

The Effect of Domestic and International Macroeconomic Variables on Sectoral Non Performing Loan (NPL) in Indonesia

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Abstract: *The aim of this study was to measure and calculate macroeconomics variabel fluctuations that affects loan performance in Indonesia. Analyzing factors affecting the variable to improvise risk mitigation in credit process and minimize the occurrence of the credit risk. The method used to achieve the purpose of the research is descriptive subset of the statistics, and VAR/VECM models. This research based on the secondary macroeconomics and banking performance data provided by authorized regulator. Based on the results, banking sectors need to pay attention to the fluctuation of domestic and international macroeconomics data. This topics has been highlighted by several studies before which examine the relationship or measurement between macroeconomics and banking performance. However the author has not found studies that examine the domestic and regional/international factor in one model when assessing the impact on the movement of NPL.*

Keywords: banking, risk, VAR/VECM

1. Introduction

In general the economy is divided into two sectors namely the financial sector and the real sector. Financial sector according to monetarist is one sector that is considered to have an important role in an economy (Mishkin, 2009). Banking is an institution that has a dominant role in the financial sector especially in developing countries, access to

capital through dominant banking compared with non-banking sector. In the Financial Stability Review report conducted by Bank Indonesia (2015) shows 78.8% of the financial industry in Indonesia is dominated by the banking sector. The development of banking credit in Indonesia by sector of business field can be seen from the picture 1 below.

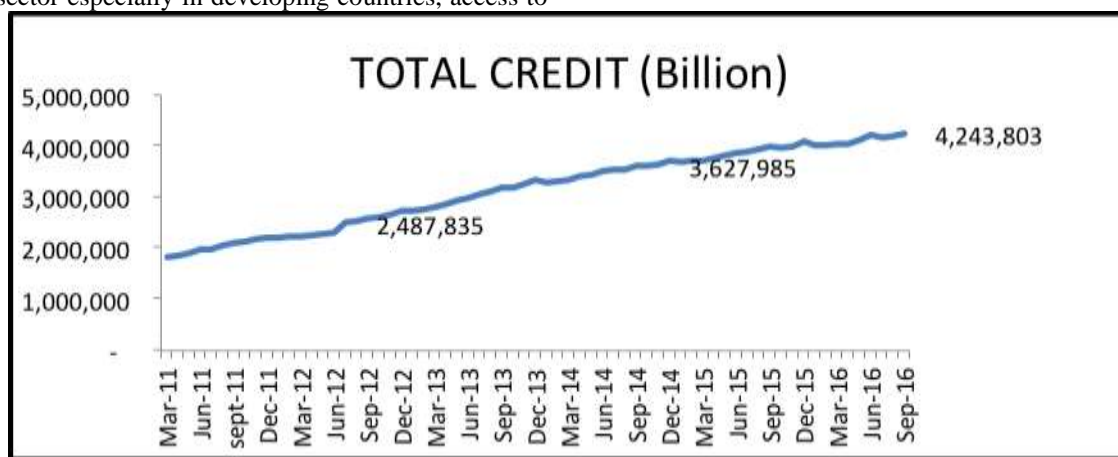


Figure 1: The movement of credit disbursed by sector of business field and not business field period 2011 - 2016

Source: Bank Central of Indonesia

Credit growth always increases every year. Figure 1 gives consequences to all parties in the banking system to always pay attention to the condition of credit quality level or Non Performing Loan (NPL). Good credit quality and channeled by banks ensure the banking system runs healthy and profitable, and can support the development of the national economy. Indonesia Financial Regulator PBI no. 13/24 / DPNP / 2011 concerning the measurement of bank risk through Risk Based Bank Rating (RBBR) states that the regulator of Bank Indonesia has regulated specifically the health indicators of banking. One of the indicators is the NPL and the method of calculation and classification of banking health criteria according to the current NPL

condition. This Regulatory Circular gives an important emphasis to the banks regarding the credit quality condition (NPL) which has become an important indicator and tool to determine the soundness of a bank in Indonesia's financial system

The development of Bank Indonesia's NPL condition based on credit disbursed and in accordance with the field of business in the period 2008-2016 can be seen through the second Figure below :



Figure 2: Movement of NPL based on business field in Indonesia during 2011-2016

Source: Bank Central of Indonesia

Figure 2 shows that banking credit NPLs have improved trend (2008-2012), then the trend has worsened after 2012. Although the NPL is still below the 5% threshold set by the OJK regulator (Financial Services Authority), this NPL condition has resulted the emergence of pressure on the financial system in Indonesia. In the report "Stability Analysis and Banking System" by LPS (2015) shows a unidirectional relationship between NPL conditions and Banking Stability Index. As banking NPLs deteriorated, the banking stability index rose. In the period of NPL increase (2008-2010) the index provides signal alerts that are in line with the subprime mortgage crisis that brings the banking crisis in Indonesia. Meanwhile, after 2012 the index provides alert signal with increasing NPL pressure. The

dominant condition of banks in the financial system in Indonesia causes the NPL to have a direct relationship with the Banking Stability Index. It is used by the central bank to measure the stability of the financial system as a whole. As NPLs increased, the index of the financial system increased (deteriorated) even in 2008 indicator has shown the financial system in crisis condition, as well as in 2012 the rise of NPL has put pressure on the improvement of financial system indicator. Here is the volatility of indicators of banking stability and financial system stability in accordance with figure 3 below:

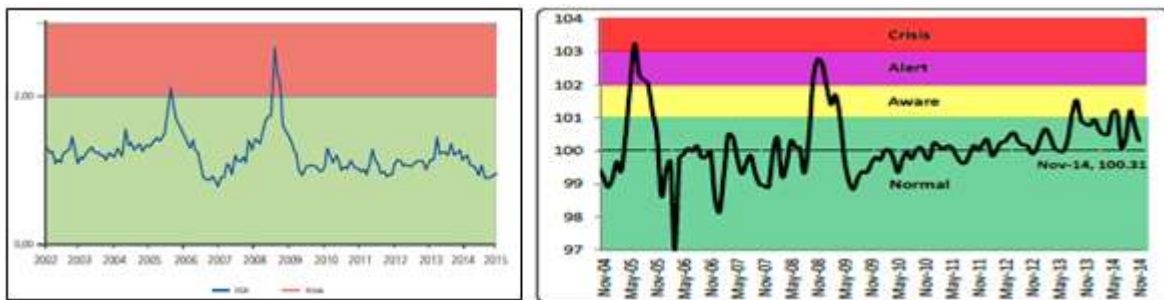


Figure 3: Volatilitas *Banking Stability Indeks* (left side) dan *Financial Stability Indeks* (right side) Indonesia
 Source : Financial Stability Review (BI) & Stability Analysis and Banking System (LPS)

Figures 2 and 3 can confirm the importance of Non Performing Loan (NPL) conditions for banks in Indonesia. This is due to the dominance of banking assets in the financial sector, so the quality of banking assets (NPL) will affect the soundness of banks, financial systems and determine the condition of the Indonesian economy.

In theory, NPL conditions can be caused by various factors. The most important factor is Repayment Capacity which is closely related to general economic conditions (macroeconomics). One illustration is the economic relationship with the level of banking performance in accordance with the 2009-2004 Indonesian Economic Outlook 2009 - 2014 edition report, prepared by Directorate of Economic Research and Monetary Policy (DKM) of Bank Indonesia. In the event of a 2008 financial crisis resulting from a default or subprime mortgage has caused pressure on the Indonesian economy through trade and financial channels. The crisis brought the effects of liquidity tightening and increased credit risk, one of the impact is in 2008 there was a drastic increase in NPLs in a very drastic.

In that year, the increase of NPL occurred in almost all of the main sectors of the business field that were targeted for credit distribution, namely; The major trade and retail sectors(NPL1); Manufacturing industry sector(NPL2); Agriculture, hunting and forestry sectors(NPL3); Construction sector(NPL4); Real estate sector(NPL5), leasing and corporate services(NPL6); Transportation, warehousing and communication sectors; Electricity, gas and water sector; And mining and quarrying sectors.

Measuring and knowing the relationship of movement between macroeconomic variables on movement of Non Performing Loan banking is very important to be understood especially for banking. It is useful in conducting analysis and mitigation to minimize the volatility impact of macroeconomic variables on the health of the banking and financial system through the management of a healthy credit portfolio. Based on the previous description, it is the background of the research to further calculate how the effects of the domestic macroeconomic 5 domestic variables namely IPXina, inflation rate (CPI), exchange rate (KURS),

trade balance (TRADE), Domestic interest rate (SBI) and and 3 regional macroeconomic variables ie Industrial Production Index of China (IPXchina), international interest rate (LIBOR), petroleum commodity price (OIL) to Non Performing Loan (NPL) movement. This study uses NPLs from 8 main sectors and total banking credit. The selection of 8 business sectors out of a total of 18 sectors is due to the dominant sectors and represents all credit sectors with a composition of 95%, so that the 8 sectors are expected to represent the movement of the entire credit sector based on business groupings. The scope of research with the object is the banking industry in Indonesia and the research period is the year 2008-2016. Selection of the time range is because the authors want to calculate the macroeconomic variables changes that occur in relatively mobile macroeconomic conditions, but not in extreme conditions of crisis. Understanding of these macroeconomic variables will provide direction for banks and interested parties to mitigate and anticipate what is needed in the face of every movement of economic variables.

2. Literatur Review

The theme of credit quality (NPL) is one of the topics that often get the attention of researchers in finance and banking. Babouček and Jancar (2005) conducted a study entitled "Effects of Macroeconomic Shocks to the Quality of the Aggregate Loan Portfolio" using the VAR model and using monthly data from February 1993 to November 2004 to determine the effect of Real Exchange Rate, the value of exports, imports, Aggregate bank loan to clients, unemployment rate, CPI (inflation), Domestic 3 Months Interest Rate, and Real Money M2, to NPL (Non Performing Loan). The results of this study conclude that some variables such as inflation is the dominant variable and has an effect on increasing the NPL ratio. Then a low interest rate with high inflation reduces the borrower's ability to pay off bank loans.

Subagio (2005) in his thesis entitled "Analysis of Factors Affecting the Occurrence of Non Performing Loans (NPLs) in Commercial Commercial Banks" analyzes the factors causing NPLs in commercial commercial banks by using multiple regression analysis. This study uses monthly secondary data from September 2000 to September 2004. The results show that simultaneously, each macro variable factor (exchange rate, inflation, GDP) and micro variable (CAR, KAP, LDR) have significant influence on the NPL at the level of significance Below 5%. Barajas et al. (2008) in his research entitled "Macroeconomic Fluctuations and Bank Behavior in Chile" using Vector Auto Regressions (VAR) analysis with quarterly data from 1989-2006 to see the effect of GDP and interest rates on various types of NPL, ROE and Capital Adequacy Ratio CAR) from commercial banks in Chile. The results of this study indicate that interest rates and GDP have a significant influence on the independent variables. Such as interest rate shocks increase ROE, NPL and CAR. While GDP has an effect on decreasing NPL and CAR. Zeman and Jurca (2008) in his research entitled Macro Testing of the Slovak Banking Sector using Vector Error Correction Model (VECM) using quarterly data from 1995 to 2006 to see the effect of all macroeconomic variables on (NPL). The result of the research shows that the most

influential macroeconomic variables in this research are GDP growth, interest rate and exchange rate. The real GDP variable and the rate of exchange rate of SKK / EUR have negative effect on the NPL level, while the nominal interest rate positively affects the NPL level.

Simon (2010) in his research entitled "Analysis of the Impact of Monetary Variable Shock on Non Performing Loan Ratio in Indonesia" attempted to analyze the impact of monetary variable shock on NPL ratio in Indonesia. Empirical studies show that there is a short-run relationship between BI rate, inflation, exchange rate, to NPL ratio. Granger causality test shows bidirectional causality between NPL and BI rate and BI rate and inflation. In addition, unidirectional causality also occurs between inflation and exchange rates against NPLs. Zakiyah Dwi Poetry and Yulizar D Sanrego (2011) conducted a study entitled "The Influence of Macro and Micro Variables Against Conventional Banking NPLs and NPF of Islamic Banking". The study was conducted to identify the effect of macro and micro economic variables on conventional bank NPLs and sharia bank NPF. The results show that in the long run all macroeconomic variables affect NPL and banking NPF. The research was conducted with VAR / VECM model with further analysis through Impulse Response Function (IRF) and Vector Error Decompositon (VECD). Setiawan Abadi (2014) conducted a research entitled "Sensitivity Analysis of Bank Indonesia Sectoral NPL on Macroeconomic Factors". Where in this study was conducted to measure the effect of Indonesia's main macroeconomic variables on the movement of banking NPLs in Indonesia. The use of the VAR / VECM model provides a good understanding of the movement of data variables and relationships among macroeconomic variables, with the condition of Indonesian banking NPLs.

Previous research has shown a relationship between various macroeconomic variables. Then in this study, more deeply will be measured about the relationship of macroeconomic variables that are domestic and macroeconomic that are international (regional) in influencing the movement of credit quality (NPL) banking in Indonesia. The data used are secondary data from January 2008-September 2016 period obtained from Indonesian Banking Survey (SPI) accessed through libraries and Bank Indonesia website, Economic and Financial Statistics (SEKI) accessible through libraries and Bank Indonesia website, International Financial Statistics (IFS) accessed through the International Monetary Fund (IMF) site, World Economic Statistics through Bloomberg portal, and Central Bureau of Statistics (BPS). NPL data used are NPL data in total and 8 main sectors based on business field, then macroeconomic data representing domestic macroeconomic and macroeconomic data representing regional / international condition. All data is monthly data and for quarterly data will be interpolated to get monthly data picture. To facilitate analysis and obtain more valid and consistent analysis results, all data are transformed in the form of natural logarithms.

3. Research Design

This research is a measurement of the effect domestic and international macroeconomic variables on NPL condition of total credit disbursed and NPL 8 sector based on business

field. The method approach is done with the VAR / VECM model. The VAR / VECM model results in forecasting of response impulses and variance decomposition. The response impulse of each variable is measured to determine the main variable that determines the NPL movement in Indonesian banking, as well as the response that occurs in the NPL when there is a change in each macroeconomic variable. Taking into account the research objectives, the observed data and the theoretical basis mentioned above, the following research thinking framework as in figure 4 as follows:

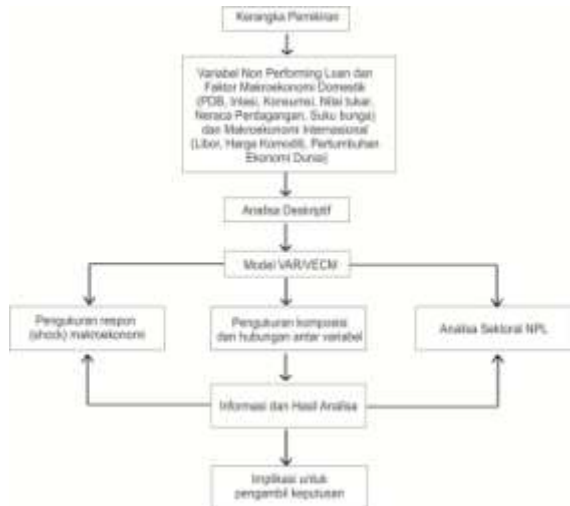


Figure 5: Research Design

VAR/VECM Model

In analyzing the effect of macro economy on NPL will be analyzed by using VAR (Vector Auto Regression) method. If there is a linear combination between the cointegrated non-stationary variables in the same order, the error correction model will be used as Vector Error Correction Model (VECM). This VAR model approach was introduced in 1980 by Christopher A Sims as an alternative to the usual structural econometrics model based on existing economic theory. VAR / VECM model is a non structural model and is atheistic, so by using this model the researcher is not bound by economic norms in general. According to McCoy (1997), the VAR model does not specify either an endogenous or exogenous variable, the VAR approach tries to let the data speak by making all variables potentially endogenous. In the VAR framework each variable, both in level and first difference, is treated symmetrically in the equation system containing the same regressor set. The general model of VAR in this study is as follows:

$$Y_{i,t} = A_{i0} + A_{i1}Y_{i,t-1} + A_{i2}Y_{i,t-2} + \dots + A_{ip}Y_{i,t-p} + \epsilon_{i,t}$$

Keterangan :

$Y_{i,t}$ = Vector from size endogen variable (nx1) are NPL and Macroeconomics

A_{i0} = Intersept size vector (nx1)

A_{ip} = Coefficient parameters size (nxn) from every sector i for every sector p

$\epsilon_{i,t}$ = error vector from i sector size (nx1)

The subsequent development of the VAR model was due to the stochastic trend in the ever-expanding economic variables, so that in 1981 Granger developed the concept of co-integration and correction of existing errors. The VECM

model was introduced by Johansen and Juselius (1990). The model provides a procedure that makes it easy to separate long-run components and short-run components from the data generation process. Thus VECM is different from VAR where VECM can be used to model time series data which is cointegration and not stationary, in other words VECM is development of VAR model which is terestriksi. In general, the VECM model in this study is as follows

$$\Delta Y_{i,t} = U_{i0} + U_{i1,t} + \eta_{i,t} Y_{i,t-1} + \sum_{k=1}^k \theta_{i,k} \Delta Y_{i,t-k} + \epsilon_{i,t}$$

Keterangan :

$\Delta Y_{i,t}$ = The vector of endogenous variable differentiation (nx1), ie NPL and macroeconomic variables

U_{i0} = The intercept vector of the i-sector model

$U_{i1,t}$ = The regression coefficient vector of the i sector model

t = time trend

$\eta_{i,t}$ = Variable where there is long term cointegration

$Y_{i,t-1}$ = Variable in level

$\theta_{i,k}$ = Cointegration coefficient matrix

k-1 = Order of VECM from VAR

$\epsilon_{i,t}$ = Vector error from sector i

The step modeling and selection of VAR / VECM model in this study through the process in accordance with the scheme in Figure 4 as follows:

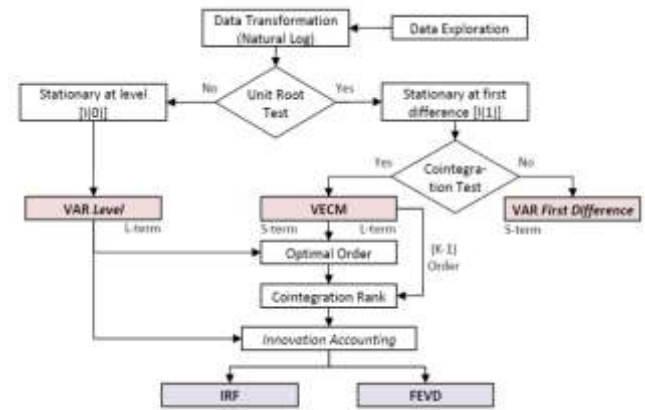


Figure 4: Step modeling VAR / VECM

VAR / VECM Model Analysis

1) Testing stages

a) Stationary test.

Dickey fuller test for stationarity, problem of autocorrelation usually arises. To tackle this problem developed a test called Augmented Dickey Fuller test (ADF)

The hypotheses to be tested are:

Ho: the variable has unit root

H1: the variable doesn't has unit root

Decision

If t statistics value is > ADF critical value we fail to reject Ho and otherwise

b) Cointegration test.

In many time series, integrated processes are considered together and they form equilibrium relationships. Although multivariate time series is integrated, certain linear transformations of the time series may be stationary.

c) Optimal lag length testing.

d) VAR stability test.

2) Estimation of VAR / VECM model

Estimation of the model using all the total NPL variables and NPL 8 sectors with all domestic and international macroeconomic variables. From the estimation will get the relationship between short-term and long-term variables.

3) Impulse Response Functions (IRF)

Tracking the current and future responses of each variable due to a change or shock of a particular variable ..

4) Forecast Error Decomposition of Variance (FEDVs)

Predicted contribution percentage of variance of each variable to change a certain variable. The method that can be done to see how the change in a variable indicated by the change of variance error is influenced by other variables.

4. Result

1) Stationary test

The stationary test results show almost all stationary variables on the first difference. The NPL variable either total or per sector has stationary on first difference. Exchange rate, inflation, birate, oil price, growth china and stationary GDP at first difference. While only the LIBOR and trade balance variables are stationary at the level. Table 1 shows the calculation results of stationary test tables:

Table 1: Stationary Test

No	Variabel	P-value		Information
		Level	1st Difference	
1	NPL1	0,1646	<0.001	Stasioner I(1)
2	NPL2	0.9850	<0.001	Stasioner I(1)
3	NPL3	0,3125	<0.001	Stasioner I(1)
4	NPL4	0.7187	<0.001	Stasioner I(1)
5	NPL5	0.0727	<0.001	Stasioner I(1)
6	NPL6	0,3303	<0.001	Stasioner I(1)
7	NPL7	0,5647	<0.001	Stasioner I(1)
8	NPL8	0,2822	<0.001	Stasioner I(1)
9	NPL Total	0.3935	<0.001	Stasioner I(1)
10	KURS	0,8106	<0.001	Stasioner I(1)
11	Inflasi	0,1344	<0.001	Stasioner I(1)
11	CPI	0.1344	<0.001	Stasioner I(1)
12	Birate	0,1208	0,0258	Stasioner I(1)
13	LIBOR	0.0087		Stasioner I(0)
14	OILPRICE	0,3228	<0.001	Stasioner I(1)
15	IPXCHINA	0,1084	<0.001	Stasioner I(1)
16	IPXINA	0.6312	<0.001	Stasioner I(1)
17	Trade Balance	<0.001		Stasioner I(0)

2) Optimal lag testing

The VECM estimate is very sensitive to the lag length of the data used. Lag length is used to determine the time required influence of each variable to the variable of his past. In this study, the determination of lag length is done by looking at the highest value of sequential modified AIC and SC test statistics. Table 2 shows the optimum lag test results:

Table 2: Optimum lag test results

Lag	NPL1		NPL2		NPL3		NPL4		NPL5		NPL6		NPL7		NPL8		NPL Total	
	AIC	SC	AIC	SC	AIC	SC	AIC	SC	AIC	SC	AIC	SC	AIC	SC	AIC	SC	AIC	SC
0	11.72552	11.96441	12.83126	13.07015	13.05064	13.28953	10.57216	10.81105	12.09699	12.33588	11.40689	11.64578	11.79541	12.03430	11.00915	11.24804	11.28978	11.52867
1	-9,457717	-7,06881	-6,997372	-4,608465	-7,18209	-4,793183	-8,914017	-6,52511	-6,990001	-4,601094	-8,057165	-5,668258	-7,27167	-4,882763	-8,352011	-5,963103	-8,335373	-5,946466
2	-11,6717	-7,132776*	-9,797383	-5,258460*	-10,09549	-5,556563*	-11,95598	-7,417055*	-9,685487	-5,146564*	-10,69934	-6,160412*	-9,928647	-5,389723*	-10,78775	-6,248822*	-11,02744	-6,488514*
3	-12,7714	-6,082464	-10,42505	-3,736108	-10,90693	-4,21799	-12,63447	-5,945526	-10,61476	-3,925821	-11,43664	-4,747698	-10,53257	-3,84363	-11,44768	-4,75874	-11,89248	-5,203539
4	-12,65334	-3,814385	-10,84293	-2,003977	-11,29213	-2,453175	-12,95552	-4,116566	-11,1134	-2,274449	-11,71585	-2,876898	-10,89708	-2,058129	-11,81887	-2,979913	-12,19944	-3,360482
5	-13,60735	-2,618375	-11,78773	-0,798758	-12,16173	-1,172761	-13,76927	-2,780301	-11,53393	-0,544961	-12,11557	-1,1266	-11,26371	-0,274736	-12,3498	-1,36083	-12,91328	-1,924309
6	-15,13497	-1,995984	-12,85658	0,282412	-13,49876	-0,359769	-15,02398	-1,884991	-13,18195	-0,042961	-13,22458	-0,085591	-12,64934	0,489645	-13,12511	0,013876	-14,49594	-1,356956
7	-18,05814	-2,769131	-15,35291	-0,063902	-15,76747	-0,478466	-17,12516	-1,836152	-15,74629	-0,457286	-15,29353	-0,004527	-15,25328	0,035724	-15,37891	-0,089909	-16,89581	-1,606806
8	-20,81787*	-3,378846	-18,40760*	-0,968583	-19,20733*	-1,768313	-20,83815*	-3,399123	-20,01726*	-2,578237	-17,89124*	-0,452219	-18,45436*	-1,01534	-17,88749*	-0,448469	-19,17607*	-1,737052

Based on optimum lag model test results with total NPL and all sectors, for NPL model 1 to NPL 8 and total NPL based on optimum AIC in lag 8 while based on optimum SC in lag 2.

3) VAR stability testing

Model stability testing is the next step before we use VECM estimates. Stability testing model, intended to test the validity of IRF and VDC. The VECM estimation stability test can be shown in table 3 as follows:

Table 3: VAR stability testing

Model	Modulus		Conclusion
	Min	Max	
NPL1	0,058521	0.966584	Stabil
NPL2	0.617451	0.962892	Stabil
NPL3	0.140707	0.841004	Stabil
NPL4	0.028707	0.553826	Stabil

Model	Modulus		Conclusion
	Min	Max	
NPL5	0.189867	0.594294	Stabil
NPL6	0.073301	0.819601	Stabil
NPL7	0.244860	0.998481	Stabil
NPL8	0.053133	0.995326	Stabil
NPLTotal	0.155531	0.442619	Stabil

Based on VAR stability test table for model NPL1 up to NPL 8 and NPL total yield minimum and maximum value of modulus less than 1, so it can be concluded that for VECM model to be used for analysis of IRF and FEVD stable.

4) Cointegration Testing

Cointegration testing to determine the relationship in the long term of each variable. The requirement in the VECM estimation, ie there is a cointegration relationship therein. If there is no cointegration relationship, the VECM estimate is

canceled, but must use VAR (Vector Autoregression) model. In this research, cointegration testing used Johansen's

Cointegration Test method and table 4 shows the results of cointegration testing as follows:

Table 4: Cointegration Testing

Hypothesized	NPL1		NPL2		NPL3		NPL4		NPL5		NPL6		NPL7		NPL8		NPLtotal	
	Trace Statistic	Prob.**	Trace Statistic	Prob.**	Trace Statistic	Prob.**	Trace Statistic	Prob.**	Trace Statistic	Prob.**	Trace Statistic	Prob.**	Trace Statistic	Prob.**	Trace Statistic	Prob.**	Trace Statistic	Prob.**
None *	522.96	0.00	382.79	0.00	423.50	0.00	387.00	0.00	405.69	0.00	398.15	0.00	351.54	0.00	380.18	0.00	408.02	0.00
At most 1 *	366.52	0.00	210.60	0.00	269.42	0.00	226.90	0.00	239.79	0.00	231.15	0.00	193.90	0.00	214.48	0.00	242.74	0.00
At most 2 *	274.06	0.00	129.94	0.03	168.49	0.00	148.22	0.00	161.71	0.00	167.81	0.00	142.63	0.00	150.79	0.00	168.96	0.00
At most 3 *	208.08	0.00	86.86	0.17	117.52	0.00	102.21	0.02	117.75	0.00	118.76	0.00	103.16	0.01	106.38	0.01	116.97	0.00
At most 4 *	146.98	0.00	57.02	0.34	77.50	0.01	68.34	0.07	77.38	0.01	79.72	0.01	71.18	0.04	75.14	0.02	82.26	0.00
At most 5 *	96.65	0.00	34.42	0.48	49.52	0.03	39.42	0.24	50.39	0.03	50.49	0.03	43.80	0.11	44.68	0.10	52.16	0.02
At most 6 *	61.46	0.00	16.64	0.67	24.80	0.17	22.53	0.27	28.32	0.07	27.20	0.10	24.49	0.18	25.13	0.16	28.27	0.07
At most 7 *	37.87	0.00	7.43	0.53	8.83	0.38	8.82	0.38	7.71	0.50	8.45	0.42	9.09	0.36	7.45	0.53	7.78	0.49
At most 8 *	18.59	0.02	0.00	0.98	0.47	0.49	1.21	0.27	0.24	0.62	0.00	1.00	0.01	0.91	0.00	0.98	0.00	0.97

Based on cointegration test it can be illustrated that for each model there is more than one cointegration at five percent real level. This rank number information will be used as an error correction model (ECM) model to be included in the VAR model to VECM.

5) VECM estimation results in the log run

The estimation result of long-term VECM model on domestic and international (regional) macroeconomic data as well as total and sectoral banking NPL in 2008-2016 period is shown by table 5 as follows:

Table 5: VECM estimation results

Variable		NPL1	NPL2	NPL3	NPL4	NPL5	NPL6	NPL7	NPL8	NPL total
BIRATE(-1)	coef	0.1310**	0.1790**	0.1900**	-0.0970**	-0.082	0.0790**	-0.0370*	0.0350**	0.0630**
	prob	0.000	0.011	0.000	0.000	0.148	0.000	0.064	0.021	0.001
CPI(-1)	coef	0.0020**	-0.0060*	0.0003	-0.0040**	-0.0080**	0.0003	-0.0040**	-0.001	-0.0030**
	prob	0.071	0.068	0.909	0.000	0.001	0.657	0.001	0.266	0.021
IPXCHINA(-1)	coef	-0.0350**	-0.0230**	-0.0280**	0.0130**	0.001	-0.0120**	0.0220**	0.003	-0.0050**
	prob	0.000	0.038	0.006	0.000	0.918	0.003	0.000	0.398	0.000
IPXINA1(-1)	coef	-0.0170**	-0.0700**	-0.0110**	0.0280**	0.0590**	0.0030*	0.0230**	0.0040**	0.0050**
	prob	0.000	0.000	0.012	0.000	0.000	0.074	0.000	0.009	0.026
KURS(-1)	coef	-0.6110**	-2.7460**	-2.1340**	0.9330**	1.4700**	-0.5380**	-0.2820*	0.017	-0.5640**
	prob	0.000	0.000	0.000	0.000	0.005	0.000	0.071	0.882	0.000
LIBOR(-1)	coef	0.1010**	0.5040**	0.1390**	-0.1050**	-0.1910**	-0.006	0.0600**	0.0380**	0.0730**
	prob	0.000	0.000	0.002	0.000	0.000	0.726	0.008	0.026	0.001
OILPRICE(-1)	coef	-0.027	-0.2440**	-0.5030**	-0.018	-0.061	-0.0620*	-0.3200**	-0.0730**	-0.1780**
	prob	0.474	0.004	0.000	0.454	0.395	0.060	0.000	0.023	0.000
TRADE(-1)	coef	-0.0070**	0.0300**	-0.0360**	-0.0200**	-0.0410**	-0.0120**	-0.0360**	-0.0100**	-0.0180**
	prob	0.067	0.005	0.000	0.000	0.000	0.000	0.000	0.002	0.000
C		10.842	34.24	25.637	-11.033	-15.986	5.912	0.568	-0.337	6.462

Description: *) significant at the real level of 10% **) significant at the real level of 5%

Based on the results in the table of long-run model can be explained the effect of the movement of each macroeconomic variables both in Indonesia and abroad against the movement of NPL. Here is an explanation based on the results in the long-term VECM model table.

A. The effect of Interest Rate (BIRATE) variable on NPL in the log term

Movement of domestic interest rate variable (BIRATE) significantly influence with positive influence (meaning 1% increase of BIRATE variable will cause increase of NPL equal to coefficient value respectively) to NPL according to detail table 6 as follows:

Table 6: Positive effects of BIRATE

SECTOR	DESCRIPTION	COEFFICIENT
NPL 2	Mining	0.179
NPL 1	Agriculture, hunting and agricultural	0.131
NPL 3	Manufacturing	0.19
NPL 6	Trade	0.079
NPL 8	Business Services	0.035
NPL TOTAL	Total sector	0.063

The calculation results show for 5 sectors as well as the total NPL has movement behavior in line with the theory, in general at the time of the increase in interest rates led to an increase in operational costs. So that will affect the decline in the ability to pay for credit disbursed and lead to an increase risk of credit default. This is supported by the amount of loan composition distributed to the 5 sectors, especially for sector 6 and sector 3 which has a composition of almost 50% of the total banking credit. The effect of BIRATE change also based on the model calculation is significantly negative (meaning 1% increase of BIRATE variable will cause the NPL decrease by its coefficient value respectively) to NPL as follows:

Table 7: Negative effects of BI RATE

SECTOR	DESCRIPTION	COEFFICIENT
NPL 4	Water, gas and electricity	-0.097
NPL 7	Transport, cargo storage and communication	-0.037

For sector 4 (electricity, gas, and water) and sector 7 (transportation, warehousing and communication) the calculation shows the relationship of domestic interest rate

has a negative relationship. Sector 4 (electricity, gas, and water) is a sector related to energy. Sector 7 (transportation, warehousing and communication) is also one of the sectors in the category of infrastructure that supports the smoothness of the economy. This is in line with the increase in infrastructure spending in the APBN posture in accordance with the Macroeconomic Framework and the Fiscal Policy Principal (KEM-PPKF) 2018 compiled by the Ministry of Finance. Targeted infrastructure targets such as toll road development with 2019 target of 1000 KM (cumulative), development with 2016 target as many as 306 ports and other infrastructure have started to bring improvements in the logical and communications path. Infrastructure improvements have a dominant impact on credit performance and quality in sector 7 compared to domestic interest rates. As for sector 5 (construction) shows the effect of BIRATE is not very significant (significant at prob rate 15%) and has coefficient value -0.082 and absolute value prob 0.148. Indicating in the current period where infrastructure has high growth targets, interest rates do not become a thing that affects the quality of loans disbursed.

B. Effect of CPI in the long run

The movement of the domestic price level with the variables used is the Consumer Price Index (CPI) affects significantly with positive influence only on the sector of NPL 1 (Agriculture, hunting and agricultural) with coefficient value is 0.002. As for the influence of price level variables Domestic / Consumer Price Index (CPI) which significantly and has a negative effect that occurs in the NPL sector as follows:

Table 8: Negative effects of CPI

SECTOR	DESCRIPTION	COEFFICIENT
NPL 5	Construction	-0.008
NPL 2	Mining	-0.006
NPL 4	Water, gas and electricity	-0.004
NPL 7	Transport, cargo storage and communication	-0.004
NPL TOTAL	Total Sector	-0.003

Table 8: Negative effects of KURS

SECTOR	DESCRIPTION	COEFFICIENT
NPL 2	Mining	-2.746
NPL 3	Manufacturing	-2.134
NPL 1	Agriculture, hunting and agricultural	-0.611
NPL TOTAL	Total Sector	-0.564
NPL 6	Trade	-0.538
NPL 7	Transport, cargo storage and communication	-0.282

For the above NPL sectors have a negative effect on the exchange rate, the weakening of the rupiah exchange rate relative to the USD causes the sectors that have sales orientation in foreign currency to experience profits thus strengthening the ability to pay credit. For example, the mining industry that has overseas sales can benefit from the increase of the USD exchange rate against the Rupiah. As for the NPL sector 8 (Real estate, rental business, and Business Services), the movement in KURS variables does not significantly affect NPL 8 compared to other sectoral NPLs.

A well-maintained inflation rate has a good impact on the economy, whereas inflation in extreme levels of both hyperinflation and deflation at high levels brings damaging consequences for the economy. Data from Bank Indonesia show that Indonesia's inflation rate in the last 7 years is stable below the 5% level with high deviation in 2013 and 2014 from 5% as the impact of the world economy. This condition indicates that the existing inflation rate can be categorized as controlled inflation and needed to move the economy. Then based on the calculations performed, the influence of pegraakan CPI has no significant effect on the sector NPL 3 (Manufacturing industry), NPL 6 (Trade and retail), and NPL 8 (Real estate, rental business, and Business Services (Business Services)).

C. Effect of KURS in the long run

Movement of USD / USD exchange rate variable (KURS) influences significantly with positive influence on NPL sector movement follows:

Table 8: Positive effects of KURS

SECTOR	DESCRIPTION	COEFFICIENT
NPL 5	Construction	1.47
NPL 4	Water, gas and electricity	0.933

The calculation results are in accordance with current conditions, where in almost all construction activities that become national projects have a low level of Domestic Components. For heavy equipment use and about 70% of materials are filled with imports and so are building materials and construction of about 55% also rely on imports. High import components cause cost components to be very sensitive to exchange rate movements. The movement of KURS variables also has a negative and significant influence on the NPL sector as follows:

D. Effect of IPX INA in the long run

The effect of changes in domestic production variables in which the variables used are domestic Industrial Production Index INA has a significant influence on all sectoral and total NPLs. The effect of IPX INA changes that have a positive relationship to the NPL sector as follows:

Table 9: Positive effects of IPXINA

SECTOR	DESCRIPTION	COEFFICIENT
NPL TOTAL	Total Sector	0.005
NPL 3	Construction	0.059
NPL 4	Water, gas and electricity	0.028
NPL 7	Transport, cargo storage and communication	0.023
NPL 8	Business Services	0.004
NPL 6	Trade	0.003

Then the influence of IPX INA variable change also significantly negatively affect the NPL sector as follows:

Table 10: Negative effects of IPXINA

SEKTOR	KETERANGAN	KOEFSIEN
NPL 1	Agriculture, hunting and agricultural	-0.017
NPL 3	Manufacturing	-0.011
NPL 2	Mining	-0.07

The effect of changes in formal sector production on sectoral NPL conditions generally has a positive and negative response. Based on the calculation for the agricultural processing sector that has a direct impact of the increase in production will bring improvement in purchasing power so that it has an improvement response to the NPL level. As for other sectors although there is a positive relationship especially on the property sector and trade, but the coefficient value has a very low level of influence indicates NPL in the sector is not solely influenced by the level of formal production

D. Effect of TRADE in the long run

The effect of change of domestic trade balance (TRADE) variable to NPL movement significantly and positively happened in NPL 2 sector (Mining) with coefficient value of 0.03. The structure of foreign trade (exports) of Indonesia which is still dominated by the primary sector and commodities is highly dependent on the level of world commodity prices. The dominant factor affecting the mining sector is the price of the world commodity which currently has improved although it is generally still below the ideal price. This causes the mining sector's NPLs and excavations to remain in high condition as a result of the decline in world commodity prices.

The influence of changes in domestic trade balance (TRADE) variable to the movement of NPL sector significantly and has a negative relationship as follows:

Table 11: Negative effects of TRADE

SECTOR	DESCRIPTION	COEFFICIENT
NPL 3	Construction	-0.041
NPL 3	Manufacturing	-0.036
NPL 7	Transport, cargo storage and communication	-0.036
NPL 4	Water, gas and electricity	-0.02
NPL TOTAL	Total Sector	-0.018
NPL 6	Trade	-0.012
NPL 8	Business Services	-0.01
NPL 1	Agriculture, hunting and agricultural	-0.007

From the above calculation, the positive change of trade balance to sectoral in Indonesia brings NPL improvement. Based on their relationship with the business pattern of each sector although not all sectors have a direct correlation in performance with the condition of trade balance, such as electricity and infrastructure sector. For the agricultural trade

sector, the trade balance response to NPL performance channeled to the sector can have a negative effect on the NPL. Based on data of export growth according to HS 6 Digit period 2012-2016 shows the largest growth of export value in the palm oil industry and its derivatives in the mei y.o.y position which increased 40% to 5,593 (million USD) and brought improvement to NPL of agricultural sector especially palm oil industry.

E. Effect of IPX CHINA in the long run

The influence of movement of foreign economy represented by China's production movement (IPX CHINA) has an effect on NPL movement significantly and positively to sector NPL 7 (Transport, cargo storage and communication) with coefficient value 0,022 and sector of NPL 4 (Electricity, gas and water (Water, gas and electricity)) with coefficient value of 0.013.

The influence of IPX CHINA also significantly and negatively affect the NPL sector to NPL sector as follows:

Table 12: Negative Effects of IPX CHINA

SECTOR	DESCRIPTION	COEFFICIENT
NPL 1	Agriculture, hunting and agricultural	-0.035
NPL 3	Manufacturing	-0.028
NPL 2	Mining	-0.023
NPL 6	Trade	-0.012
NPL TOTAL	Total Sector	-0.005

China's economic growth response as an Indonesian trading partner brings the impact of improvement on the NPL of the industry sector related to foreign trade especially to China. The mining sector as one of the sectors that has export destinations to China and India is dominant (based on export data of coal by destination, BPS) compared to other countries has good industrial performance and depends on economic conditions in export destination countries. So that when China has a good economy will cause improvement to the NPL mining sector.

As for the NPL sector 5 (Construction) and NPL 8 (Real estate, leasing business, and Business Services), IPX CHINA does not significantly affect the NPL conditions in those two sectors given the construction and real estate sectors directly Unaffected by conditions of demand from other countries.

F. Effect of LIBOR in the long run

The movement of international interest rates using LIBOR variables significantly and positively occurred in the NPL sector as follows:

Table 13: Positive effects of LIBOR

SECTOR	DESCRIPTION	COEFFICIENT
NPL 2	Mining	0.504
NPL 3	Manufacturing	0.139
NPL 1	Agriculture, hunting and agricultural	0.101
NPL TOTAL	Total Sector	0.073
NPL 7	Transport, cargo storage and communication	0.06
NPL 8	Business Services	0.038

The results show for the NPL sector in the table along with the total NPL in general in line with general rules. Increased cost of funds leads to decreased ability to pay and increase credit risk. The influence of LIBOR movement significantly and has a negative direction occurs in sector NPL 5 (Construction) with coefficient value -0.191, and sector NPL 4 (Electricity, gas and water (Water, gas and electricity)) with coefficient value - 0.105. For NPL sector 6 (Large trading and retail) LIBOR movement does not significantly affect NPL movement. For construction and electricity, gas, and water, international interest rate increases do not lead to an increase in NPLs. This happens because infrastructure projects are currently being the focus of the government and require substantial budgets and financing. In the ministry's finance ministry report on fiscal 2017 issues, infrastructure budgets during 2014-2017 increased 117.7% to Rp. 387.7 trillion as compensation for the subsidy reduction of 77.9% over the same time frame. These large financing opportunities result in domestic and international financing rates at reasonable levels are insensitive in influencing the condition of NPLs in infrastructure-based sectors.

F. Effect of OIL PRICE in the long run

The effect of world commodity price variable with the variable used is OIL PRICE has no positive effect on sectoral NPL movement or totally. The effect of OIL PRICE variable movement significantly affects the NPL is negatively indicated as follows:

Table 13: Negative effects of OILPRICE

SECTOR	DESCRIPTION	COEFFICIENT
NPL 3	Manufacturing	-0.503
NPL 7	Transport, cargo storage and communication	-0.32
NPL 2	Mining	-0.244
NPL TOTAL	Total Sector	-0.178
NPL 8	Business Services	-0.073
NPL 6	Trade	-0.062

The results of the calculation are in line with the conditions in Indonesia, where as the oil producer and as the net importer for oil and gas sector (NPL sector 2), with the increase of world oil price causes the increase of revenue and repayment capacity to decrease the NPL. For other sectors the world oil price hike in principle raises the cost component, but the calculation results show for sectors that have a link with production such as manufacturing turns out that the increase of response does not cause the NPLs deterioration. This can happen because the price of industrial fuel has been regulated by the government, so the industry does not buy fuel from the market in general. Then the calculation results show that the movement of OIL PRICE variable although causing negative movement but not significantly resulted in movement of NPL sector variables for sector 1 agriculture, hunting and forestry, then sector 4 electricity, gas and water, and sector 5 construction

6. Impulse Response Function Analysis (IRF)

a) IRF NPL 1 (Agriculture, hunting and agricultural)

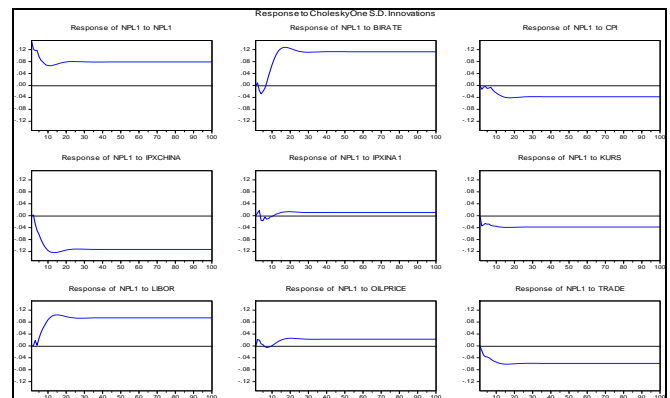


Figure 5: IRF NPL 1

IRF for agricultural, hunting and forestry sector NPLs shows the following results:

- a) Domestic macroeconomic variables that provide the greatest response to NPL sector 1 are BIRATE variables where there is a high NPL of sector 1 jump compared to other domestic macro variables. As for international macroeconomic variables (regional) the biggest response that affect the NPL sector 1 is IPXCHINA.
- b) Domestic macroeconomic variables BIRATE and CPI as well as international macroeconomics IPXCHINA provide a strong turbulent effect on NPL sector 1 is shown by the length of time period of about 20-30 months required NPL to be stable compared to other variables

b) IRF NPL 2 (Mining)

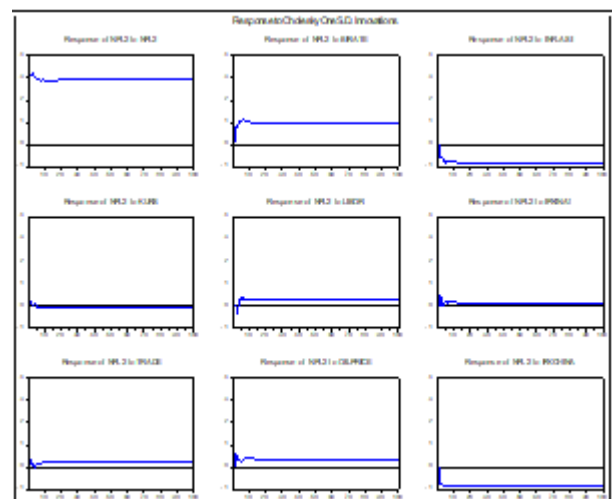


Figure 6: IRF NPL 2

IRF for NPL mining and quarrying sector shows the following calculation results:

- a) Domestic macroeconomic variables that provide the greatest response to NPL sector 2 are BIRATE and CPI variables where there is a high NPL of sector 2 jump compared to other domestic macro variables. As for international macroeconomic variables (regional) the

biggest response that affect the NPL sector 2 is IPXCHINA.

- b) Domestic macroeconomic variables CPI and IPX INA and international macroeconomics IPXCHINA and OILPRICE have a strong fluctuating effect on sector NPL 2 shown by the time period of about 10-20 months NPL required to be stable compared to other variables

c) IRF NPL 3 (Manufacturing)

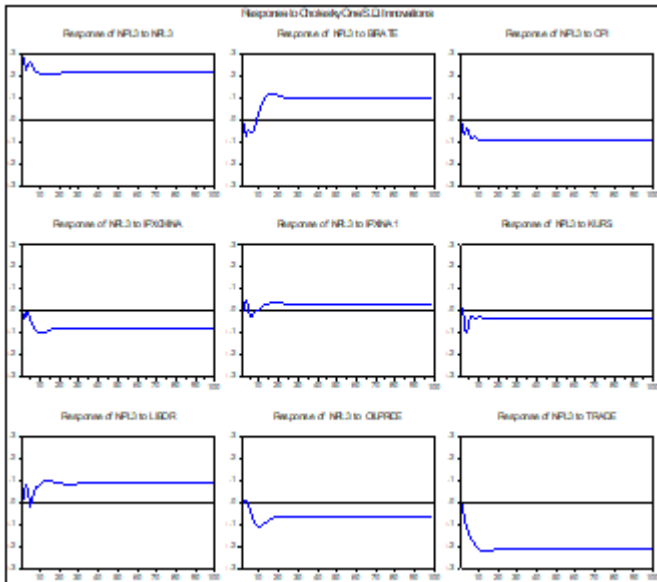


Figure 7: IRF NPL 3

IRF for NPL of processing sector shows the following calculation result:

- a) Domestic macroeconomic variables that provide the greatest response to NPL sector 3 are BIRATE and CPI variables where there is a high NPL of sector 3 jump compared to other domestic macro variables. As for international macroeconomic variables (regional) the biggest response that affect the NPL sector 2 is IPXCHINA.
- b) Domestic macroeconomic variables CPI and IPX INA and international macroeconomics IPXCHINA and OILPRICE have a strong turbulent effect on sector 3 NPLs shown by the length of time period.

d) IRF NPL 4 (Water, gas and electricity)

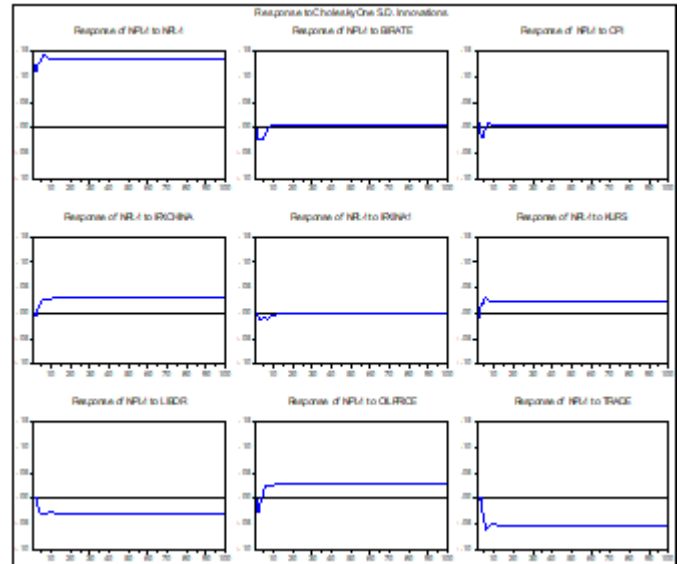


Figure 8: IRF NPL 4

IRF for NPL of electricity, gas, and water sector shows the following calculation result:

- a) Domestic macroeconomic variables that provide the greatest response to sector 4 NPLs are TRADE and KURS variables where there is a high NPL of sector 4 jump compared to other domestic macro variables. As for the international macroeconomic variables (regional) the response of the three variables have a similar response effect.
- b) Domestic macroeconomic variables TRADE as well as international macroeconomics OILPRICE gives a strong turbulent effect on sector 4 NPL shown by the time period of about 10-15 months required NPL to be stable compared to other variables.

e) IRF NPL 5 (Construction)

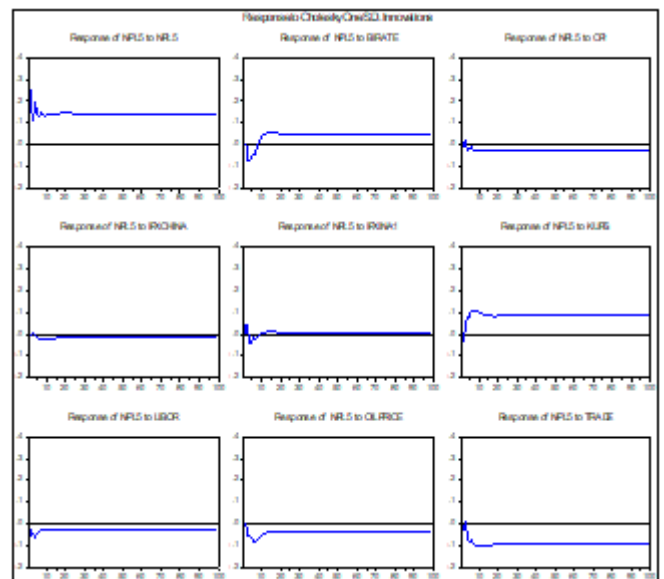


Figure 9: IRF NPL 5

IRF for construction sector NPL shows the following calculation result:

- a) Domestic macroeconomic variables that provide the greatest response to NPL sector 5 are TRADE and KURS

and BIRATE variables where there is a high NPL of sector 5 jump compared to other domestic macro variables. As for international macroeconomic variables (regional) that is OILPRICE variable.

- b) Domestic macroeconomic variables TRADE and BIRATE and international macroeconomics LIBOR and OILPRICE have a strong turbulent effect on sector NPL 5 shown by the time period of about 10-15 months required NPL to be stable compared to other variables.

f) IRF NPL 6 (Trade)

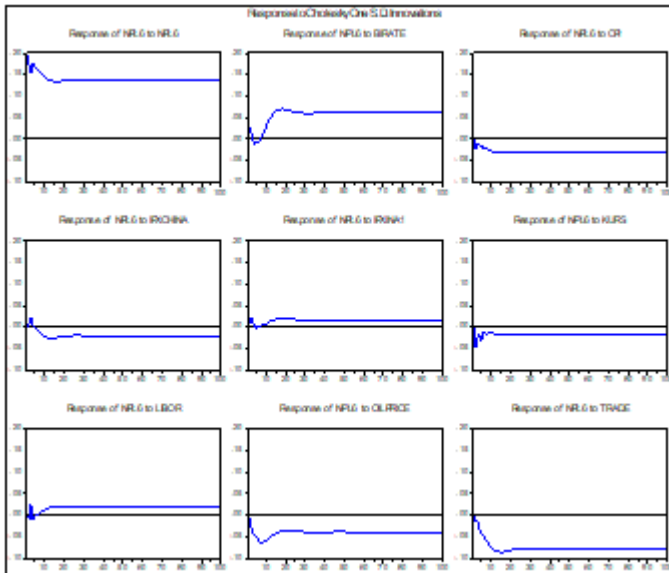


Figure 10: IRF NPL 6

IRF for NPL of large and retail trade sector shows the following calculation result:

- a) Domestic macroeconomic variables that provide the greatest response to sector 6 NPL are TRADE and CPI and BIRATE variables where there is a 6% increase in NPL of sector 6 compared to other domestic macro variables. As for international macroeconomic variables (regional) that is OILPRICE variable.
- b) Domestic macroeconomic variables IPX, CPI and BIRATE as well as international macroeconomics LIBOR and IPXCHINA provide a strong fluctuation effect on sector 6 NPL shown by the time period of about 10-15 months required NPL to be stable compared to other variables.

g) IRF NPL 7 (Transport, cargo storage and communication)

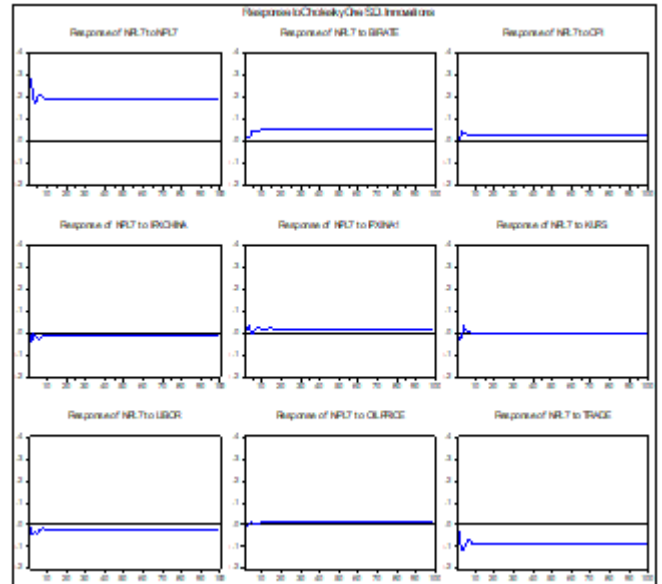
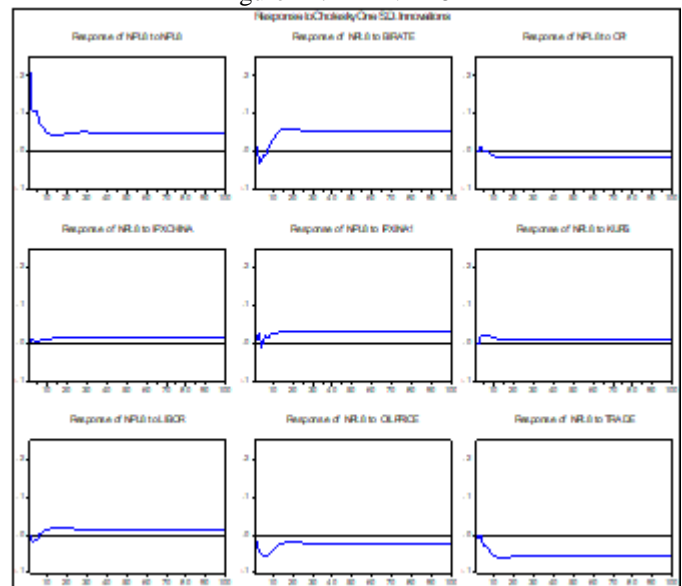


Figure 11: IRF NPL 7

IRF for NPL of the transporting, warehousing and communications sector shows the following calculation results:

- a) Domestic macroeconomic variables that provide the greatest response to sector 7 NPLs are TRADE variables in which there is a shift in the high NPL of sector 7 compared to other domestic macro variables. As for the international macroeconomic variables (regional) ie LIBOR and IPXCHINA variables.
- b) Domestic and international macroeconomic variables TRADE and international macroeconomics OILPRICE and IPXCHINA provide a strong fluctuation effect on sector 7 NPL shown by the time period of about 5-10 months required NPL to be stable compared to other variables.

a. IRF NPL 8 (Business Services)
 Figure 12. IRF NPL 8



IRF for NPL real estate sector, leasing business, and Business services show the following calculation result:

- a) Domestic macroeconomic variables that provide the greatest response to NPL sector 8 are BIRATE, IPXINA,

TRADE variables where there is a high NPL of sector 8 jump compared to other domestic macro variables. As for international macroeconomic variables (regional) that is OILPRICE variable.

b) Domestic macroeconomic variables BIRATE, IPX, TRADE and international macroeconomics LIBOR and OILPRICE have a strong turbulent effect on NPL sector 8 shown by the length of time period.

7. Forecasting Error Variance Decomposition (FEVD) Analysis

a) FEVD NPL 1 (Agriculture, hunting and agricultural)

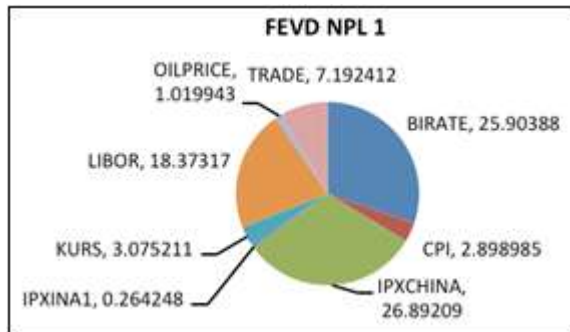


Figure 11: FEVD NPL 1

b) FEVD NPL 2 (Mining)

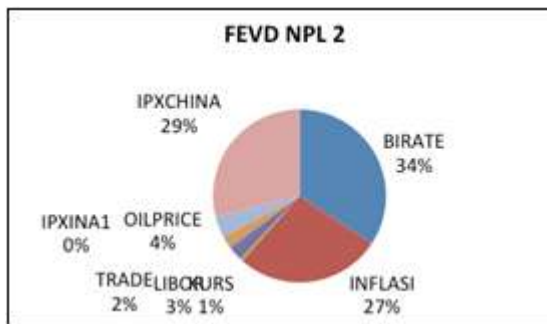


Figure 12: FEVD NPL 2

c) FEVD NPL 3 (Konstruksi (Construction))

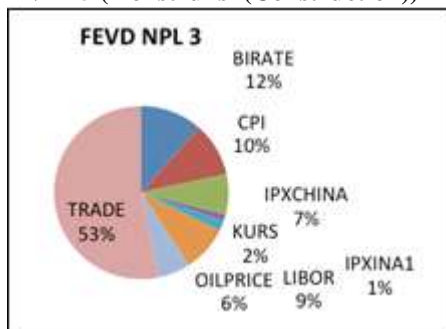


Figure 13: FEVD NPL 3

d) FEVD NPL 4 Listrik, gas dan air (Water, gas and electricity)

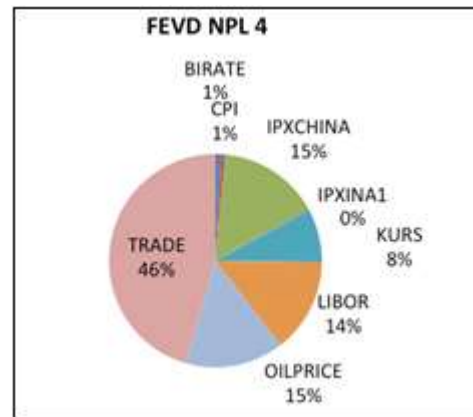


Figure 14: FEVD NPL 4

e) FEVD NPL 5 (Konstruksi (Construction))

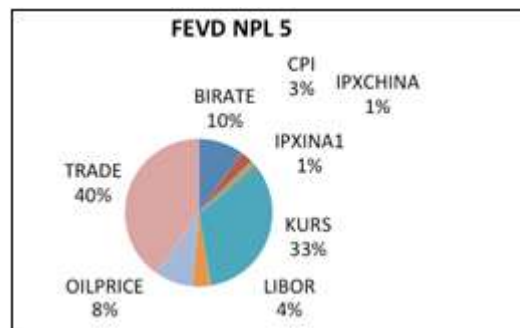


Figure 14: FEVD NPL 5

f) FEVD NPL 6 (Perdagangan besar dan eceran (Trade))

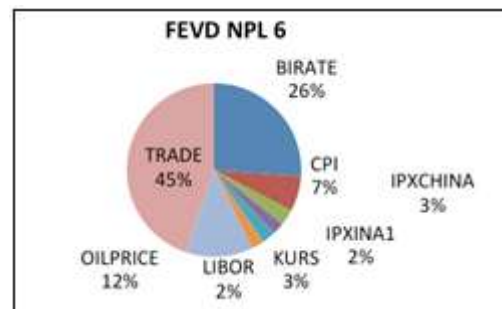


Figure 15: FEVD NPL 6

g) FEVD NPL 7 (Transport, cargo storage and communication)

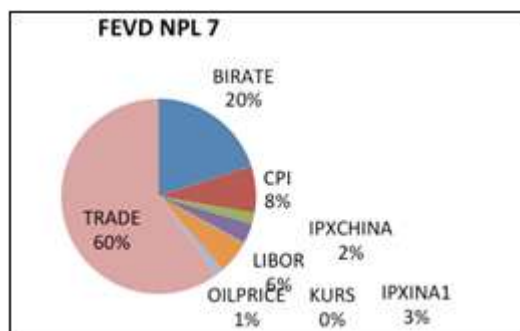


Figure 16: FEVD NPL 7

h) FEVD NPL 8 (Business Services)

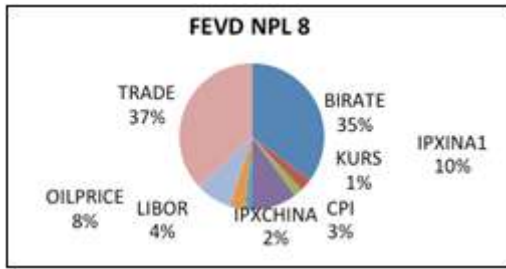


Figure 17: FEVD NPL 8

i) FEVD NPL TOTAL

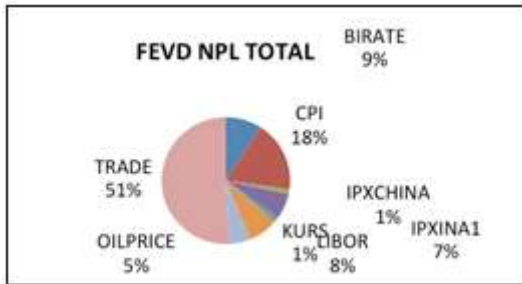


Figure 18: FEVD NPL TOTAL

From the analysis of Forecasting Error Variance Decomposition (FEVD), for NPL sector 1 up to NPL sector 8 and NPL Total is known to be the strongest factor affecting NPL as follows:

- 1) Total NPLs (agriculture, hunting and forestry) are strongly influenced by domestic macroeconomic variables TRADE and BIRATE, as well as international macroeconomic variables LIBOR
- 2) NPL sector 1 (agriculture, hunting and forestry) is strongly influenced by domestic macroeconomic

- variables BIRATE and TRADE, as well as international macroeconomic variables IPX CHINA
- 3) NPL sector 2 (mining and quarrying) is strongly influenced by domestic macroeconomic variables BIRATE and INFLATION, as well as international macroeconomic variables IPX CHINA
- 4) NPL sector 3 (construction) is strongly influenced by domestic macroeconomic variables TRADE and BIRATE, as well as international macroeconomic variables LIBOR
- 5) NPL sector 4 (electricity, water and gas) is strongly influenced by domestic macroeconomic variables TRADE and KURS, as well as international macroeconomic variables IPX CHINA and OIL PRICE
- 6) NPL sector 5 (construction) is strongly influenced by domestic macroeconomic variables TRADE and KURS, as well as international macroeconomic variables OIL PRICE
- 7) NPL sector 6 (large trading and retail) is strongly influenced by domestic macroeconomic variables BIRATE and TRADE, as well as international macroeconomic variables IPX CHINA
- 8) NPL sector 7 (transport, warehousing and communication) is strongly influenced by domestic macroeconomic variables BIRATE and TRADE, as well as international macroeconomic variables LIBOR
- 9) NPL sector 8 (real estate, rental business and business services) is strongly influenced by domestic macroeconomic variables BIRATE and TRADE, as well as international macroeconomic variables IPX CHINA

Conclusion

Impulse Response Function Analysis Resume

Table 14: Impulse Response Function Analysis Resume

Sektor Ekonomi	BIRATE	CPI	INFLASI	KURS	LIBOR	IPXINA	TRADE	OILPRICE	IPX CHINA
NPL1	↑(*)	↓(*)	↑(√*)	↓(*)	↑(*)	↑(*)	↓(*)	↑(*)	↓(*)
NPL2	↑(*)	↑(*)	↓(*)	↑(*)	↑(*)	↑(*)	↑(*)	↑(*)	↓(*)
NPL3	↑(*)	↓(*)	↑(*)	↓(*)	↑(*)	↑(*)	↓(√*)	↓(*)	↓(*)
NPL4	↑(*)	↑(*)	↑(*)	↑(*)	↓(*)	↓(*)	↓(√*)	↑(*)	↑(*)
NPL5	↑(*)	↓(*)	↑(*)	↑(*)	↓(*)	↑(*)	↓(√*)	↓(*)	↓(*)
NPL6	↑(*)	↓(*)	↑(*)	↓(*)	↑(*)	↑(*)	↓(√*)	↓(*)	↓(*)
NPL7	↑(*)	↑(*)	↑(*)	↓(*)	↓(*)	↑(*)	↓(√*)	↑(*)	↓(*)
NPL8	↑(*)	↓(*)	↑(*)	↑(*)	↑(*)	↑(*)	↓(√*)	↓(*)	↑(*)
NPLTotal	↑(*)	↓(*)	↑(*)	↓(*)	↑(*)		↓(√*)	↓(*)	↓(*)

Source : data calculation

Information:

- ↑ : has a positive change response
- ↓ : have a negative change response
- √ : sensitive in absolute (response > 0.3%).
- * : Approaching sensitive, with response in the range 0.10 to 0.3.

√* : most responsive to macroeconomic changes

Forecasting Error Variance Decomposition (FEVD) Analysis Resume

Table 15: FEVD Analysis Resume

Sektor Ekonomi	KURS	INFLASI	BIRATE	LIBOR	OILPRICE	GROWTH CHINA	PDB	TRADE
NPL1	√	*	*	√	*	√*	*	*
NPL2	*	√	√	*	*	*	*	√*
NPL3	√	*	√*	√	*	√	*	√
NPL4	*	*	√	*	*	*	*	*
NPL5	*	*	*	*	√	√*	*	√
NPL6	*	√	√	*	√	√	*	√*
NPL7	*	*	√	*	*	*	√*	*
NPL8	*	*	√*	*	*	*	*	√
NPLTotal	*	√	√*	*	*	√	*	√

Source : data calculation

Information

- √ : contributes to NPL > 5%.
- * : Contributes in the range of 2.5 to 5%.
- √* : most dominantly affects the NPL (other than the NPL variable itself).

The conclusions of this study are :

1. The results of the VECM model calculation show the response of each macroeconomic variable representing domestic variables and international variables. VECM approach is free from economic theory, so that from the existing relationship can be seen causality between macroeconomic variables and NPL in the long term. From the model specification used with optimum lag analysis using lag 2.
2. Based on the calculation obtained the results of the analysis as follows:
 - a) There are long-term relationships between the effect of macroeconomic variables on the total NPL moves shown by the VECM equations according to their coefficients.
 - b) The relationship of various long-term relationships is shown by the VECM equation where the macroeconomic variables affect the NPL sectorally according to the coefficient value of the VECM equation. There are variables that affect the NPL and do not affect what can be seen from the significance of each variable.
 - c) From structural analysis of VECM with IRF and FEVD analysis. Response of each macro variable shock to NPL changes for some future period. And also can know comparison of influence from various macroeconomic variable to NPL that measured.
 - d) From the results of IRF and FEVD analysis, banking related parties can perform risk mitigation by looking at how the response occurs when a macroeconomic variable is changed so as to determine the right policy.

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