BEKS q2-2010 and maximum 28.1% in BEKS q3-2010. Besides, the deviation standard value is 3.58% and mode 10.9%.

ROE variable is the next bank-spesific independent variabel. In this variable, generated average data amounted 11.8% with minimum number -787.6% and maximum 85%, whereas the deviation standard value is 58.9% and its mode 12%. The minimum number derived from BEKS q2-2010 and maximum data from Bank BNI 46(BBNI) q2-2006.

SIZE variable or bank total asset regarding 20 tested samples generated an average data amounted 4.96%, the deviation standard data that includes in this variable is 6.44% and mode 14.8%. Minimum data are 0.1% which were possessed by BEKS in 2007, 2009, and 2010, as well Bank of India Indonesia (BSWD) in 2005-2012, while maximum data are in the 25.6% number.

5. Result discussion

Based on the calculation, this research passes all of classical assumption so that it can conclude that there are no multicollinearity, no autocorrelation, and pass Sargan test. On multicollinearity test, all models have VIF score below 10. On autocorrelation test, almost all models have significance on order 1 and 2, but there are some exceptions on order 1 in model 2 and 4, but its not a matter if there is a significance in order 1. On Sargan test, all models are valid.

Table below shows a result from all models.

Table 3. Result discussion

VARIABLES	MODEL BASELINE	MODEL 2	MODEL 3	MODEL 4	MODEL 5
ΔNPL_{it-1}	**-0.311*** **	**-0.805*** **	**-0.492*** **	0.0321	**-0.127*** **
	(0.000270)	**(0.000181)**	**(0.00799)**	(0.840)	**(0.00210)**
PDB_{t-1}	**0.0345** **	**0.128***	-0.00735	-0.0391	0.00985
	(0.0260)	**(0.0566)**	(0.866)	(0.332)	(0.479)
PDB_{t-2}	**-0.128*** **	-0.0345	-0.0628	**-0.109** **	**-0.133*** **
	(0.000224)	(0.452)	(0.128)	**(0.0210)**	**(0.000141)**
$\Delta Infl_{t-1}$	0.0368	0.139	-0.116	0.189	0.0999*
	(0.574)	(0.195)	(0.430)	(0.189)	(0.0581)
$\Delta Infl_{t-2}$	**-0.244*** **	-0.135	-0.0327	0.0431	**-0.161*** **
	(0.000192)	(0.256)	(0.890)	(0.820)	**(0.000600)**
$\Delta BIRATE_{t-1}$	0.256	0.105	-0.0768	-0.154	-0.00692
	(0.178)	(0.401)	(0.678)	(0.340)	(0.942)
$\Delta BIRATE_{t-2}$	0.0792	0.0693	-0.0893	0.0609	0.0683
	(0.119)	(0.534)	(0.654)	(0.589)	(0.103)
$BOPO_{it}$		0.0195			
		(0.301)			
$BOPO_{it-1}$		0.0299			
		(0.168)			
$BOPO_{it-2}$		-0.00527			
		(0.843)			
$BOPO_{it-3}$		0.0504			
		(0.208)			
$BOPO_{it-4}$		**0.120*** **			
		(0.00508)			
ROE_{it}			0.00603		
			(0.875)		
ROE_{it-1}			0.00426		
			(0.874)		
ROE_{it-2}			**0.0345** **		
			(0.0158)		
ROE_{it-3}			**0.0599*** **		
			(0)		
ROE_{it-4}			0.0135		
			(0.357)		
$SOLR_{it}$				0.186	
				(0.309)	
$SOLR_{it-1}$				0.0754	
				(0.870)	
$SOLR_{it-2}$				-0.111	
				(0.758)	
$SOLR_{it-3}$				0.0634	
				(0.824)	
$SOLR_{it-4}$				-0.339	
				(0.196)	
$SIZE_{it}$					0.550
					(0.587)
Constant	0.000441	-0.183**	-0.0145	0.0141	-0.0258
	(0.474)	(0.0237)	(0.133)	(0.883)	(0.605)
Sargan test	10.41	2.750	9.890	6.780	11.32
	[1.000]	[1.0000]	[1.0000]	[1.0000]	[1.0000]
AR (1)	-1.131	-0.0686	-0.675	-1.336	-1.641
	[0.2581]	[0.9453]	[0.4995]	[0.1815]	[0.1008]
AR (2)	-2.692	-2.947	-2.458	..	0.345
	[0.0071]	[0.0032]	[0.0140]	.	[0.7302]
Observations	740	720	720	720	740
Number of banks	20	20	20	20	20
AR (1)	-1.131	-0.0686	-0.675	-1.336	-1.641
AR (2)	-2.692	-2.947	-2.458	.	0.345

p-values reported in parentheses
p-values of Sargan test reported in brackets
*** p<0.01, ** p<0.05, * p<0.1

Variable PDB is the growth rate of PDB and gave a negative coefficient result on the 2nd quarter. This result is in a same direction with previous research by Abid et. al., (2014) in Tunisia. Because of that, we could say that PDB would have an influence to NPL. When the growth rate of PDB is increasing, on the next second period, NPL would be decreasing. PDB growth rate has a close relationship with economic growth rate in the country. When economic growth increases, people salary would be rising and decreased the probabilty of financial distress. When salary increases, people purchasing power is rising in the same direction. So that, loan would more easy to pay and NPL should be lower.

The change of inflation rate has a negative for the lag second quarter. So that, inflation rate has a negative impact on the next period. Although this significance has a different direction with Abid et. al. (2014) and Louzis et. al. (2012), but it meets the same direction with Shu (2012), Endut et. al. (2013), and Nkusu (2011). Based on Nkusu (2011) and Shu (2012), inflation could affect borrower's payment ability from many aspects, and the impact on NPL could be either positive or negative. On the positive side, higher inflation rate could make borrower's payment ability easier, because the real value of money is decreased or higher inflation relates on lower unemployment rate (philips curve). On the negative side, inflation could make borrower hard to pay the loan when their real income decreases, while their income is fixed, because real

income is calculated when adjusted to inflation. Because of inflation and NPL having two sided impact, if we see a case in Indonesia, borrower could be easier to pay it's loan, because basic salary in Indonesia increases with same direction to inflation and borrower's payment ability is fixed.

The last macroeconomic variable is BI rate. In this research, there is no significance for BI rate, although there is a positive coefficient on this variable. Rise of BI rate in this period wouldn't increase NPL in the next period. This result is different from previous research from Abid et. al. (2014), because they found interest rate having a positive implication on NPL. Nkusu (2011) said that interest rate would decrease borrower's payment ability, when interest rate is always changing. Lender could change interest rate to maintain their profit. This insignificant result is based on Febrianti and Ashar (2015). The result is that BI rate on the short term doesn't have relationship and significance for NPL. This is result different from other, because many of loan has a middle to long term period, so that BI rate would be significant for more than 4 years.

Operational expense to operational income ratio as known as BOPO variable in Indonesia shows positive coefficient and significance at the same quarter, but the assumption on journal shows that financial performance to NPL ratio usually shows its impact in the future, so the significance in previous quarter is observed. This study shows positive coefficient and significance at 1% on the lag fourth quarter. It means that the increased BOPO ratio in present will increase the NPL in the next 4 periods. This result is supported by Louzis et. al. (2012) and Abid et. al. (2014) who stated that when a bank is inefficient, it will increase NPL.

Variable ROE has a significantly positive impact on NPL. So we could say that if this quarter ROE is negative, in the next 2 or 3 quarters NPL will be positive. This finding is supported by procyclical-credit-policy theory (Rajan, 1994). This theory stated that there is a correlation between credit policy and demand condition. This theory stated that credit policy is not only affected by increasing bank revenue, but also short-term reputation that focuses on rational bank management. They can 'manipulate' current earning because of the liberal credit policy and loose credit policy, which can be defined as negative NPV extension of credit. On this matter, bank wants to convince consumer with their good profitability by increasing current earnings. Bank could use loan loss provision to increase it's current earnings.

From this research, there is no significance between solvency ratio and NPL. This finding is supported by Louzis et. al. (2012) in Greece. Based on case in Greece, there were only a few banks operating there, so the possibilities for manager to do a moral hazard could be diminished. Bank with low capitalization doesn't push it's manager to do an excessive risk taking, so we can't capture NPL score patterns on this variable.

Variable size has no significance for NPL. This result is supported by Louzis et. al. (2012) and Khemraj and Pasha (2009). From these two research, although they found the same coefficient, they didn't find the significance from size. From that point, they conclude the size assumed as proxy for diversification, but they couldn't describe diversification activities on banks. They assume before that bank with big size, their portfolio could be diversified into many sectors, so if one sector.

Conclusion

It can be concluded macroeconomic variables such as PDB and inflation rate are negative and significant for NPL, although there is no significance for BI rate. On specific-bank variable, previous NPL has a significantly negative impact on NPL, although BOPO and ROE have a significantly positive impact on NPL on banks listed in BEI 2005-2014. Besides, solvency ratio and size don't have any signifiance for NPL.

This research would give a suggestion for regulator to increase PDB and stabilize inflation rate. Loosened monetary policy with lower BI rate could make NPL better. Lower BI rate would stimulate investment better and decreasing borrower debt to bank.

Author would give a suggestion for bank to do a smart efficiency. On the lending policy, bank is suggested to use a tight credit policy to all the borrowers. When banks loosen their policy, it would decrease bank's bargaining power to borrower. Bank with low capitalization ratio must assure their manager to avoid an excessive risk taking. The relation of asset to NPL is not significant for the sample. And the last, bank with big asset must make a diversification policy for its asset portfolio. With all of these suggestions, hopefully, it would be easier for bank to manage its non-performing loan for the next period.

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