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The Effect of Banking Credit Growth and Purchase of Securities Growth on Banking Stability in Indonesia

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This study aims to analyse the impact of banking fund distribution activities, banking credit and purchase of securities in October 2014 to March 2018. This study uses the Vector Error Correction Model (VECM) method. In this study the effect of banking fund distribution activities will be related to the banking stability index. The estimation results of the VECM method show that variables credit growth have negative effect and the purchase of bank securities have a positive effect on the banking stability index. The higher the banking stability index shows the deteriorating condition of banking stability. Therefore the higher the rate of credit growth will make banking stability better and the purchase of securities will further worsen the condition of banking stability.

Key words: *Banking stability, VECM, credit growth, securities trading growth.*

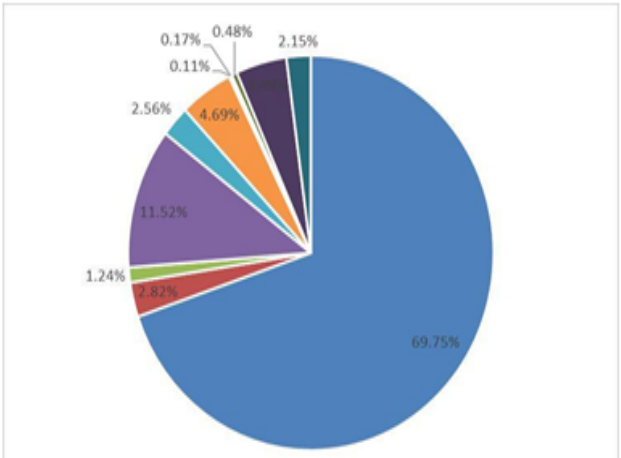
Introduction

The economic condition of a country is influenced by the country's financial system. The financial system has an intermediary role to channel funds from surplus parties to deficit parties (Purmiyati, 2019). Financial regulation in the banking industry is experiencing rapid development. The role of banks also drives economic growth in Indonesia by providing and distributing credit (Sigit, 2018). A good financial system can perform a good intermediary function. Bank Indonesia (BI) has a role in creating policies that can have an impact on financial system stability (Zulkhibri, 2016). Financial system stability is defined as the financial system's resilience to economic shocks, so that the intermediation function, payment system and risk distribution continue to run properly (Bank Indonesia, 2007a).

The occurrence of economic crises in various parts of the world in 1990 to 2000, especially the monetary crisis that impacted Southeast Asia in 1997/1998 pushed central banks in various countries including Bank Indonesia (BI) to create financial system stability through monetary policy by forming a Bureau Financial System Stability (BSSK) at Bank Indonesia.

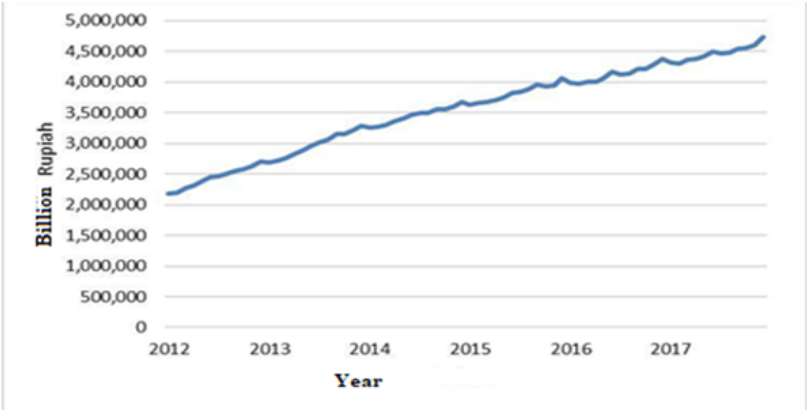
Financial institutions in Indonesia are divided into bank and non-bank financial institutions. Based on Banking Basic Law No. 23 of 1998 bank financial institutions consist of central banks, commercial banks and people's credit banks. The definition of financial system stability from Bank Indonesia which means financial system resilience can be seen as the resilience or stability of financial institutions in Indonesia (Muthia et al, 2019; Ismiyanti et al, 2018). Banking financial institutions are the largest financial institutions in Indonesia. The number of banks in Indonesia and the number of assets owned by banks is very large when compared to other financial institutions. The share of banking assets in Indonesia controlled more than 50% of the share of assets of financial institutions in Indonesia in 2017.

Figure 1.1. Asset Share of Indonesian Financial Institutions 2017



The share of banking assets reaching 69.75% shows that banking financial institutions are the most influential on the stability of the Indonesian financial system. Banking has a role to distribute excess funds to households and investors to finance household consumption and investment (Koong, 2016). The stability and health of the banking sector is part of the stability of the financial sector and is closely related to the health of an economy (Crocket, 1997). The link appears in the function of the banking system as a financial intermediary institution.

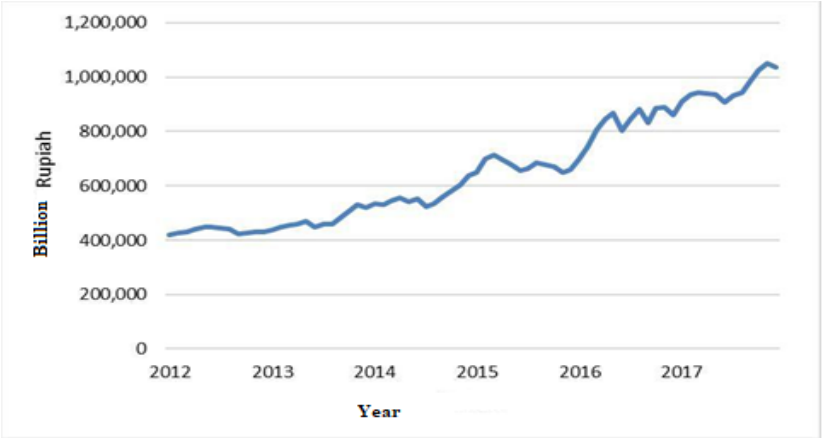
Figure 1.2. Indonesia Banking Credit (Billion Rupiahs)



The bank functions as an intermediary institution that provides services to surplus units or deficit units. The increasing number of banks causes competition to attract funds from the public to increase. The level of banking stability is influenced by economic activities and transactions carried out by the bank (Syahyunan, 2017; Sadalia, 2018). Based on the Indonesian banking report issued by the Financial Services Authority (OJK) in 2017, the largest channelling of banking funds is bank credits and securities purchases. The level of commercial bank credit in Indonesia from 2012 to 2017 continues to increase and can be seen in Figure 1.2. According to Koong (2016) banking credit influences the stability of the bank

Purchases of securities by commercial banks in Indonesia in 2012 to 2017 (Figure 1.3) appear to have increased, despite a decline in certain months. According to Abbasi (2016) the activity of buying and selling securities during a time of economic crisis can cause the bank to experience excess credit, so that the purchase of securities will certainly affect banking conditions.

Figure 1.3. Purchase of Securities (Billion Rupiahs)



Diamond and Rajan (2011) show that sales made in the capital market can cause banks that are actively involved in trading, to maintain their existing investments in the form of securities that have a low level of liquidity. Fund disbursement by banks both in the form of credit and securities certainly has their respective risks, these risks can be either credit risk or liquidity risk (Erwin, 2018) The risk faced by banks in channelling these funds will affect the amount of funds to be channelled by the bank both in the form of credit or securities. Banking stability index according to Crocket (1997) can be used to see the stability of a country's financial system. In this study the banking stability index will be used to see the condition of financial system stability in Indonesia. Banking as a financial institution becomes an institution to channel funds from and to various parties. The biggest funds used by banks in channelling these funds are in the form of granting credit to third parties and purchasing securities.

Literature Review

Banking Credits

Credit plays an important role in banking because banks have a role in lending. To get a large income from credit repayments provided by banks, credit processing needs to be done effectively and efficiently (Cahyono et al., 2017). In the Indonesian banking statistics report from the Financial Services Authority (OJK) it can be seen that loans extended by banks are channelled to two party, namely credit extended to third parties. The elements contained as consideration of granting credit are as follows: trust, time, risk, agreement (Abdulkadir & Rilda, 2000).

Credit Risk

Financing risk is the risk due to failure of customers or other parties in fulfilling their obligations to banks in accordance with the agreement. One of which is the risk arising from the concentration of the provision of funds to one party or group of industries, sectors and certain geographical areas that has the potential to cause substantial losses and can threaten the bank's business continuity (Nurfalah, 2018). In addition to financing, banks face credit risk from various financial instruments such as securities, interbank transactions, trade financing transactions, exchange and derivative transactions, and commitment and contingency obligations.

Non-Performing Loan

Non-performing loans in banking are one form of credit risk, one of the problem loans is usually called a non-performing loan (NPL). NPL is an indicator of the health of the quality of bank assets. The indicator is the principal financial ratio that can provide information on the assessment of capital conditions, profitability, credit risk, market risk and liquidation (Servigny

& Renault, 2004). Rivai and Veithzal (2006) also explained that, non-performing loans describe a situation where credit repayment agreements run the risk of failure, even indicating that the bank will get a potential loss. Bank Indonesia Regulation Number 6/10 / PBI / 2004 dated 12 April 2004 concerning the rating system for commercial banks, stipulates that the ratio of non-performing loans (NPL) is 5%. The NPL is calculated as follows:

$$\text{Rasio NPL} = (\text{Total NPL} / \text{Total Kredit}) \times 100\% \quad \text{..... (2.1)}$$

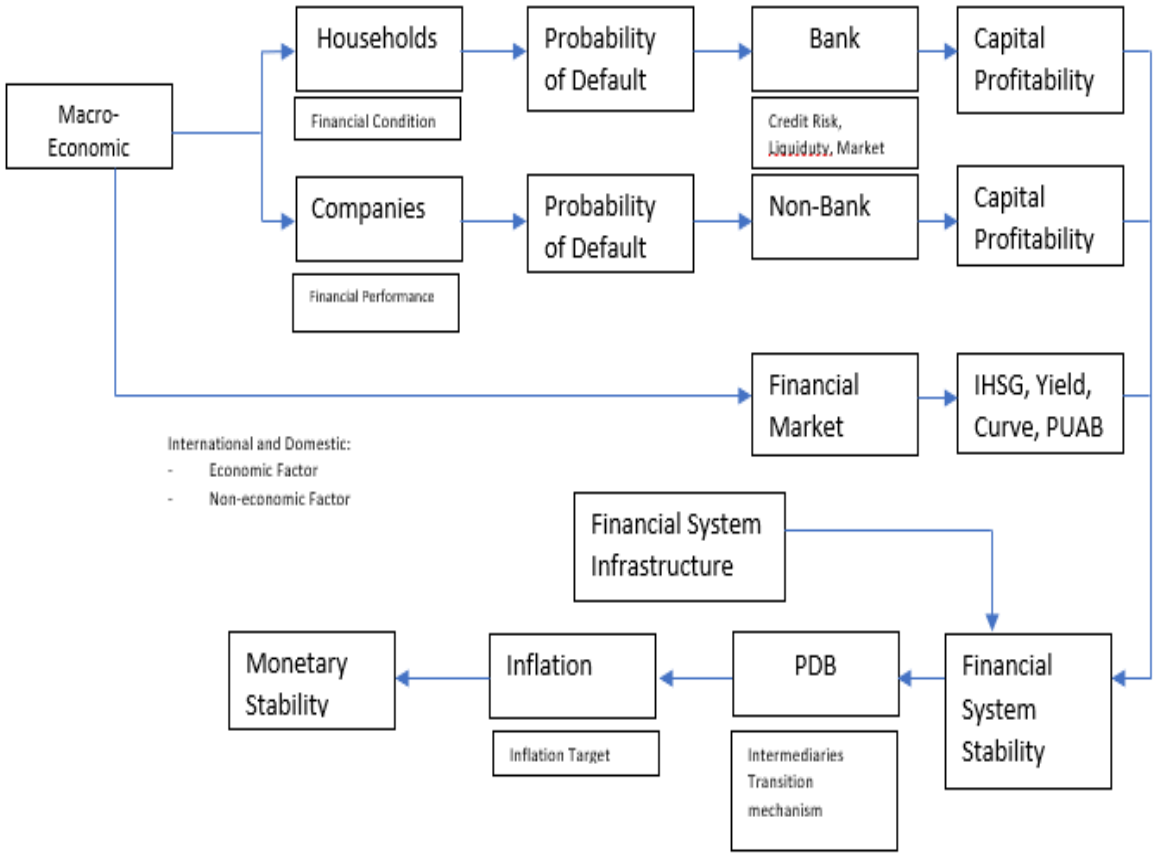
Financial System

The financial system is a system that carries out economic functions and channels funds between three economic actors, such as households, companies and the government (Mishkin, 2012). The financial system is run by financial institutions, divided into banking and non-banking financial institutions. The difference between the two types of financial institutions is where the banking financial institutions have the authority to raise funds directly in the form of deposits, the non-bank financial institutions cannot collect funds directly in the form of deposits. Based on Banking Basic Law No. 23 of 1998 bank financial institutions consist of central banks, commercial banks and people's credit banks.

Financial System Stability

The definition of financial system stability still does not have a standard agreement. This is also in accordance with the statement of Bank Indonesia (BI); which states that Financial System Stability (SSK) actually does not have a standard definition that has been accepted internationally. In Figure 2.1 we can see that financial system stability is different from monetary stability. There are four related factors that support the creation of financial system stability, namely (i) a stable macroeconomic environment; (ii) well-managed financial institutions; (iii) effective supervision of financial institutions; and (iv) a secure and reliable payment system.

Figure 2.1. Relationship of Financial System Stability and Monetary Stability



Financial System Stability Assessment Framework

Financial system stability is a public policy that states all parties related to the financial system have a responsibility to create stability in the financial system (Crocket, 1997). Parties with responsibilities in maintaining financial system stability include:

1. Financial authority (government, central bank, etc.)
2. Financial actors (banks and nonbank financial institutions)
3. The Public, especially financial service users

Banking Stability Index

The banking system index can be regarded as an early warning system in the banking industry. There are four levels in the banking stability index that describe the condition of banking stability. The stability levels are: normal with a maximum stability level of 101; standby with

a stability level of 101 <ISP≤102; alert to a stability level of 102 <ISP≤103 and a crisis stability level if the stability level exceeds 103 (LPS, 2015).

Table 2.1: Banking Stability Index

Banking Stability Index	Banking Condition Assessments
ISP<101	Normal
101<ISP≤102	Alert
102<ISP≤103	Standby
ISP>103	Crisis

Source: Deposit Insurance Agency

Investment

Securities are a means of payment or an investment vehicle in modern trade transactions today. These securities are used as a substitute for money that has been used as a medium of exchange in trade, especially by business people or entrepreneurs. This is because using securities is safer, practical, and is a separate presides, more widely used today, securities have become commodities in business activities or object agreements, making them more profitable and more varied. Examples of debt securities are; notes, stocks, bonds, credit securities, or obligations from issuers in the form commonly traded on the capital market and money market (Judisseno, 2002).

Liquidity Risk

Liquidity risk is the risk caused by the bank not being able to meet obligations that are overdue. This risk arises when the bank is unable to meet the needs of funds (cash flow) immediately and with appropriate costs to meet the needs of daily transactions. There are several factors that drive liquidity risk, namely (Sobarsyah, 2020):

1. At the time of withdrawal of large deposits, banks do not have enough funds and fast funding sources that can be used to meet these liquidity needs.
2. When a bank already has a large amount of financing commitments that have not been realised with the debtor and at the time of realisation the bank does not have sufficient funds.
3. There is a large withdrawal of deposits and banks do not have assets that can be immediately disbursed to meet customer liquidity needs.
4. A large decline in the value of assets owned by banks that trigger customer mistrust so they withdraw savings from the bank

Monetary Policy

Monetary policy is an instrument of macroeconomic policy that can be used by the government to improve the country's economy. A good economic condition is the existence of labour and capital efficiency which creates a continuous increase in output (Hubbard, 2011). At the central bank there are six main objectives of monetary policy, namely: price stability, high employment, and economic growth, stability of financial markets and institutions, interest rate stability, foreign exchange market stability.

Hypothesis

Based on the problems in previous research and the theoretical basis that has been described, the hypothesis of this study is stated as follows:

1. Banking credit growth has a significant influence on the level of banking stability and has a negative relationship with the condition of banking stability, or the level of banking stability index (ISP) will increase.
2. The growth of banking securities purchases has a significant influence on the level of banking stability and has a negative relationship with the condition of banking stability, or the level of banking stability index (ISP) will increase.

Research Methodology

The study was conducted using a descriptive quantitative approach to explain the influence between related variables. The quantitative approach is carried out using an econometric model which is a combination of mathematical analysis, economic theory, and statistical analysis. The quantitative approach used in this research is the Vector Error Correction Model (VECM) method. The software used to calculate the effect of credit growth and the growth of securities purchases on banking stability index is Microsoft Excel and Stata13 is used to calculate collected data. This study uses data with the type of time series using monthly data with the period 2014: 10-2018: 3. The type of data used in this study is secondary data in the form of time series data. This data was obtained from two sources; the Financial Services Authority (OJK) and the Deposit Insurance Corporation (LPS).

Variable Identification

The independent variables in this study are credit growth and banking securities growth, while the dependent variable is the banking stability index (ISP). The banking stability index is reviewed with three sub-indices, namely: Credit Pressure (CP) which is seen from the condition of banking stability due to problems in the credit or financing section. Interbank Pressure (IP),

namely the condition of banking stability due to the dependence of a bank with other banks. Market Pressure (MP), which is a condition of banking stability due to activities that occur in the market such as exchange rate depreciation, rising interest rates, or the level of market volatility.

Data Analysis Technique

***Vector Error Correction Model* (VECM)**

The VECM method is a VAR model in which time series data are not stationary at the level and there is cointegration (long-term relationship) to the data (Hill, et al. 2012). So the VECM method can also be identified as a VAR method that is detected. The VECM method is an econometric analysis model used to determine the short-term behaviour of a variable over the long term due to permanent shock, so VECM can provide a long-term structural relationship with information about adjustments which provides better insight into economic activities. A stationarity test can be performed on the unit root value in a variable using the Augmented Dickey Fuller (ADF) test. Cointegration is used to see whether there is a short-term and long-term relationship in the model. Cointegration in the model can be tested using the Johansen or Engel-Granger method. If there is no cointegration in the model, the VAR method will be used for analysis, but if in the model there is cointegration, then the VECM method will be used.

$$\Delta ISP_t = \Gamma \begin{bmatrix} \Delta k_{t-1} \\ \Delta sb_{t-1} \end{bmatrix} + \begin{bmatrix} \alpha k_t \\ \alpha sb_t \end{bmatrix} \chi \{\beta k_t \beta sb_t\} \chi \begin{bmatrix} k_{t-1} \\ sb_{t-1} \end{bmatrix} + \varepsilon_t \quad \text{.....(2.2)}$$

Analysis Model

The Vector Error Correction Model (VECM) analysis model is used to find the relationship between the banking stability index, credit growth, and the growth of securities purchases. VECM is used to determine the short-term behaviour of a variable against its long-term value. VECM is also used to calculate short-term relationships between variables through standard coefficients and to estimate long-term relationships using residual lag from co-integrated regression (Basuki, 2016).

ISP_t : Banking Stability Index
K_t : Credit Growth
Sb_t : Securities Growth
T : Matrix Coefficient ($p \chi p$); j=**1,…**k
α, β : Total linear combination of element x_t that is only affected by shock transistor
ε_t : *Error correction*

The Steps of VECM

Stationarity Test

To find out the appropriate method used in the study it is necessary to know whether the time series data is stationary or not. Stationary time series data is data that has a tendency to approach its average value and fluctuate around its average value (Gujarati, 2012). Stationarity test can be done with the Augmented Dickey Fuller (ADF) method in the same degree (level or first difference). According to Gujarati (2012) the form of stationarity test equation with ADF analysis is as follows:

$$\Delta Y_t = \alpha_0 + \gamma Y_{t-1} + \beta_i \sum_{i=1}^{p} \Delta Y_{t-i+1} + \varepsilon_t \quad \text{..... (3.3)}$$

ΔY_t : *first difference*
A_0 : Intercept
Y : The stationarity of variables tested
P : The length of the lag used in the model
ε : *Error term*

Optimum Lag Determination

In research with time series data the VECM method needs to be tested to determine the optimal lag in the model. Determination of the optimal lag length can be done by looking at the information criteria recommended by Final Prediction Error (FPE), Akaike Information Creation (AIC), Schwarz Information Creation (SIC), and Hannan-Quinn (HQ). Some of these criteria use weighted sum of square residuals. The results of determining the optimal lag length will have an asterisk, which is the optimal recommended lag length.

Cointegration Test

Cointegration is a combination of linear relationships of variables that are not stationary and these variables must be integrated to the same degree. The integrated variable shows the same stochastic trend and have the same movement over a long time. One approach in the cointegration test is the Johansen method. The cointegration test with the Johansen method can be analysed with the VAR model with equations (Rosadi, 2012):

$$y_t = A_1 y_{t-1} + \cdots + A_p y_{t-p} + \beta \pi_t + \epsilon_t \quad \text{..... (3.4)}$$

Further, the equation is written as follows:

$$\Delta y_t = \prod y_{t-1} + \sum_{i=1}^{p-1} r_i \Delta y_{t-1} + \beta \pi_t + \epsilon_t \quad \text{..... (3.5)}$$

$$\prod = \sum_{i-1}^{p} A_i - I, r_i = -\sum_{j=i+1}^{p} A_j \quad \text{..... (3.6)}$$

Where,
y_t : vector -*k* on non-stationer variable
π_t : vector -*d* on deterministic variable: innovation vector
$\mathfrak{E}_t$: Innovation vector

In the Johansen test the null hypothesis is that there are r, r = 0.1, ..., k-1 cointegration equation

$$\begin{bmatrix}\Delta y_{1t}\\ \Delta y_{2t}\\ \Delta x_{1t}\\ \Delta x_{2t}\end{bmatrix} = \Gamma \begin{bmatrix}\Delta y_{1t-1}\\ \Delta y_{2t-1}\\ \Delta x_{1t-1}\\ \Delta x_{2t-1}\end{bmatrix} + \begin{bmatrix}\alpha_{11}\\ \alpha_{21}\\ \alpha_{31}\\ \alpha_{41}\end{bmatrix} \chi\{\beta_{11}\beta_{21}\beta_{31}\beta_{41}\}\chi \begin{bmatrix}y_{1t-1}\\ y_{2t-1}\\ x_{1t-1}\\ x_{2t-1}\end{bmatrix}$$

versus the alternative hypothesis, against k cointegration equation, with k stating the number of endogenous variables in the VAR model. This residual test is almost the same as the stationarity test to determine that time series data is cointegrated or cannot be known by observing the magnitude of the Max-Eigen value and its trace value. If the Max-Eigen value and trace value are greater than the critical value of 1% and 5%, then the data is cointegrated and has a long-term relationship. Conversely, if the Max-Eigen value and trace value are smaller than the critical value of 1% and 5%, then the data is not cointegrated.

VECM Estimation

It has been found that if there is no cointegration then the VECM analysis model cannot be used to analyse the time series data. Cointegrated time series data that has been stationary to the same degree then the first difference will be continued with VECM estimation. VECM analysis model has a dynamic interaction that can be seen from the endogenous response variables to the shock of these variables. There are two ways to look at dynamic behaviour in the VECM model, namely the impulse response function and variance decomposition.

Impulse Response Function and Variance Decomposition

Impulse Response Function (IRF) is used to interpret variables in the VECM model, because the coefficients in the VECM model are difficult to interpret. IRF is used to describe the level of movement of the variable shock to other variables until the effect disappears and returns to the balance point. The effect of the shock of a variable can describe how quickly the variable can affect other variables. Variance decomposition also called forecast error variance decomposition, is a device in the VECM model that will distinguish variance from a variable estimated to be a shock component or an innovation variable, assuming that the variables do not correlate with each other.

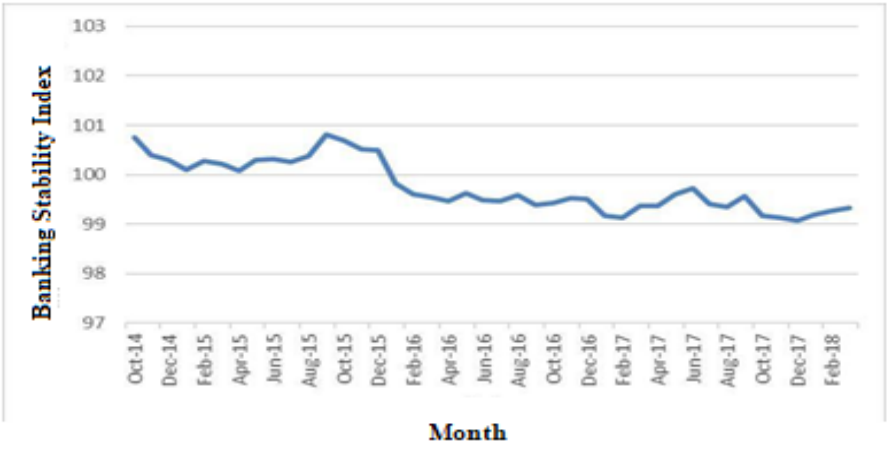
Result and Discussion

General Overview of Research Object

Development of Banking Stability Index in Indonesia

ISPs in Indonesia in 2014 precisely from October 2014 to the beginning of 2018 are very stable and remain at normal limits as described in Table 2.1. ISPs in 2014 to 2018 can illustrate that banking conditions in Indonesia in that period can be said to be healthy and have never experienced a crisis at all. This can be seen in the ISP value in Figure 4.1 where the ISP value is always in a normal state (ISP <101). ISP values that are always below 101 can be analysed as banks in Indonesia during this period were never in a crisis condition (ISP> 103). ISP value in that period can also identify that banks do not need to be alert or alert to ISP conditions, where banks will be alert or alert when ISPs are between 101 and 103.

Figure 4.1. Development of the Banking Stability Index



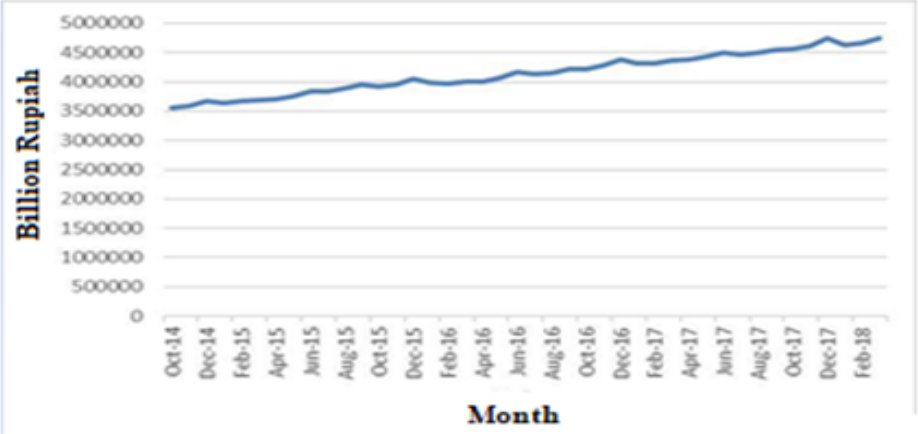
Changes in ISP values in Indonesia in 2014 to 2018 show that ISP values are declining as in Figure 4.1, where ISPs in 2014 and 2015 were around 100 bps. Whereas starting in early 2016, ISP values began to enter the range of 99 bps and these ISP values also remained in the range of 99 bps until March 2018. ISP values in Indonesia that were stable from 2014 to 2018 were also followed by Credit Pressure (CP), Interbank Pressure (IP), and Market Pressure (MP) which can also be considered stable. The peak value of ISPs in September 2015 were high, 100.81 bps, but this value was also still within the normal limits of banking stability (ISP <101). So, it can be said that the value of the banking stability index (ISP) in the period October 2014 to March 2018 remained at a stable value.

The Growth of Banking Credit in Indonesia

Loans granted to third parties have a very large amount when compared to loans given to other banks, so that loans given to third parties can already represent the total bank credit. Banking credit in Indonesia can be said to be significantly increasing every year, this can also illustrate

the Indonesian economy that is experiencing growth. In Figure 4.2 we can see that banking credit has a positive growth in this research period, starting from October 2014 to March 2018. Banking credit continues to grow until bank credit in this study peaked at the end of the period, namely in March 2018 amounting to 4,743. 237 billion rupiah. The growth of bank credit in each month grows around less than 2%. In some periods of course there is a credit growth that has growth to exceed 2%. In this study period there are 5 months in which credit growth grew more than 2% from the previous month.

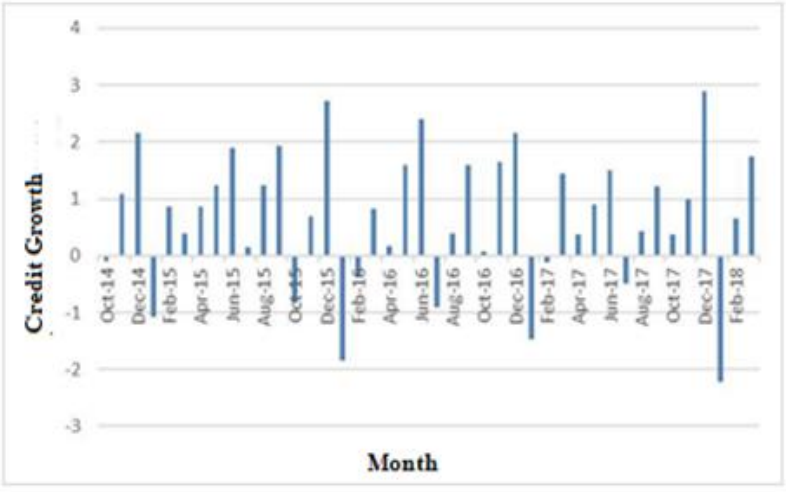
Figure 4.2. Banking Credit Development (Billion Rupiahs)



Source: Indonesia's Banking Statistics

The biggest credit growth occurred in December 2017 with a growth rate of 2.88%. Although Figure 4.2 shows that the period with the largest level of bank credit in Indonesia occurred in March 2018, but credit growth in that month only grew around 1.73%. Which is smaller when compared to growth in December 2017 which shows a difference of more than one percent growth.

Figure 4.3. Banking Credit Growth



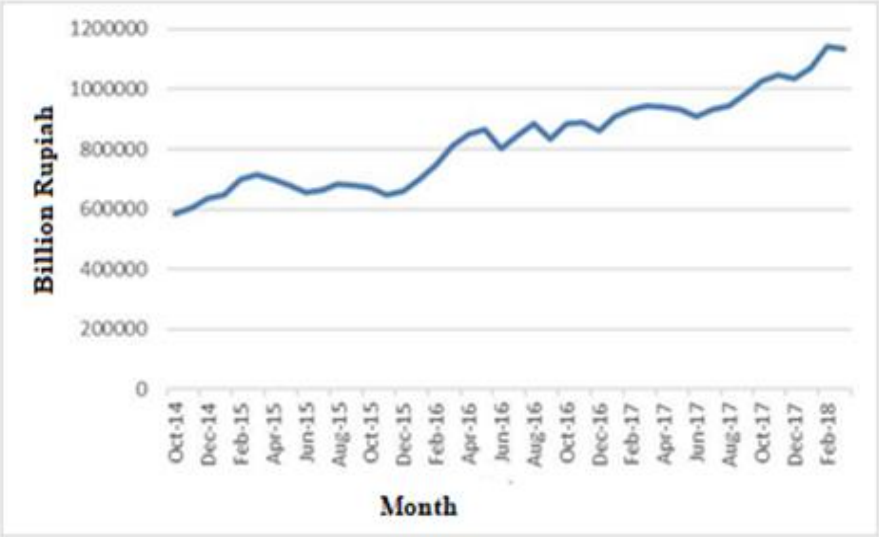
Source: Indonesian Banking Statistics

In addition to growing credit, the bank also has a negative credit growth value. Negative credit growth is certainly less when compared to positive credit growth. There are nine periods that have a negative credit growth value. However, in Figure 4.3 we can see an event which displays a very drastic change in credit growth, namely in December 2017 and January 2018. In a period of only one month apart there was a very different credit growth rate. The December 2017 period had the highest credit growth with a growth rate of 2.88%, while in the next period, January 2018, it had the lowest credit growth in this study period, with a growth rate of -2.23%. If there is a very large difference in credit growth in one period to the next period this can indicate an impact for the bank.

Development of Banking Securities Purchasing Growth in Indonesia

Bank credit is one form of channelling banking funds that we can see in Indonesian banking statistics issued by the financial services authority (OJK). In addition to bank credit in Indonesian banking statistics, evidence shows that banks in Indonesia channel funds in other forms such as placement of funds in other banks, placement of funds with Bank Indonesia, purchase of securities, and placement of other funds. In Indonesian banking statistics, the purchase of securities is the second largest distribution of bank funds after bank loans. The bank choses to change the shape of their assets into securities. Purchasing securities by banks has a smaller amount of bank credit but has a more volatile rate. Purchases of banking securities are usually in the form of Bonds, Bank Indonesia Certificates (SBI), Treasury bills, and other securities. Bonds are securities most widely bought by banks, evidenced from Indonesian banking statistics. Although the purchase of securities can be seen to be more volatile than bank credit, the purchase of securities still has a positive growth rate in this research period, namely from October 2014 to 2018.

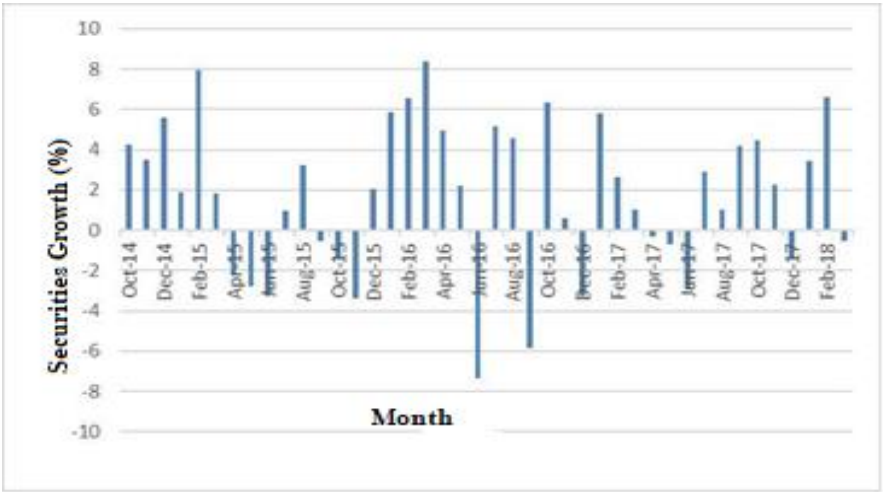
Figure 4.4. Purchase of Banking Securities (Billion Rupiahs)



Source: Indonesian Banking Statistics

Purchase of securities does not always increase in each period but there is also a growth rate that is negative. In this research period the purchase of securities has a positive growth rate as seen in Figure 4.4, where the level of purchase of securities has increased at the beginning of the study period until the end of the research period. The largest number of securities purchases at the end of the study period was in February 2018, with the number of securities purchased by Indonesian banks amounting to 1,142,234 billion rupiah. Purchases of securities that are more volatile when compared to bank credit can be seen in Figure 4.5 where the growth rate in each period has a fairly high growth rate, even though the distance between research periods is only one month, but the growth rate of the purchase of securities has an average a growth rate of around 5% per month.

Figure 4.5. Banking Securities Purchases Growth



Source: Indonesian Banking Statistics

Result and Discussion

This study uses time series data with a total of 42 observations. The development of research variables namely the banking stability index, credit growth, and the growth of banking securities purchases shows that the level of banking stability index in this study has a level that seems to decline in this research period. The ISP level shows that the level of stability in banks in Indonesia from October 2014 to March 2018 is in a stable condition. Credit growth and bank letter purchases indicate volatile data in each period. This growth rate can change with a very large distance in each period.

Model Analysis

This study aims to determine the effect of the growth of bank credit and the growth of bank securities purchases on banking stability in Indonesia. Vector Error Correction Model (VECM) was used as a method in this study. The following are the steps used in analysing this research model using the VECM method.

Data Stationarity Test

Stationary test results with the first ADF method test the research variables of the level with the level of the results of the stationarity test in table 4.1. Table 4.1 shows that not all time series variables in this study have been stationary at the level. The ADFt-statistic value of the Banking Stability Index (ISP) variable does not meet or is not greater than the Mackinnon Critical Value either at the 1%, 5%, or 10% error rates. This is different from the other two variables, namely credit and securities variables which have been stationary even at 1% error. Research using good time series data must have all variables that are stationary.

Table 4.1: ADF Test Result: *Level-Trend*

Variable	ADFt-statistic		*Mackinnon Critical Value*		
			1%	5%	10%
ISP		-1.919	-3.641	-2.955	-2.611
Credit(k)	***	-8.437	-3.641	-2.955	-2.611
Securities (sb)	***	-5.625	-3.641	-2.955	-2.611

Notes: *** Significant at α = 1%; ** Significant at α = 5%; * Significant at α = 10%

When there are variables that are not stationary at the level, then the next thing to do is to change the data on each variable into the form of first difference. After the time series data has been

changed into the form of first difference by reducing the data on a variable in the previous period, a stationary test will be carried out by the ADF method. This is done by testing the research variables at the first difference level, with the results of the stationarity test in table 4.2, on stationarity testing after converting time series data into first difference form produces different ADFt-statistical values on all variables.

After the data has been changed at the level of first difference produces all-time series variables in this study have been stationary. Banking stability index variable (ISP) which at the level of level is still not stationary, after being changed to the first difference level to be stationary. So that this research will use time series data at the first difference level because all variables are stationary at the first difference level by having an ADFt-statistic that is greater than the Mackinnon Critical Value at the error level of 1%, 5%, and 10%. So all variables in this study were stationary at a significant level α = 1%.

Table 4.2: ADF Test Result: *First Difference-Trend*

Variable	ADFt-statistic		*Mackinnon Critical Value*		
			1%	5%	10%
ISP	***	-6.253	-3.648	-2.958	-2.612
Credit(k)	***	-8.411	-3.648	-2.958	-2.612
Surat Berharga (sb)	***	-5.325	-3.648	-2.958	-2.612

Notes: * Significant at α = 1%; ** Significant at α = 5%; * Significant at α = 10%**

Determination of Optimal Length Lag

In research with time series data the VECM method needs to be tested to determine the optimum lag on the model. Determination of the optimal lag length can be done by looking at the information criteria recommended by Final Prediction Error (FPE), Akaike Information Creation (AIC), Schwarz Information Creation (SIC), and Hannan-Quinn (HQ). Some of these criteria use a weighted sum of square residuals. If the lag that is used is too little, then the residuals of the regression will not display the white noise process, so the model cannot estimate the actual error correctly or it can be said that the model can be specified, but is not exactly right.

Table 4.3: Optimal Lag Length Determination Results

Lag	FPE	AIC	HQIC	SBIC
0	0.000067	-1.09485	-1.0488*	-0.94232*
1	0.000061	-1.19319	-1.009	-0.670727
2	0.00006	-1.21889	-0.896551	-0.304581
3	0.000057	-1.29501	-0.834629	0.011141
4	0.000044*	-1.61123*	-1.01261	0.086763

The results of determining the optimal lag length will have an asterisk which is the optimal recommended lag length. The asterisk in the results of determining the lag length in Table 4.3 is in the lag length 4. So that in this study we will use lag length 4 in accordance with the Stata13 program recommendations.

Cointegration Test

A cointegration test is needed in research that uses time series data, because it can influence the selection of methods used to analyse time series data in the study. Vector Error Correction Model (VECM) can be used when the time series data contains cointegration. The cointegration test is used to determine the possibility of a long-term relationship between the variables in this study. The cointegration test used in this study is the Johansen test.

Table 4.4: Johansen Cointegration Test Result

Maximum Ranks	Eigen value	Trace statistic	5% critical value
0	.	81.1426	29.68
1	0.6683	38.1049	15.41
2	0.44112	15.414	3.76
3	0.32648		

This residual test is similar to the stationarity test. It determines that time series data is cointegrated or cannot be recognised from the magnitude of the Max-Eigen value and its trace value. If the Max-Eigen value and trace value are greater than the critical value of 1% and 5%, then the data is cointegrated and has a long-term relationship. In Table 4.4 we can see that the value of the trace statistic is greater than the 5% critical value, so the time series data in this study are cointegrated and the VECM method can be continued to analyse the models in this study.

VECM Estimation Result

Determination of the optimal lag length in this study found that the lag in this study amounted to 4 periods. Research data from October 2014 to March 2018 produced 42 observations (n) as many as 42. The dependent and independent variables in this study were 3 variables, so that the degree of freedom was 39. VECM estimation results in the short term found that not every variable will affect each other in the short run (see appendix). One way to understand the effect of each variable is by looking at the probability z score, where the VECM estimation results use a critical value of 5% or 0.05. H1 will be accepted if the probability z score is smaller than the critical value so that there is an influence between the variables in the VECM estimation in the short term. Conversely, if the probability value z score is greater than the critical value H0 will be accepted or it can be said that there is no influence between variables.

Table 4.5: Long-Term VECM Estimation Results

	Coef.	Std. Error	Z	p>|z|
ISP_{t-1}	1			
Kt-1	0.0016525	0.0005566	2.97	0.003
SBt-1	-0.0004071	0.0000986	-4.13	0.000
Cons	-0.0008789			

In this research period, it is known that the variable credit growth and the growth of securities purchases affect the banking stability index in the long run according to the VECM estimation results in Table 4.5. This is where to see the effect in the long term is the same as seeing the effect in the short term, by looking at the probability value z the score. In table 4.5 it can be seen that the probability z score of the variable credit growth and securities purchase growth is smaller than its critical value. Probability score z score on the variable credit growth and the growth of securities purchases that are smaller than the critical value of 5% (0.05), so that it can be seen that in the period of this study using the VECM method credit growth and the growth of securities purchases significantly influence the banking stability index.

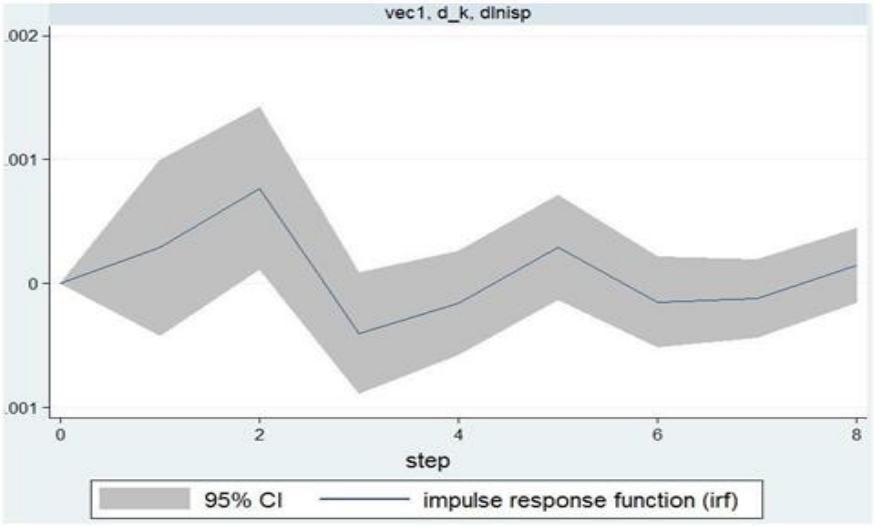
$$ISP_{t-1} = -0.0008789 + 0.0016525K_{t-1} - 0.0004071SB_{t-1} + e_t \quad \text{..... (4.1)}$$

The interpretation of the VECM estimation results in equation 4.1 shows that the variable of economic growth has a positive influence on the condition of banking stability where when credit growth occurs by 1% then the condition of banking stability will increase by 0.0016525% ISP. The variable growth in securities purchases has a negative influence on the condition of banking stability where, when there is a growth of securities purchases by 1%, the condition of banking stability will decrease by 0.0004071% ISP.

***Impulse Response Function* (IRF)**

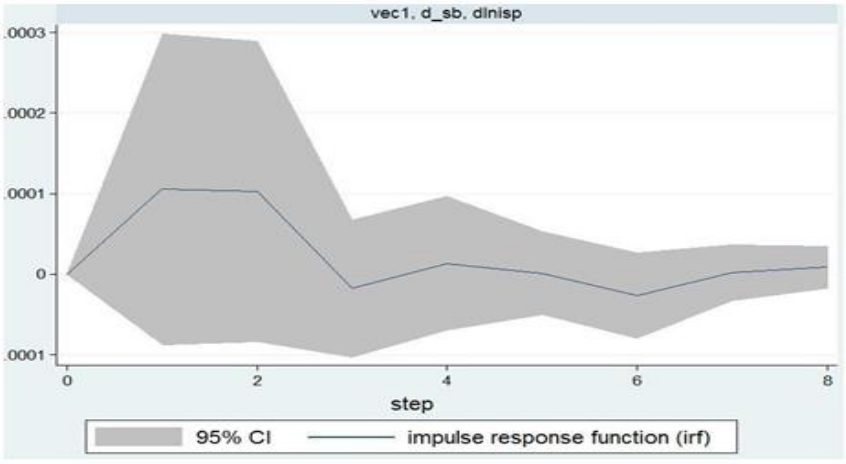
Figure 4.6 shows that the response of the ISP to the shock of the variable credit growth continues to fluctuate in each study period. This level of fluctuation also shows a balanced level at both positive and negative levels. Very high shocks occurred at the beginning of the period and the level of fluctuations in the ISP's response to the shock rate of credit growth continued to decrease in subsequent periods. Figure 4.6 shows that the ISP's response to the shock rate of credit growth stopped in the 8th period of this study. Where the ISP's shock response to the shock rate of credit growth starting from the 8th period until the end of the study period was at a balance point. Although in Figure 4.6 it looks balanced but it can be said that the ISP's response to the shock rate of credit growth is greater at a positive level, even though this difference is very small. This shows that the ISP's response to the shock rate of credit growth is positive with a peak in the initial study period, namely the second period.

Figure 4.6. ISP Response to Credit Growth Shock



The ISP's response to the shock rate of growth in securities purchases in Figure 4.7 also continued to fluctuate in this research period. The level of fluctuation in ISP's response to the shock level of growth in securities purchases is more visible at a positive level. High-fluctuating shocks also occurred at the beginning of the study period and fluctuations in ISP responses to the shock rate of growth in securities purchases and decreased in the following period. The ISP's response to the shock rate of growth in securities purchases also stopped in the 8th period, this is also the same as the ISP's response to the shock rate of credit growth. In the 8th period until the end of this research period the ISP's response to the shock level of growth in securities purchases was at a balanced level. In this study it can be seen that the ISP's response to the shock rate of growth in securities purchases is positive with a peak in the initial study period, namely in the first to second periods.

Figure 4.7. ISP Response to Shock Growth in Purchasing Securities



Variance Decomposition

Variance decomposition is used to see how much variation in ISP changes to the contribution of each shock to each variable. Contribution changes in each independent variable, namely credit growth and growth in purchasing securities to the ISP. The intended contribution is the shock contribution of each independent variable to the ISP level

Table 4.6: Contribution of Shock to Credit Growth and Securities Purchases to ISP

Period	Credit Growth	Growth of Securities Purchases
1	0	0
2	0.001217	0.023437
3	0.064532	0.041403
4	0.088394	0.040605
5	0.093857	0.040454
6	0.107564	0.039598
7	0.108738	0.040663
8	0.111278	0.040546

The results of variance decomposition in Table 4.6 show the level of contribution from the shock of credit growth and the growth of securities purchases to ISPs in this study period. As with the IRF results that show the ISP's response to the shock of credit growth and the growth of securities purchases shows that the contribution or response occurred until the 8th period in this study.

Shock that occurred in the growth of securities purchases also began to affect ISPs in the 2nd period. This effect can also be said to have a small degree of shock effect, where in the 2nd period the shock of the growth of securities purchases affected ISP by 0.023% and this influence only grew with a peak point in the 3rd period only that the shock of the growth of securities purchases affected the ISP amounting to 0.041% and the level of shock effect on the growth of securities purchases tends to be stable until the 8th period.

Conclusion

Banking credit growth has a significant effect on the level of banking stability. Analysis using the VECM method: the relationship between credit growth and securities purchases has a positive relationship, namely credit growth can increase banking stability. The impulse response function and variance decomposition found that the shock of credit growth affected the banking stability index in the eight initial periods, with the level of influence from shock increasing every period. Growth in purchases of banking securities has a significant effect on

the level of banking stability. Analysis using the VECM method: the relationship between the growth of securities purchases and securities purchases has a negative relationship, namely the growth of securities purchases can worsen banking stability. Impulse response function and variance decomposition found that the shock of the growth of securities purchases affected the banking stability index in the initial eight periods, with the level of influence of the shock increasing until the third period and then was stable in the following period.

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