Macroeconomic Stress Test on the Probability of Default Banking in Indonesia
(Study on Conventional Banks 2007-2021)

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Abstract

The role of the Bank in mobilizing is a necessity, especially related to the provision of financing facilities to economic actors in the form of loans or credit. Usually, when an economy expands, it will be followed by a procyclical trend of credit growth, which will cause banking vigilance. And cause banks to have more expectations and are too optimistic about the ability to pay customers, thus making banks less careful. Furthermore, this condition will result in excessive delays which will eventually become a nightmare during the boom or expansion of the economy. This situation will lead to the failure of the debtor in dealing with his credit, causing a non-performing ratio, and eventually becoming a probability of default. Meanwhile, to measure the risk of a bank failure, it can use the macroeconomic stress testing method and sensitivity analysis

This study aims to measure how big the impact of macroeconomic shocks on the probability of default that will be borne by banks, as well as to see the sensitivity of the probability of default of banking to macroeconomic variable shocks. To measure the impact of macroeconomic shocks on the probability of default, the study uses regression analysis. And to determine the sensitivity of macroeconomic variables to the probability of default using the stress test method by calculating macroeconomic variable shocks.

The results showed that there was a significant effect of macroeconomic variables (Real GDP, exchange rates, inflation, interest rates, and world oil prices) on the probability of bank failure. Furthermore, after calculating the stress test, the result is that of the three bank samples, only BCA Bank has the lowest stress value. Meanwhile, to see how big the Probability of Default is, when there is a shock or session on macroeconomic variables, it shows that Mandiri Bank is very sensitive to macroeconomic variable shocks compared to others.

Keywords: Probability of default, Macroeconomic stress test, Sensitivity, Banking.

1. Introduction
1.1. Introduce the Problem
Banks function as intermediary institutions that play an important role in the development of the country's economy. According to (Mishkin, 2001) in Aviliani, Siregar, Maulana, & Hasanah, (2015) states that the bank is an important and main institution for external financing in every country. Until now, the role of the banking industry continues to dominate the financial system

in Indonesia with a share of around 77.9% of the total assets of financial institutions (Central Bank of Indonesia, 2013). According to Nasution (2003), the health of financial institutions, especially banking, plays an important role in the realization of the financial system, because the characteristics of banks are very vulnerable to large-scale withdrawals of funds by the public (bank runs), which will result in bank failure.

The failure of the bank will result in a very rapid spread of losses through the contagion effect, causing system problems and will cause pressure in the financial sector (financial distress). Banks as intermediary institutions play a role in lending to the public. The development of the total distribution of banking funds during 2011 to 2020 can be illustrated by the Table 1 below.

Table 1

Total Distribution of Banking Funds in Indonesia, 2011-2020

Years	Types of Disbursement (IDR Billion)					
	Credit (Loans)	Placement in Central Bank	Participation	Placement in Other Banks	Securities	Other Bills
2011	2,000,015	575,045	5,023	135,000	437,015	75,025
2012	2,975,023	625,015	5,076	135,025	450,065	75,087
2013	3,105,037	625,075	5,085	135,026	450,071	75,088
2014	3,875,083	625,100	5,097	135,030	597,032	75,088
2015	4,025,034	625,225	5,125	135,075	602,041	76,022
2016	4,082,337	635,400	5,221	135,098	602,056	76,034
2017	4,925.035	635,428	5,221	136,002	976,095	76,553
2018	5,223,785	635,435	5,040	136,015	988,037	76,602
2019	5,756,981	635,452	5,042	136,083	1,025,000	76,874
2020	5,534,768	650,234	5,123	137,037	1,437,078	77,935

Note: IDR (Indonesia Rupiah)
Source: Statistic of Banking Indonesia, 2021

Based on the Table 1 above, it shows that the distribution of bank funds is dominated by lending. Thus it can be concluded that the main income of banks comes from credit interest income. Thus, in carrying out its business activities, banks are always faced with risks and one of these risks is credit risk. According to Blaschke, Jones, Majnoni, & Peria (2001), credit risk is a risk of loss associated with the possibility of counterparty failure to fulfill its obligations. An increase in credit risk can be demonstrated by an increase in the ratio of non-performing loans (NPL). Referring to Central Bank of Indonesia Regulation Number 21/12/PBI/2019, a bank is said to have the potential to endanger its business continuity if the bank has a non-performing loan ratio of more than 5%.

Macroeconomic conditions in a country greatly affect the stability of the country's financial system. One of the financial systems that is vulnerable to macroeconomic conditions is banking (Aviliani, Siregar, Maulana, & Hasanah, 2015). Macroeconomic conditions can be seen from

variables such as: high economic growth, low interest rates and controlled inflation rates. This will later be able to create and encourage a positive environment for banking performance itself. In addition, favorable macroeconomic conditions will generate optimism among economic actors.

Good macroeconomic conditions were created through stable macroeconomic variable control. In addition to macroeconomic variables, there are other variables that can also affect the performance of the country's economy, especially banking, namely external variables which in this case are world oil prices (Achmad & Wiranatakusuma, 2018). Fluctuations in world oil prices have an impact on the country's economy, both oil-exporting and oil-importing countries. High oil prices will have an impact on increasing production costs so that companies will make production adjustments which ultimately affect changes in real output and economic growth of a country (Septiawan, Hidayat, & Sulasmiyati, 2016).

Correspondingly, favorable and expansionary macroeconomic conditions can create a positive impact on the growth of capital resources. Then with such economic conditions, it can further encourage an increase in asset prices and the value of collateral. By increasing the value of collateral, it can improve the balance sheet of banks and companies which will then encourage an increase in demand and supply of credit (Utari, Arimurti, & Kurniati, 2012).

Alfaro & Drehmann (2009), said that when the economy expands or increases, it will lead to a procyclical credit growth tendency so that it can cause banking vigilance due to high economic growth when it is in an expansion cycle. This will cause banks to over-expect and be overly optimistic about the ability to pay customers, thus making banks less careful in extending credit. Excessive and uncontrolled credit growth will trigger growth in aggregate demand above the supply of national output. So this condition will encourage an increase in inflation and interest rates (Utari, Arimurti, & Kurniati, 2012).

Furthermore, this condition will result in excessive borrowing which will have the potential to become non-performing loans when the economy ends its boom or expansion period. This can lead to the failure of the debtor to fulfill their credit responsibilities, thereby encouraging the ratio of NPL, and ultimately the potential to become a probability of default in banks. The probability of default in a banking credit activity is strongly influenced by NPLs which credit supervisors do not pay attention to. So that the probability of default in banking can occur if there are debtors who cannot fulfill their obligations. Probability of default will certainly have a big influence on a bank's losses.

Understanding the Bank's probability of default is important so that it requires the government, relevant authorities, and the public to know early that the possibility of the bank will fail. Therefore, the risk of a bank's failure realistically must be made into a measurable and rational risk, so that the chance of a bank's failure must be calculated and anticipated no matter how small the opportunity. The risk of bank failure is a threat to banks that can occur at any time, among others, due to excessive credit growth and withdrawals of asset funding from third party funds, where this can be influenced by macroeconomic conditions.

To measure the risk of a bank failure opportunity due to the risk behavior of credit failure in banks, macroeconomic stress testing method can be used which can provide information about the characteristics of the financial system in crisis conditions and help policymakers calculate the level of vulnerability and failure or probability of default that may occur. occur in a financial system caused by shocks in macroeconomic variables. The probability of default in banks can be reflected in the ratio of non-performing loans, which is the ratio of total non-performing loans to total bank loans, which is better able to describe the bank's performance. Where the risk of bank failure due to credit failure risk behavior or probability of default is caused by unwary credit growth.

Meanwhile, at the end of 2008, instability in macroeconomic conditions was evident from an increase in the inflation rate to 1.51%, followed by a decline in economic growth to 1.1%. According to National Development Planning Agency (NDPA, 2009) the impact of the global financial crisis on the Indonesian economy can be seen from the economic growth in the fourth quarter of 2008 which decreased by -3.6% compared to the third quarter of 2008 (q-t-q). Where the instability of macroeconomic conditions will also have the opportunity to cause the occurrence of probability of default in the financial system, especially banking. The economic crisis can provide a lesson that systemic risk mitigation efforts need to be a major concern in maintaining financial system stability.

In line with that, the Basel Committee on Banking Supervision in 1988 issued the Basel Capital Accord II, which includes, among other things, the quality of risk management for financial institutions, one of which is credit risk management. In addition to containing risk management, Basel II also emphasizes the importance of stress tests and requires banks to perform stress tests on potential bank minimum capital requirements. Stress testing is an important tool in managing the risk management of financial institutions. In the report (Bank for International Settlements, 2000), stress testing is defined as a general term to describe the various techniques used by financial institutions to measure potential vulnerability to extraordinary but plausible events, such as the onset of a global economic crisis.

Stress test is a method used to measure financial system stability by calculating credit risk as well as anticipating bank failures. In addition, stress tests can provide information about the financial system in crisis conditions and help policy makers calculate the level of vulnerability and failure that may occur in a financial system. Scenario analysis and stress tests have also become important elements in the analysis so that they can help determine the level of sensitivity to economic shocks through evaluating the health and vulnerability of the entire financial system, because in this case the tendency of banks to be easily exposed to macroeconomic risks (Jones, Hilbers, & Graham, 2004).

Simons & Ferdinand (2009), state that probability of default is the first step in assessing credit exposure and potential losses faced by financial institutions. Probability of default is also a basic input when evaluating systemic risk and stress testing the financial system. Stress test analysis of the banking system is generally focused on credit risk which can lead to probability of default which includes several things, including (1) analysis of the influence of variables related to bank

credit quality, (2) developing stress test scenarios that will used in stress testing analysis, (3) calculating credit risk and reserves against potential losses under stress conditions in accordance with the scenarios that have been prepared (Jiang, Wu, Philp, & Coleman, 2014).

Based on data from the Indonesian Banking Statistics 2020, the development of credit and NPL for commercial banks reached 5,481,560 trillion. Therefore, proper risk measurement for banks is important to implement to prevent probability of default in banks. In 2018, the Financial Services Authority (FSA) along with Central Bank of Indonesia (CBI) and banking regulators carried out stress tests on banks in Indonesia. This stress test aims to measure capital resilience and the adequacy of banking liquidity in the face of changes and shocks that occur in macroeconomic conditions in Indonesia as well as shocks that occur in world macroeconomic conditions. Stress tests are carried out until the Rupiah is close to the level of IDR 20,000 per US Dollar. The results of the stress test show that Indonesian banking is still quite strong (Kontan.co.id, 2018).

1.2. *Explore Importance of the Problem*
Based on the stress tests that have been carried out by FSA and CBI, all state-owned and non-state-owned banks, both banks with the category of Business Group Commercial Banks (BGCB) 3 and BGCB 4, are all required to perform stress testing in order to obtain information. additional information regarding the form of financial risks that can have a negative impact on the entire financial system, as based on regulation of FSA, No. 18/OJK.03/2016 concerning the implementation of risk management for Commercial Banks, that banks are required to implement risk management effectively. So that all banks in Indonesia need to know the importance of conducting stress tests as a form of risk management for their business activities in order to anticipate and minimize losses or the impact of the risk of failure that may occur.

Foglia (2009), state that the main purpose of conducting stress tests on the financial sector, especially banking, is to provide adequate information on potential systemic risks under extraordinary (but still reasonable) shocks, so that they can then assist policy makers in assessing vulnerability. existing financial system. Several studies related to stress tests have been conducted to analyze the vulnerability of the financial system in various countries. Simons & Ferdinand (2009), conducted a stress test to estimate the relationship between macroeconomic variables and default behavior in Dutch companies. This study finds a convincing relationship between GDP growth, oil prices, interest rates on default behavior, where the stress test scenario of zero GDP growth does not affect the default rate significantly and does not have a very severe impact. (Vazquez, Tabak, & Souto, 2012), conducted a macro stress test on bank credit risk in Brazil as reflected by non-performing loans. This study resulted in a strong negative relationship between NPL and GDP growth. Dua & Kapur (2018) conducted macro stress testing on Indian banks which showed a cointegration relationship between credit quality and macroeconomic variables.

Based on the description above, this research was carried out to test the level of vulnerability of the financial system and to measure the probability of default on banking financing from shocks to macroeconomic variables and other external variables through the macroeconomic stress

testing method which can be obtained from the probability of debtors on each collectability of defaults or defaults that occur. can be proxied by NPL (Yusup, 2018). It aims to measure the impact of macroeconomic shocks on the probability of default that will be borne by banks, as well as to see the sensitivity of the probability of default of banks in Indonesia to shocks in macroeconomic variables. Prior to carrying out the stress test, a banking Probability of Default mapping is first carried out using the measurement of the credit failure ratio or NPL which is more able to reflect the possibility of default on state-owned banks and non-state-owned banks listed on the Indonesia Stock Exchange (IDX) which are included in the category of BGCB 4.

The problems that will be analyzed in this research are: (a) How the influences of real GDP growth, Exchange Rate, Inflation, Interest rates, and world oil prices on the probability of default Banks (BGCB 4)? And (b) How much is the sensitivity of BGCB 4 Banks to macroeconomic variable shocks and external variables?

1.3 Describe Literature Review
1.3.1 Probability of Default
Probability of default is defined as the probability that the debtor will default or default on its obligations. Probability of default can result in the bank's cash inflow from interest income and loan repayments being insufficient to meet the cash outflow of withdrawals by third parties, resulting in a negative impact on bank liquidity. Probability of default can be obtained from the probability of debtors in each default or default collectability which can be proxied by NPL net (Yusup, 2018). Basel II defines probability of default as the probability of default on maturing loans, bankruptcy or debt restructuring caused by the debtor's difficulty in paying off his obligations. Probability of default is a financial term that describes the probability of default over a certain period of time.

According to Munich & Budi (2013), who adopted the default risk model from Ong & Cihak, (2010) said that the probability of default in banking can be measured using the ratio of non-performing loans (NPL). Since the probability of default is related to loan issues, it is possible to obtain this by dividing the NPL the total base loan so that the formula is as follows:

Probability of default = Non-performing loans / Total loans

Where the probability of default is the possibility of the debtor's failure to pay off its obligations (Yusup, 2018).

1.3.2 Macroeconomic Variables Versus Probability of Default
1.3.2.1 Probability of Default Relationship with Real GDP Growth
Simons & Ferdinand (2009) state that, real GDP is related to company sales. Lower GDP growth means lower growth in company sales. The lower of the GDP growth, the harder it is for companies to generate revenue through sales. Lower income thus increases the likelihood that the company will not be able to meet its obligations. Real GDP is able to show indicators of the progress of the community's economy which can be shown by its ability to pay obligations to banks. With the increase in GDP, the ability of the community to pay off their obligations will

also increase, and vice versa, the lower the GDP, the lower the community's ability to pay their obligations, thus encouraging an increase in NPL in paying their obligations. The level of GDP which is a macroeconomic indicator will have an impact on the level of financing or non-performing loans, which will indirectly affect profit gains. It can be said that when GDP is rising, it will have a direct impact on decreasing NPL so that an increase in GDP is a positive signal that the public will be able to pay off their obligations to banks (Firmansyah, 2004). Through real GDP growth, it shows an increase in individual and company income, so this causes the ability to pay debts or loans to increase so that the number of non-performing loans or the NPL ratio decreases. Meanwhile, when the income of individuals or companies decreases, it will have an impact on the decline and even the inability of individuals and companies to pay their debts which will then cause the level of non-performing loans or the NPL ratio to increase (Naibaho & Rahayu, 2018).

1.3.2.2 Relationship between Probability of Default and Exchange Rate
Martono & Harjito (2001), explain that the foreign exchange rate (ER) is the number of units of a domestic currency that can be purchased or exchanged for one unit of foreign currency or the price of a domestic currency expressed in the currency of another country. This is determined in the forex exchange or in the forex market or in the bank where forex is traded. The demand for foreign exchange arises from the need to pay for goods and services originating from abroad. Base on Simons & Ferdinand (2009) state that, companies in sectors that have a lot of international business are expected to be greatly affected by the exchange rate. The business condition of the importing company is positively influenced by the exchange rate because imports become cheaper if the exchange rate is high. On the other hand, the exporting company's business conditions are negatively affected by the exchange rate because exports become more expensive if the exchange rate is high.

The development of the exchange rate greatly affects economic activity, when the currency of a country depreciates, the higher the amount of local currency that must be paid to earn 1 USD, so that the NPL ratio will increase. This is due to a weak economy, and the large number of debtors, so the company bears a greater burden and the risk of default (NPL) has the opportunity to increase into failure (Naibaho & Rahayu, 2018).

Depreciation of a country's currency will have an impact on foreign currency borrowing because the value of the loan will increase according to the decrease in that country's currency. The increasing amount of debt will lead to the inability of the debtor to pay off the debt so that it will cause the NPL ratio to increase (Ahmadi, Amin, & Madi, 2019). Meanwhile, Dendawijaya (2008) explain taht, if there is a decrease in the exchange rate, of course the value of a country's currency will decrease, this can result in the value of debt to be paid to banks increasing, this condition will certainly encourage the increase in the possibility of bad loans as seen from NPL owned by a bank. When the local currency exchange rate weakens against the US Dollar, it shows a positive contribution, where the higher the amount of local currency that must be spent to get one Dollar will increase the potential for higher NPL ratios on loans obtained from banks.

1.3.2.3 Probability of Default Relationship with Inflation

Inflation is an economic condition experienced by a country where the prices of goods rise continuously. Inflation occurs when there is an excess demand for goods and services in the economy as a whole and meanwhile Gunawan (1991); Sukirno S (2008) are said that, inflation occur when prices of goods for general needs continue to increase. Continuously within a certain period, when inflation occurs, the purchasing power of the people will decrease and lead to reduced sales and economic and business conditions will stagnate. This event will cause debtors to have difficulty paying their obligations to the bank, so that it can cause bad loans or the bank's NPL ratio to increase (Naibaho & Rahayu, 2018).

Similarly, according to Diyanti & Widyarti (2012) state that, inflation affects economic activities both macro and micro, including investment activities. In addition, inflation also causes a decrease in people's purchasing power which has an impact on sales. The decline in sales that occurs can reduce the company's return. Then the decrease in return that occurs will affect the company's ability to pay credit installments to the bank. Debt payments that are not on time and exceed the specified time will cause credit quality to worsen, resulting in bad loans and increasing the number of Non-Performing Loans.

When inflation occurs, the cost of living will be higher because prices will increase. So that in real terms the income of the community and companies has decreased, and it is difficult for debtors to pay off their debts and the NPL ratio will increase (Rizal, Zulham, & Asmawati, 2019). In addition Sukirno S (2008), revealed that inflation can occur due to excess demand for a number of products or services so as to encourage an increase in overall product prices, an increase in inflation will certainly be followed by an increase in interest rates for both savings and loans, and then have an impact on an increase in the value of the bank's NPL, this condition occurs because the interest expense that must be paid by the debtor is relatively increased while the relatively unchanged income value causes debtors to find it difficult to pay their obligations to the bank. It can be concluded that when inflation continues to increase, it will encourage an increase in bank Non-Performing Loans.

1.3.2.4 Relationship between Probability of Default and Interest Rate

The interest rate is a form of remuneration provided by the bank to customers who have placed their funds in the bank. Interest can also be interpreted as the price that must be paid by customers who obtain loans to banks (Kasmir, 2013). Increasing interest rates have an impact on the deteriorating quality of loans, the higher the cost of debt, the more difficult it will be for the debtor to repay the loan and have the potential to harm the debtor, so that if there is an increase in interest rates, it will increase the NPL ratio. The amount of credit interest rates will certainly determine the profit earned by a bank, while for customers the higher interest rates for commercial banks will certainly encourage the amount of profits earned by the bank. However, when interest rates are high, the risk of non-performing loans will increase. Increasing interest rates will push the number of credit payments that must be paid immediately to be higher (Dendawijaya L, 2008).

The determination of the cost of funds and lending rates (market interest rates) refers to the CBI 7 Day Reverse Repo Rate (CBI 7DRR), and CBI 7DRR is a policy made by Central Bank of Indonesia regarding interest rates. The CBI 7DRR is announced at every monthly as a result of the meeting of the Board of Governors. Later this policy will be implemented in monetary operations carried out by CBI through liquidity management in the money market in order to achieve the operational targets of monetary policy. The operational targets of monetary policy are reflected in the development of the Overnight Interbank Money Market (OIMM) interest rate. It is hoped that the movement in interbank rates will be followed by developments in deposit rates and, in turn, bank lending rates (www.bi.go.id). The CBI 7DRR is an indicator of monetary policy in Indonesia. In addition, the CBI 7 Day Reverse Repo Rate is an instrument of market operation policy that affects money circulation. An increase in the CBI 7DRR can cause banks to increase their deposit interest rates. With the increase in deposit rates, the costs incurred by banks to collect third party funds also increase, so that the cost of banking funds will increase. If this happens, bank loan interest rates will also increase so that the possibility of non-performing loans is even greater (Dwihandayani, 2017). Base on Simons & Ferdinand (2009), companies often finance part of their activities by debt. Therefore, the firm's cost of financing is positively related to interest rates. If interest rates are high, companies have higher fees and are more likely to default.

1.3.2.5 Probability of Default Relationship with World Oil Prices
Oil is one of the main export commodities for Indonesia. The continuous decline in oil prices will have an impact on the Indonesian economy. This is because as an oil exporting country, Indonesia will certainly experience a decline in oil export performance. Based on CNN Indonesia (2020), crude oil prices fell to their lowest in 18 years, plummeting demand for oil because all activity was halted in the midst of the Covid-19 pandemic. Meanwhile, world oil supplies continue to flow in the midst of the feud between Saudi Arabia and Russia. In addition, the decline in oil prices will also have an impact on the decrease in the realization of government revenues as indicated in the Government Budget. The decline in oil prices was caused by an oversupply of oil supply in the global market as a result of the removal of the Iran embargo sanctions and the absence of oil production cuts from other oil-producing countries. This is also exacerbated by the condition of growth prospects in China, Japan, and the European Union which tend to weaken (Addury, 2019).

According to Simons & Ferdinand (2009), oil prices affect the prices of most of the products used by companies. Because it will affect the company's costs and thus the probability of Default is negatively related to oil prices. When there is a decline in oil prices, it has an impact on the jamming of various financing activities in the mining sector. The decline in oil prices also had an impact on the prices of other mining commodities. This will have an impact on increasing the risk of bad loans and banking NPL figures in the mining portfolio (Addury, 2019). The decline in oil prices resulted in a slowdown in bank credit and deposits. This is because the decline in world oil prices has an impact on the price of other mining commodities. The decline in oil prices had a major impact on oil and gas companies. If in some period there is a decline in oil prices, it is feared that some oil and gas companies will collapse. This situation will ultimately have an

impact on increasing bank credit risk as measured by the increase in the number of Non-Performing Loans due to the bottleneck in the oil and gas sector.

1.3.2.6 Stress Test

The stress test method aims to identify scenarios that have a detrimental impact as a result of events outside normal limits. Stress tests consist of various techniques to calculate and determine the resistance of something from extreme events. In addition, the stress test method is also used as a tool to measure the stability of a financial system, such as banking (Cihak, 2007). Meanwhile, according to (Blaschke, Jones, Majnoni, & Peria, 2001), the macro stress test is an important part of a quantitative tool. Macro stress test can be defined as a measure of the risk exposure of a group of financial institutions for a particular stress scenario. The main objective of the macro stress test is to assist the public and relevant authorities to identify structural vulnerabilities and overall risk exposures in the financial system that may create systemic problems. An example is a situation where all particular financial institutions have a large exposure to a single source of risk (a segment or sector of the economy).

The macroeconomic stress test refers to a method that analyzes the adverse impact of the development of macroeconomic conditions, either the risk on an individual or a group of financial institutions (Virolainen, 2004). So in other words, the purpose of the macro stress test is to make risk more transparent and easy to anticipate in order to estimate potential losses in the portfolio in abnormal conditions. Stress tests are often used to complement the internal models and management systems used by financial institutions for capital allocation decisions (Blaschke, Jones, Majnoni, & Peria, 2001).

Stress test methods according to Banker Association for Risk Management and Banking Professional Certification Institute (2012) include:

a. Sensitivity Analysis

Sensitivity Analysis is an estimate of the impact of the assumed change in a related risk factor (risk driver) on the value of a portfolio. Sensitivity analysis shows the effect of a certain risk factor on the bank's portfolio.

b. Scenario Analysis

Scenario Analysis measures changes in portfolio value by simulating scenarios under stress scenarios that affect several risk factors simultaneously. In addition, scenario analysis evaluates the combined impact of changes in all risk factors, so scenario analysis is more often used for overall stress testing in banking.

Meanwhile, according to Office of the Superintendent of Financial Institution (OSFI) Canada (2009), explains that there are two stress test methods, that is:

a. Scenario Testing

Scenario testing uses the assumption of future world conditions to determine changes in risk factors that can affect the activities of an institution. Scenario testing involves a number of risk factors, as well as ripple effects which are other impacts that logically follow from changes and related management and regulatory actions. Scenario testing is usually carried out within a certain time that is appropriate for the business and risk being tested.

b. Sensitivity Test

Sensitivity testing involves gradual changes in a number of risk factors, where sensitivity testing is carried out over a shorter period of time, for example, a momentary shock. Sensitivity testing requires fewer resources than scenario testing and can be used as a simpler technique to assess the impact of changing risks when a rapid response or more frequent results are required.

Graph 1. Stress Testing
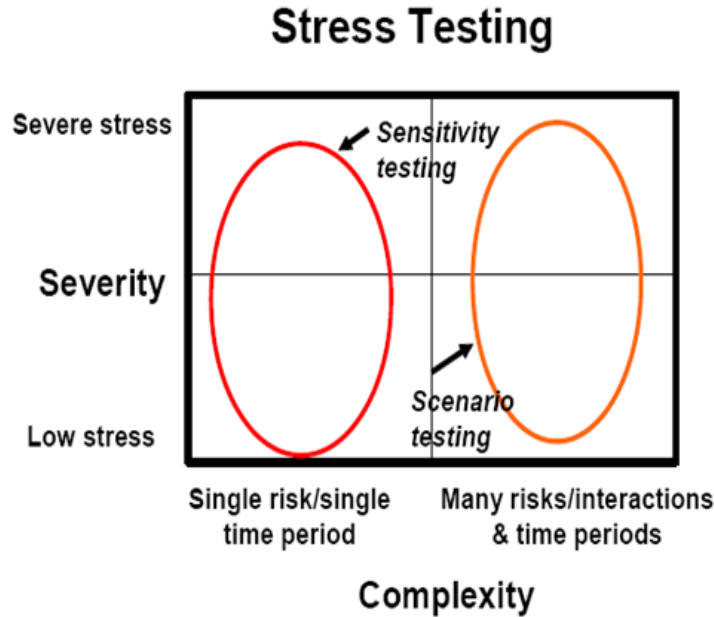
Source: OSFI Stress Testing 2009

Based on the figure, it can be seen that when measuring and knowing the stress level of an institution based on only one type of risk aspect in a period of time, it is better to use a sensitivity testing approach. Meanwhile, when you want to see from various types of risk aspects in a period of time, it is better to use scenario testing.

In line with that, it can be concluded that the use of sensitivity testing is used to measure the stress level of an institution by looking at only one aspect of risk and the desired response is fast and the results are often needed. While the use of scenario testing is used to measure stress levels based on various risk aspects where the simulation of crisis conditions can be historical or hypothetical.

1.4 State Hypotheses and Their Correspondence to Research Design

The hypothesis in this study was built base on describe relevant scholarship are: (i) Real GDP growth, Exchange Rate, inflation, interest rates, and world oil prices have a significant effect on the probability of default Banks in category BGCB 4. (ii) BGCB 4 banks are sensitive to changes (shock) in external variables of world oil prices and macroeconomic variables.

2. Methods

2.1 Data Type, Population, Samples

This study uses a deductive quantitative approach by measuring phenomena with variable accuracy and testing hypotheses. Quantitative research emphasizes more on numerical data that is processed by statistical methods (Suryana,2010). The quantitative approach aims to test hypotheses about certain phenomena by using a more rigid system, closed question format, and using accurate methods (Mack, Woodsong, Macqueen, Guest, & Namey, 2005).

The sample of this research is banks that are included in the category of BGCB 4 or Bank Groups based on Core Capital (BGCC), as regulated in RFSA Number 12/RFSA.03/2021 concerning Commercial Banks which was just released on August 18, 2021. In the rules it is stated that the BGCC grouping is divided into 4 groups as follows:
• BGCC 1 for banks with a core capital of up to IDR 6 trillion.
• BGCC 2 for banks with core capital of more than Rp 6 trillion to IDR 14 trillion.
• BGCC 3 is a bank with a core capital of IDR 14 trillion to IDR 70 trillion.
• BGCC 4 is a bank with a core capital of more than IDR 70 trillion.

Meanwhile, BGCB 4 banks can be equated with BGCC 3 and BGCC 4, which means that BGCB 4 banks are banks with core capital of IDR 14 – 70 trillion and more than IDR 70 trillion. However, to determine the sample, the researcher took a sample of banks with the highest tier of capital.

2.2 Analysis Methods

The data analysis used in this study is an analysis that describes the research problem regarding the relationship of macroeconomic variables to the probability of default in banking in Indonesia, where this study examines the relationship between two or more independent variables on the dependent variable. Therefore, this study uses the method of multiple linear regression analysis, stress testing, and sensitivity analysis. The form of linear regression as shown below.

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + ui$$

2.3 Variables Definitions and Measurement

Variables	Definition	Formula
Probability of Default Y	Opportunity to default on loans that have matured, bankruptcy or debt restructuring caused by debtor difficulties in paying off their obligations which can be obtained from the possibility of the debtor in each bad collectability or default.	$PD = \dfrac{Credit\ Bad\ Quality}{Total\ Credit}$
Real PDB X_1	The market value of all final goods and services produced in an economy during a given period of time measured at constant prices.	$Real\ PDB = \dfrac{Current\ Nominal\ PDB}{CPI\ base\ period}$
Nominal Exchange Rate X_2	Domestic currency in term foreign currency	$NER = IDR\ /USD$
Inflation Rates X_3	The increase in the price of goods and services in general and continuously within a certain period of time.	$Inflation\ Rates = \dfrac{CPIt - CPIt-1}{CPIt-1}$
Interest Rates X_4	the benchmark interest rate set by the central bank	CBI 7 Day Reverse Repo Rate
World Oil Price X_5	Brent Crude is used as a benchmark for world oil prices because of its storage area and wide market around the world.	No formula

3. Results

The implementation of multiple linear regression analysis and the application of the stress test method, begins with a description of the data characteristics of the variables that the researcher uses. The categories of variable descriptions in descriptive statistics that researchers use include the standard deviation, mean, maximum and minimum values. This descriptive calculation describes the related characteristics of the sample that the researcher used. There are details of descriptive statistics that the researcher uses, which can be seen clearly in Table 2.

Table 2. Descriptive Statistic

	GDP	Exchange Rate	Inflation Rates	Interest Rates	World Oil Price
Mean	1.23	11538	5.11	6.37	79.1
Maximum	5.05	14763.3	11.96	9.42	126.3
Minimum	-4.19	8556	1.43	3.50	33.92
Std. Dev.	2.61	2245.9	2.45	1.51	25.00
Observations	54	54	54	54	54

Source: Processed data

The following is an explanation of the results of the regression estimation (Table 3) between the probability of default (NPL) and macroeconomic variables, there are: Real GDP, Exchange Rates, Inflation, Interest Rates, and World Oil Prices.

Table 3. The Results of Estimation

Detail	Name of Samples Bank		
	BRI	**BCA**	**MANDIRI**
Constant	14.49491 (0.0013)*	11.53191 (0.0148)*	15.00810 (0.0453)*
Real GDP	-0.051464 (0.0491)*	-0.058841 (0.0375)*	-0.045093 (0.0309)*
Exchange Rates	1.492958 (0.0009)*	1.130297 (0.0160)*	1.665951 (0.0259)*
Inflation rates	0.000892 (0.9986)	0.022011 (0.6807)	0.036761 (0.6678)
Interest rates	0.084139 (0.2993)	0.140353 (0.1113)	0.283760 (0.0460)*
World oil price	-0.015555 (0.0001)*	-0.016890 (0.0000)*	-0.020560 (0.0014)*

*Note: Bracket ( ) is Std. Deviation; and * Significant at 5%*
Source: Print out processed

The magnitude of the macroeconomic variable shock simulation that will be applied refers to a very severe economic scenario or a very detrimental scenario or can be called a Severely Adverse Scenario which has been determined by the Minister of Finance of the Republic of Indonesia at the time of FSSC (Financial System Stability Committee) 2020. Following are the results of the stress test calculation with reference to the very severe economic scenario, it can be seen in Table 4 below.

Table 4. Stress Test Calculation Results

Name of Banks	Variable's Shock				
	GDP	Exchange Rate	Inflation	Interest Rate	World Oil Price
BRI	14.47%	44.29%	14.49%	14.18%	14.99%
MANDIRI	14.99%	48.33%	14.82%	13.94%	15.66%
BCA	11.51%	34.13%	11.42%	11.01%	12.06%

Source: Processed Data

Furthermore, based on the results of the calculation of the sensitivity of BGCB 4 Banks to the simulation of macroeconomic variable shock scenarios, it shows that the probability of default of BGCB 4 Banks, are BCA Bank, Mandiri Bank, and BRI Bank, all show sensitive results. This means that every time there is a change, either an increase or a decrease in macroeconomic variables, the probability of default which can be reflected by the potential for bad loans, credit quality, and credit growth of the three Banks in the BGCB 4 category always responds and is affected. Although the three BGCB 4 banks are sensitive to macroeconomic changes, for example, during the COVID-19 outbreak, the conditions are like now where there is an economic slowdown, but BCA Bank, Mandiri Bank, BRI Bank, can maintain credit quality so that it does not lead to probability of defaults.

Table 5. Sensitivity Calculation Results

Bank	Real GDP	Exchange Rate	Inflation Rate	Interest Rates	World Oil Price
BRI	-13.0	120.0	6.0	199.5	-27.0
MANDIRI	-26.4	251.2	12.0	384.3	-55.2
BCA	-10.5	95.0	4.8	157.3	-22.1

Source: Processed Data

4. Discussion

Based on the results of the regression estimation as contained in Table 3 above, it can be explained as follows:

4.1. The Effect of Real GDP Growth on the Probability of Default

Sourced from data from research calculations indicate that Real GDP growth has a negative and significant effect on the probability of default of BRI Bank. This result can be interpreted that there is a significant effect of increasing or decreasing Real GDP growth on the Bank's probability of default. According to (Simons & Ferdinand, 2009), the lower the GDP growth, the more difficult it is for the company to generate revenue through sales. Lower income thus increases the likelihood that the company will not be able to meet its obligations.

Real GDP growth can show the overall value of services & goods that can be made in a certain area within a certain period of time, thus Real GDP growth can describe the characteristics of an

overall economic activity. In addition, Real GDP growth can also reflect the income of individuals, both society and companies, so that if there is an increase in Real GDP growth, there will also be an increase in people's income which will also increase their ability to pay and pay off their credit obligations to banks. This will cause potential losses from the possibility of bad credit (probability of default) banks will decrease due to the increase in Real GDP growth and also increase the ability to pay the public (Adicondro & Pangestuti, 2015). The results of this study are relevant to other research results including (Simons & Ferdinand, 2009), (Otani, Shiratsuka, Tsurui, & Yamada, 2009), (Vazquez, Tabak, & Souto, 2012), and (Onder, Damar, & Hekimoglu, 2016) who found that real GDP growth had a significant negative effect on the banking probability of default.

4.2. Effect of Exchange Rate on Probability of Default

Sourced from the calculation results indicate that the exchange rate variable has a positive & significant effect on the probability of default, which means that there is a significant effect of the depreciation or appreciation of the exchange rate or the exchange rate of the IDR against the US Dollar on the probability of default. The existence of fluctuations in the exchange rate or the exchange rate of the IDR against the USD, especially if there is a depreciation event in the Rupiah exchange rate, it will cause an increase in production costs as well as import funding activities. So that this can result in a decrease in income, especially for export and import companies that obtain raw materials from other countries. The cause of the decline in the company's income can cause the company to experience difficulties when returning credit responsibilities to the bank so that it will increase the potential for bad loans in banking.

In addition, according to (Dendawijaya, 2008), if there is a depreciation of the exchange rate, of course it will result in a decrease in the value of a country's currency, where this incident can cause an increase in the value of the debt that must be repaid to the bank. When the exchange rate of the IDR against the US dollar weakens, indicating a positive relationship, when the total currency required to earn US $1 increases, it can also increase the possibility of the NPL ratio because loans obtained from banks are also higher, so that will increase the Bank's probability of default. Where the results obtained by researchers are in line with the results of a study that has been carried out (Simons & Ferdinand, 2009) and (Otani, Shiratsuka, Tsurui, & Yamada, 2009).

4.3. The Effect of Inflation on the Probability of Default

As with the results obtained from the study, it was found that inflation had a positive & insignificant effect on the probability of default. Where the statement can be interpreted if there is no real effect of increasing or decreasing inflation on the probability of default. Where these findings are not in line with the theory and previous research which states that inflation has a significant positive effect on the probability of bank default. The findings of the research results that are not significant are supported by research.

According to (Akbar, 2016), higher inflation will not affect the increase in the potential for bad loans or the probability of default in banks, because the stability of non-performing loans in certain banks is still maintained. The occurrence of these events can reflect when the debtor feels responsible and committed to paying obligations to the bank. Although there is an increase in

inflation, it will not cause an increase in the occurrence of non-performing loans and even bad loans to banks. In addition, the increase in inflation in a relatively short period of course cannot reduce the will of the citizens to continue to meet their needs, thus the effect of the potential for temporary bad loans can be controlled and does not have the potential to become a probability of default for banks. Based on the inflation data used in the research covering the years 2007 to 2021, it shows that inflation tends to decline, especially in 2017 to 2021 where the decline in inflation is very significant. Therefore, due to the decrease in inflation and controlled and anticipated inflation by the Bank and the government, it will not have an impact on the occurrence of bad loans or the probability of default.

4.4. *The Effect of Interest Rates on the Probability of Default*
Similar to inflation, the open rate variable also has a positive and insignificant effect on the Bank's probability of default, which means that there is also no significant effect of an increase or decrease in interest rates on the Bank's probability of default. Where the results of this study are not in line with the specified hypothesis and the results obtained by previous research which states that interest rates have a significant positive effect on the probability of bank default. However, the conclusions of the research obtained are relevant to the results of research (Syahid, 2016) and (Vatansever & Hepsen, 2013) which found that interest rates did not have a significant effect on NPL which led to the probability of default bank.

According to (Syahid, 2016), a bank's probability of default which is reflected by the potential for new bad loans will decrease if there is a decrease in credit interest rates. So that it does not happen directly and automatically, where if in this case the interest rate, namely the CBI 7 DRR decreases, the Bank's probability of default as reflected by the potential for bad loans will also decrease. Instead, the probability of a bank's default or the potential for new bad loans will decrease if there is a good credit risk management so that it can prevent the occurrence of bad loans that lead to the bank's probability of default, and not just because of declining interest rates.

On the other hand, it is also influenced by loan interest rates. A cost of loanable funds (interest rates on loans) is under the influence of the "cost of funds" to provide a fee for public deposits. So if there is a decrease in the "cost of funds", of course it will have an effect on loan interest. As for other aspects (factors) that can also have an influence on loan interest rates, namely the desired margin. The next aspect is the risk premium, which is the type of premium charged to businesses that have a high risk, thereby being exposed to a much higher premium that will increase interest rates to a higher level.

In addition, the Bank was less responsive in responding to the CBI 7DRR reduction through the Basic Loan Interest Rate (BLIR). Basic Bank Loan Interest Rates tend to be slow to adjust to the benchmark interest rate, where Bank's BLIR only decreased by 150 – 325 bps from 2020-2021. BRI Bank will still conduct periodic interest rate reviews, so that the Bank will not be too responsive in adjusting the reduction in prime lending rates. The response of the Bank's BLIR which tends to be slow to the reduction in the CBI 7DRR, interest rate has the potential to cause the probability of default of the BRI Bank cannot be directly controlled through the CBI 7DRR.

These factors can also affect the occurrence of the Bank's probability of default or the potential for bad loans. Thus, there is no significant or direct effect of interest rates on the Bank's probability of default.

4.5. *The Effect of World Oil Prices on the Probability of Default*

Based on the research results, it indicates that world oil prices have a negative and significant impact on the probability of default of BRI Bank. This result can be interpreted that there is a significant effect of an increase or decrease in world oil prices on the Bank's probability of default. According to (Simons & Ferdinand, 2009), oil prices affect the prices of most of the products used by companies. Because it will affect the company's costs and thus the probability of default is negatively related to oil prices.

This is because the decline in world oil prices is usually followed by a weakening in commodity prices. In addition, the decline in world oil prices has the potential to cause an economic recession. Because when world oil prices fall, the prices of commodities such as palm oil and coal will also fall. This is because the price of oil is often the reference for the price of leading export commodities, which in turn will have an impact on the performance of companies engaged in export and import that finance their business activities through bank loans. So when there is a decline in world oil prices, it will reduce commodity prices and cause a slowdown in the overall economy, which in turn will encourage an increase in bad loans to banks as well as reduce credit demand. Meanwhile, on the other hand, banks will also be more careful in extending credit which will cause credit demand and supply to decline, and cause credit growth to be negative (Bisnis.com, 2020). Where the research results obtained are relevant to the results of previous studies that were carried out (Simons & Ferdinand, 2009).

4.6. *Stress Test Analysis*

Based on the results of the regression estimation as contained in Table 4 above, it can be explained as follows:

The stress test method that the researcher uses is the type of calculation of sensitivity test analysis and hypothetical scenario test analysis. In this study, the use of sensitivity testing is used to analyze the sensitivity of the probability of default banking due to credit failure risk behavior in the event of a shock or shock on each macroeconomic variable. While the use of hypothetical scenarios is a simulation of macroeconomic variable shocks originating from events that are considered to be present and in the future.

Table 4 above can be read as described, that when there is a shock to Real GDP growth of -0.4%, the probability of default for BRI Bank is 14.47%, Mandiri Bank is 14.99%, and BCA Bank is 11.51%. Mandiri Bank has the highest probability of default compared to the other two banks at 14.99% and BCA Bank has the lowest probability of default at 11.51%. Meanwhile, when the IDR exchange rate depreciated to IDR 20,000/USD, the probability of default for BRI Bank was 44.29%, Mandiri Bank was 48.33%, and BCA Bank was 34.13%. Where Mandiri Bank has the highest probability of default at 48.33% and BCA's Bank probability of default is the lowest at 34.13%.

Furthermore, when Indonesia's inflation was at the level of 5.1%, BRI's Bank probability of default was 14.49%, Mandiri Bank was 14.82%, and BCA Bank was 11.42%. Mandiri Bank has the highest probability of default at 14.82% and BCA Bank has the lowest probability of default at 11.42%. And when the interest rate is at the level of 3.75%, BRI's Bank probability of default is 14.18%, Mandiri Bank is 13.94%, and BCA Bank is 11.01%. Where BRI Bank has the highest probability of default at 14.18% and the lowest probability of default BCA Bank at 11.01%. Meanwhile, when world oil prices touched USD 31/Barrel, BRI's Bank probability of default was 19.99%, Mandiri Bank was 15.66%, and BCA Bank was 12.06%, where Mandiri Bank had the highest probability of default of 15.66% and Bank's probability of default. The lowest BCA Bank is 12.06%.

Accordingly, of the five simulations of macroeconomic variable shock scenarios, 4 of them indicate that Mandiri Bank has the highest probability of default, while the highest probability of default BRI Bank only occurs in the simulated interest rate shock scenario. Mandiri's Bank high probability of default can be explained by the decline in Mandiri's Bank performance indicators due to the COVID-19 pandemic. The COVID-19 pandemic that has hit Indonesia since 2020 has caused Mandiri's Bank net profit to be eroded quite deeply. In addition, due to declining interest income and increasing reserves to prevent credit risk, fortunately, Mandiri Bank is increasingly under pressure. In 2020, Mandiri Bank could only record a net profit of IDR 17.1 trillion, this number decreased by 37.71% compared to the previous year. Not only that, there was a decrease in Mandiri's Bank net interest margin by 0.91%, changing to the level of 4.65%. Furthermore, there was a decrease in Mandiri's Bank net interest receipts to IDR 59.4 trillion in 2020. The slowdown in the economic system made it difficult for Mandiri Bank to create expansion because the level of credit demand was sluggish and focused more on rescuing debtors who were affected by the COVID-19. As a result, Mandiri's Bank lending activities were depressed by 1.61%. On the other hand, Mandiri's Bank liquidity level is very broad where this statement is shown by the collection of third-party funds which grew 12.24% y-o-y, but credit demand was still low. This will increase bank costs, which means increasing the potential for bad loans that have the potential to become a bank's probability of default in the midst of the COVID-19 pandemic if it is not accompanied by non-selective lending (Hutauruk, 2021).

The different performance achievements of BCA Bank, Mandiri Bank, and BRI Bank also cause differences in the magnitude of the probability of default. In the first quarter of 2021, BCA's Bank net profit led other banks, where BCA Bank managed to record a net profit of IDR 7 trillion, which was supported by placements in corporate bonds. Furthermore, BRI Bank was in the second position with a net profit of IDR 6.86 trillion, and the third position was Mandiri Bank with a net profit of IDR 5.9 trillion.

Meanwhile, in terms of credit quality as reflected by the number of bad loans, Mandiri Bank was in the first highest position, followed by BRI Bank and BCA Bank. In the first quarter of 2021, Mandiri's Bank non-performing loans amounted to IDR 20 trillion, much of which was contributed by non-performing loans in working capital and investment. Furthermore, BRI Bank has bad debts of IDR 9.47 trillion, while BCA Bank has the lowest bad loans of only IDR 8.13 trillion.

The net profit position and total non-performing loans from these three banks can be the reason why Mandiri's Bank probability of default is the highest, then BRI Bank is in second position, and BCA Bank is in the third position, which means the lowest. This indicates that if the number of bad loans owned by a bank increases, it can certainly bring the bank closer to bankruptcy. Meanwhile, in the simulation of the interest rate shock scenario, BRI Bank has the first highest probability of default, then Mandiri Bnak, and the lowest is BCA Bank.

This is very relevant to BRI's Bank *Basic Loan Interest Rate* (BLIR) in 2021, which is the highest for the corporate segment, which is 8.00%, the retail segment is 8.25%, and the micro segment is 14%. Furthermore, Mandiri's Bank prime lending rate is 11.25% for micro loans, 8.25% for retail loans, and 8.00% for corporate loans. On the other hand, BCA's Bank prime lending rate is 7.95% for corporate loans, 8.20% for retail loans, and micro loans. So it can be concluded from the three Banks in the BGCB 4 category that have the highest interest rates, there are, BRI Bank, the higher the interest rate, of course, the more the potential for bad loans will increase which will then lead to a higher probability of default due to the larger number of payments that must be paid by the bank. debtor. In addition, if there is a shock in interest rates such as a decrease in interest rates to the level of 3.75%, it will greatly impact the performance of BRI Bank because of the high BLIR owned.

In line with the findings of the data which indicate that the exchange rate variable has the largest and dominant influence on the probability of default of BGCB 4 banks, the results of the stress test also show this result. Where when a macroeconomic variable shock scenario is simulated, the simulation results of an increase in the exchange rate of the IDR against the US Dollar show the results or the greatest impact on the probability of default of BGCB 4 banks (BRI Bank, Mandiri Bank, and BCA Bank). Especially during the COVID-19 outbreak where the IDR exchange rate was very volatile and depreciated. The IDR depreciated in March 2020 exceeding IDR 16,000 per US Dollar, this depreciation continued until early April 2020 and was at its lowest position on April 2, 2020 with a value of IDR 16,741 per US Dollar.

The exchange rate variable has a very dominant influence on the probability of default of samples bank, because these three banks have high foreign exchange portfolios. BRI Bank had foreign currency loans in 2020 reached IDR 90 trillion and third-party funds (TPF) was IDR 145 trillion, Mandiri Bank has foreign currency loans was IDR 133.2 trillion and TPF was IDR 150.4 trillion, and BCA Bank has loans of IDR 58.9 trillion. With the number of loans and deposits in foreign currency getting higher in the midst of fluctuations and depreciation of the IDR exchange rate and contracted credit demand, it will also increase the potential for the number of bad loans in all banks, and will even lead to the occurrence of the probability of default banking due to the high risk. from portfolios or loans in foreign currencies.

4.7. Sensitivity Calculation
Based on the results of the regression estimation as contained in Table 4 above, it can be explained as follows:

BRI Bank has managed to maintain the quality of loans disbursed in the midst of slowing economic conditions due to the pandemic, where the crisis in 2020 was more severe than the 1998 and 2008 crises, economic growth contracted, the Rupiah depreciated, inflation rose, interest rates continued to change, and world oil prices which have slumped greatly due to disruption of economic activity in the midst of the COVID-19 pandemic. BRI managed to maintain the quality of its credit as reflected in the NPL below 3% or 2.99% at the end of 2020. This is supported by the trend of re-improvement which is increasingly prevalent in conjunction with the recovery of economic activity. Where efforts to improve the quality of BRI's credit were balanced by the growing credit growth exceeding the industry average. In 2020, BRI disbursed loans amounting to Rp938.37 trillion, of which the NPL coverage was 237.73%. Where the amount of reserves is a form of BRI's Bank efforts to maintain performance so that it can always grow sustainably by implementing various precautionary principles and controlling risk appropriately (Wareza, 2021).

Furthermore, Mandiri's Bank probability of default can be shown by the potential for bad loans and credit quality which is also sensitive to economic shocks due to the COVID-19 pandemic. Mandiri's Bank NPL increased to 3.09% in 2020 as a result of the large number of Mandiri's Bank debtors affected by the pandemic, and Mandiri managed to disburse loans of IDR 871.3 trillion. Despite the increase in Mandiri's Bank NPL, there are strategies that have been implemented to suppress NPL so that they do not lead to the occurrence of probability of default, namely through a restructuring program for debtors affected by the pandemic. In addition, Mandiri Bank has also implemented preventive measures, namely through the provision of reserve for impairment losses. To anticipate and maintain the potential for bad loans and credit quality which is considered to be very sensitive during the COVID-19 pandemic, Mandiri Bank has also implemented a provision in lending to targeted customers in a prudent and selective manner with consideration of potential sectors and sectors who performed well during the pandemic.

Not only BRI and Mandiri Bank, the probability of default which is reflected by the potential for bad loans and the credit quality but BCA Bank is also sensitive to macroeconomic shocks. This can be reflected by the quality of credit during the COVID-19 pandemic. At the end of 2020, the NPL of BCA Bank was maintained at 1.6%, of which had disbursed loans of IDR 596.4 trillion. Although current credit still dominates, all other collectability loans have increased due to shocks to economic variables in the midst of this pandemic. The largest increase occurred in doubtful loans, namely 43.39% or IDR 985.06 billion. However, to overcome credit quality problems that can lead to the occurrence of probability of default, this can be overcome by relying on a restructuring program to withstand a higher increase in NPL where the program has a very significant impact on efforts to manage credit quality at BCA Bank (Sudarwan, 2020).

Overall, it can be judged that the performance of banks in BGCB 4 category can still be maintained and solid since the beginning of the COVID-19 pandemic in early 2020 and even until 2021. Where this incident occurred simultaneously with the restoration of the real sector which was considered to have a positive impact on the performance and quality of credit for banks in BGCB 4. Quarter IV-2020 is maintained, where this condition is shown by bank capital

which is considered quite solid and CAR amounting to 23.81%. This statement indicates that banks can offset risk absorption, although there is a slight decline in the intermediation function due to depressed credit growth, on the other hand, third party funds show high growth at 11.11%, y-o-y. In addition, the aspect of banking liquidity is quite adequate as shown by Loans to Deposit Ratio (LDR) was 82.24%. However, it must also be reviewed further regarding the declining credit risk and declining profitability along with economic activities, the impact of which is still being felt due to the impact of the COVID-19 outbreak (Financial Services Authority, 2020).

5. Conclusion and Implications
5.1. Conclusion
Overall, based on the discussion of the results above, it can be concluded that the performance of banks in GBCB 4 can still be maintained and solid since the beginning of the COVID-19 pandemic in early 2020 and even until 2021 at this time. When the current state of the domestic and global economy is affected by the Covid-19 effect, banking stability in general remains stable in the fourth quarter of 2020, which reflects the bank's fairly strong capital and adequate as well as the potential for banks to minimize risk, although there was a slight decline in the intermediation function as a result of depressed credit growth.

5.2. Implications
Furthermore, based on this conclusion, it has implications for: (1) Banking in Indonesia, especially GBCB 4 category, should always control credit growth through more careful and selective credit distribution while still paying attention to the ability of debtors, especially when economic growth declines or in the midst of economic growth so that bad loans that have the potential to become a probability of default can be anticipated; (2) Furthermore, GBCB 4 Banks should maintain the composition of foreign currency assets and portfolios at a certain limit of the total assets owned so that they are not too large and be more careful in distributing foreign currency loans as an anticipation of IDR depreciation so that it does not become a risk and threat that can lead to probability of default at the bank; (3) Banks also need to improve risk management to anticipate the impact of inflation on the occurrence of bad loans which can lead to the occurrence of probability of default; (4) To anticipate the occurrence of bad loans, banks should make appropriate and responsive adjustments and reductions in BLIR which will later be charged to debtors so that they can pay off their obligations in response to the decline in the benchmark interest rate that has been determined by Central Bank of Indonesia; (5) Banks should anticipate the decline in world oil prices by tightening credit distribution to sectors that are directly related to world oil prices so that the decline in oil prices does not have an impact on the occurrence of probability of default on the Bank; (6) Mandiri Bank needs to make efforts to improve its performance and to maintain credit quality so that it does not become bad loans which will then lead to a probability of default considering the high number of Mandiri's Bank loans, especially in the midst of the COVID-19 pandemic where when a simulation of the four shocks scenarios is carried out Mandiri's Bank macroeconomic variables have the highest probability of default; (7) BRI Bank has the highest probability of default when simulating a decrease in interest rates, thus BRI can make adjustments and respond quickly to a decrease in the benchmark interest rate (CBI 7DRR) to a decrease in loan interest rates charged to debtors so that does not lead to the occurrence of probability of default.

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