

Analytic Network Process on Early Warning Indicators for Financial System Stability

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The purpose of this research is to find out the leading indicators of financial crisis from the perspective of expert practitioners, micro and macroeconomic sides; Based on the results of interviews with banking practitioner experts, related to the most important indicators of financial system stability in Indonesia, both microprudential and macroprudential criteria, both aspects are equally considered important and priority. However, from the practitioners' perspective, the microprudential aspect is a more important factor (0.506) than the macroprudential aspect (0.494). Macroprudential and Microprudential policies issued by Bank Indonesia as the central bank with full authority play an important role in maintaining Financial System Stability. The presence of the Financial System Stability Coordination Forum (FKSSK) which consists of several financial authorities is expected to be able to save the economic conditions of the Indonesian nation in the financial sector. For future research, this study is expected to be an initial step. For example, by further expanding the number of expert respondents who are not only from banking practitioners, but also from academics and policy makers.

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INTRODUCTION

Bank Indonesia data shows that the banking sector controls around 79% of the total assets of the entire financial industry. (Indonesian Banking Statistics, 2009). So it can be predicted that if there is a failure in the banking system, it will greatly impact the Indonesian economy. Suseno and Abdulloh (2003) said that banks are business units that depend on the source of funds from the public in their operational activities. So, banks can run so far because of the trust of the community. If this trust declines, it will result in a systemic banking system failure and will lead to a banking crisis.

The financial crisis that hit most of Asia, including Indonesia, in 1997-1998 has made the economy fall sharply. It was initially characterized by the weakening of the Thai Bath exchange rate against the United States Dollar (US) reaching -54%. This financial crisis continued to spread to several Asian regions such as South Korea, Malaysia Singapore and Indonesia. The Won depreciated against the US Dollar by -48%, the Malaysian Ringgit depreciated by -40% against the US Dollar and the Singapore Dollar depreciated by -19%. (Suta and Musa, 2003). Whereas in Indonesia the depreciation of the Rupiah/USD exchange rate was in the range of Rp. 2,500 (1997) and during the crisis period the Rupiah exchange rate slumped to its lowest point reaching Rp.16,500/USD. (Annual Report on the Indonesian Economy 1998/1999, BI). The exchange rate fell so sharply that Indonesia's economic growth was negative -13.1% in 1998. (World Bank).

The exchange rate crisis in 1998 should have been addressed by the banking sector by raising interest rates. *Overnight call rates* increased by 81% and SBI rates moved from 12% to 30%. However, the increase in interest rates could not re-stabilize the Rupiah exchange rate because there was no protection of *unhedged foreign exchange exposure* trying to buy dollars. In the end, the depreciation of the rupiah, the high interest rates, the increasing demand for dollars and the increasing problems of borrowers with large debts made a combination of problems that led to the banking crisis. (Suta and Musa, 2003).

The increase in interest rates by the government to stabilize the Rupiah exchange rate will automatically increase the *cost of funds*, *lending rate*, and *foreign exchange exposure* in the banking sector. This will result in an increase in the *default rate* on bank loans, the liquidity of banks in Indonesia is disrupted and the continuity of

the national payment system is threatened. (Suta and Musa, 2003).

After the financial crisis of 1997-1998, the crisis has now struck again at the economic fundamentals of the superpower United States (US). In 2008, the US was hit by a financial crisis caused by high-risk housing loans. This financial crisis is also known as *subprime mortgages* where the distribution of funds in the US increased rapidly, which in 2002 was below USD200 billion and three years later, in 2005, the distribution had reached USD500 billion. (Indonesia Economic Outlook 2009-2014, January 2009 edition). The impact of this global financial crisis in the US itself was the bankruptcy of several government and private investment companies such as Lehman Brothers, Fannie Mae and Freddie Mac.

The turmoil of the financial crisis in 2008, not only affected the US domestic economy, but impacted almost all countries integrated with this country. Indonesia itself was not spared from the impact of this global financial crisis, the Indonesian capital market was volatile, data published by the Ministry of Finance in January 2010 showed a shock or instability in the capital market in Indonesia. In the fourth quarter of 2008, the Jakarta Composite Index (JCI) fell sharply from 2,830 on January 9, 2008 to 1,155 on November 20, 2008, a drop of more than 50% and was temporarily suspended by the stock exchange authorities. (Indonesia Economic Outlook 2009-2014, January 2009 edition a).

The global financial crisis had an impact on the Indonesian economy, which was reflected in the turmoil in the capital and money markets with a decrease in capitalization value, stock trading volume, foreign ownership in stocks, SUN and SBI and the exchange rate of the rupiah against the US dollar. Another impact was that foreign investors moved their funds to safe investments, the decline in export commodity prices had a negative impact on businesses engaged in exports and caused layoffs. The decline in business activity affected the economy and banking business (Bank Indonesia, 2009 b).

During the economic crisis, banks as financial institutions were more or less involved in the crisis. It is known that one of the banks in America failed to comply with regulations on capital. Violation of this regulation, according to Norgren (2010), is one of the contributors to a crisis. In addition, the many innovations in financial products that are an illustration of financial liberalization are also one of the factors, banking and financial crises are closely interrelated after

financial liberalization (Kamminsky and Reinhart, 1999).

Then after 2 periods of crisis passed by Indonesia, suddenly the crisis hit again. In 2013 the rupiah exchange rate tended to decline, this was followed by *emerging market* countries. The time span of the current crisis is getting shorter, initially 10 years is now only 5 years. The main reason for the weakening of the exchange rate of some *emerging market* countries is the *Quantitative Easing* (QE) policy where the impact is that the capital investment portfolio is drawn to the US, so that the rupiah currency supply is increasing and the demand for US dollars is increasing. As a result, the value of the rupiah currency was eroded and the value of the US dollar dominated again. Some *emerging market* countries affected by this policy include the Brazilian real exchange rate which weakened from the first quarter of 2013 around 2.02 per US dollar to 2.66 per US dollar in the fourth quarter of 2014. In addition, the Indian rupee exchange rate also weakened from around 54.39 per US dollar to 63.33 per US dollar in the 4th quarter of 2014, then the Indonesian rupiah exchange rate weakened in the 1st quarter of 2013 around 9,719 per US dollar to 12,440 per US dollar in the 4th quarter of 2014. And the Turkish lira exchange rate which weakened around 1.82 per US dollar in the first quarter of 2013 to 2.32 per US dollar in the fourth quarter of 2014. (International Financial Statistics, IMF).

Broadly speaking, there are 2 indicators of financial system stability measurement, namely microprudential and macroprudential. Microprudential indicators include: banking capital adequacy ratio, asset quality, sound financial system management, bank income and profits, liquidity aspects, sensitivity to market risk and several market-based indicators. Meanwhile, macroeconomic indicators include: economic growth, *balance of payments*, inflation rate, interest rates and exchange rates, contagion effect, and other factors. In contrast to previous studies related to the measurement of financial system stability, this study will try to see from the perspective of banking and financial practitioners related to which is the most important indicator (*leading indicator*) in measuring financial system stability so that it is expected that we will be able to know what the main indicators of financial stability are from the reality at hand.

The impact of the global financial crisis that threatens the stability of the financial system in Indonesia is of great concern to the government of the

Republic of Indonesia. The Government of the Republic of Indonesia on March 17, 2016 has passed Law (UU) Number 9 of 2016 concerning Prevention and Handling of Financial System Crisis (PPKSK Law). In order to realize financial system stability. The PPKSK Law aims to establish measures to prevent and handle financial system crisis conditions, especially through the coordination of four institutions that are members of the Financial System Stability Committee (KSSK) consisting of the Minister of Finance as Coordinator, Governor of BI, and Chairman of the OJK Board of Commissioners as Members with voting rights, and Chairman of the Board of Commissioners of the Deposit Insurance Corporation (LPS) as a Member without voting rights (Financial Services Authority, 2017: 6).

From this background, there are several research objectives that will be researched by the author: 1). Knowing the *leading indicators* of financial crisis from the perspective of *expert* practitioners, micro and macroeconomic side; 2). Knowing the right recommendations that can be offered in the framework of financial system stability.

RESEARCH METHODOLOGY

Analytic Network Process

Analytic Network Process or ANP is a general theory of relative measurement used to derive composite priority ratios from individual ratio scales that reflect relative measurements of the influence of interacting elements with respect to control criteria (Saaty, 2003). ANP is a mathematical theory that allows one to treat *dependence* and *feedback* systematically that can capture and combine *tangible* and *intangible* factors (Azis, 2003). ANP is a new approach to the decision-making process that provides a general framework for treating decisions without making assumptions about the independence of higher-level elements from lower-level elements and about the independence of elements within a level.

ANP is a development of the Analytic Hierarchy Process (AHP) where levels have a hierarchy. In the AHP network, there are levels of objectives, criteria, sub-criteria, and alternatives, where each level has elements. Meanwhile, in the ANP network, the levels in AHP are called clusters that can have criteria and alternatives in them, which are now called nodes (see Figure 1).

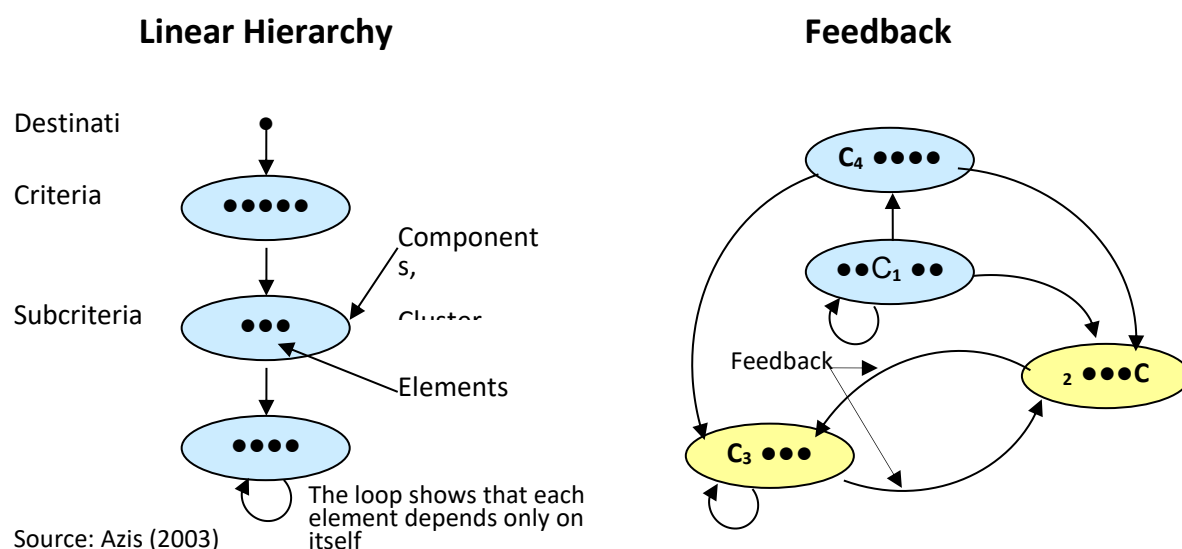


Figure 1. Comparison of Hierarchy and Network

There are three basic principles of ANP, namely decomposition, *comparative judgements*, and composition or synthesis of priorities (Saaty, 1994).

The principle of decomposition is applied to structure a complex problem into a hierarchical framework or network of clusters, sub-clusters, sub-sub-clusters, and so on. In other words, decomposition is modeling the problem into the ANP framework.

The principle of comparative scoring is applied to construct a *pairwise comparison* of all combinations of elements in a cluster with respect to its parent cluster. This pairwise comparison is used to derive the local priority of the elements in a cluster with respect to its parent cluster (Fajariah et al., 2020).

The principle of hierarchical composition or synthesis is applied to multiply the local priorities of the elements in the cluster by the 'global' priority of the parent element, which will result in the global priority of the entire hierarchy and sum them up to produce the global priority for the lowest level element (usually an alternative).

In accordance with its basic principles, the main functions of AHP/ANP are three: structuring complexity, measurement, and synthesis.

1. Structuring complexity.

Saaty sought a simple way to deal with this complexity. So simple that a layperson with no knowledge or training could understand and participate. Saaty found one commonality in a number of examples of how humans have solved complexity over time. That is by hierarchically structuring complexity into homogeneous clusters of factors.

2. Measurement into ratio scale.

Previous decision-making methodologies generally used low-level measurements (ordinal or interval measurements), while the AHP/ANP methodology uses ratio-scale measurements which are believed to be the most accurate in measuring the factors that form the hierarchy. Measurement levels from lowest to highest are nominal, ordinal, interval, and ratio. Each level of measurement has all the meanings that the lower level has with the addition of new meanings. The interval measurement does not have the meaning of ratio, but has the meanings of interval, ordinal, and nominal. Ratio measurements are needed to reflect proportions. To maintain the simplicity of the methodology, Saaty proposed using the ratio scoring of each pair of factors in the hierarchy to obtain (not directly score) ratio scale measurements.

Any methodology with a hierarchical structure must use ratio-scale prioritization for elements above the lowest level of the hierarchy. This is important because the priority (or weight) of an element at any level of the hierarchy is determined by multiplying the priority of the element at that level by the priority of its parent element. Since the product of two interval level measurements is mathematically meaningless, a ratio scale is required for this multiplication. AHP/ANP uses ratio scales at all the lowest levels of the hierarchy/network, including the lowest level (alternatives in the choice model). This ratio scale becomes even more important if prioritization is not only used for choice applications, but for other applications, such as for resource allocation applications.

3. Synthesis.

Synthesis is the opposite of analysis. If analysis means breaking down a material or abstract entity into its elements, then synthesis means putting all the parts together into a whole. Since complex, critical decision situations, or forecasts, or resource allocations, often involve too many dimensions for humans to synthesize intuitively, we need a way to synthesize many dimensions. Although AHP/ANP facilitates analysis, an even more important function of AHP/ANP is its ability to help us quantify and synthesize a number of

factors in a hierarchy or network. No other methodology has a synthesis facility like AHP/ANP.

Procedure for Obtaining the Ratio Scale

Let $A_1, A_2, \dots, A_n$ be the n elements of a matrix in a hierarchy. The pairwise comparison of the elements (A_i, A_j) that we have to perform is represented by $A = (a_{ij})$, an $n \times n$ matrix, where $i, j = 1, 2, 3, \dots, n$. Define a set of numerical weights $w_1, w_2, w_3, \dots, w_n$ that reflect the comparison obtained, so it can be written as follows:

$$A = \begin{matrix} & \begin{matrix} A_1 & A_2 & \dots & A_n \end{matrix} \\ \begin{matrix} A_1 \\ A_2 \\ \vdots \\ A_n \end{matrix} & \begin{bmatrix} w_1/w_1 & w_1/w_2 & \dots & w_1/w_n \\ w_2/w_1 & w_2/w_2 & \dots & w_2/w_n \\ \dots & \dots & \dots & \dots \\ w_n/w_1 & \dots & \dots & w_n/w_n \end{bmatrix} \end{matrix}$$

Since each row is a fixed multiplication of the first row, A has unit rank. By multiplying A and the weight vector w ,

$$Aw = nw \quad (3.1)$$

To get the scale of the matrix ratios, the system below must be solved:

$$(A - nI)w = 0 \quad (3.2)$$

From this it is clear that a nontrivial solution can be obtained if and only if $\det(A - nI)$ vanishes, i.e. the characteristic equation of A . Thus, n is the eigenvalue and w is the eigenvector of A . If A has unit rank, all its eigenvalues are zero, except one. So, the trace of A is equal to n .

If each 'component' entry in A is expressed by a_{ij} , then $a_{ij} = 1/a_{ji}$ (reciprocal property) is satisfied, and also $a_{jk} = a_{ik}/a_{ij}$ (consistency property). By definition, $a_{ii} = a_{jj} = 1$ (when comparing two equal elements). Thus, if we are going to rank a set of n elements, for example, A of size $n \times n$, the number of required inputs (from pairwise comparisons) is less than n^2 ; i.e. it is only equal to the number of components of the sub-diagonal part of A (see Saaty, 1994). Thus, if there are three elements in a given level

of a hierarchy, then only three pair comparisons are required.

However, in general, the exact value of w/w_{ij} is difficult to know because the pair comparisons we make are only approximate, which means that there is still interference. Although the reciprocal property still holds, the consistency property no longer holds. By taking the largest eigenvalue expressed by $\lambda_{\max}$,

$$APwP = \lambda_{\max} \cdot wP \quad (3.3)$$

Where AP is the actual or known matrix (matrix A with perturbations). Although equations (3.1) and (3.3) are not identical, if wP is obtained from solving equation (3.3), the matrix whose components are w/w_{ij} is still a consistent matrix; it is a consistent estimate of matrix A , although AP itself is not necessarily consistent. Note that AP will be consistent if and only if $\lambda_{\max} = n$. As long as the exact value of w/w_{ij} cannot be obtained, which is common in real cases due to the bias in comparison, $\lambda_{\max}$ will always be greater than or equal to n (thus, a consistency measure can be obtained based on the deviation of $\lambda_{\max}$ from n).

When more than two elements are compared, the consistency issue can be related to the transitivity condition: if and , then . It is obvious that in solving

w, the transitivity assumption is not necessarily necessary; the comparisons entered do not necessarily reflect full consistency. However, as shown earlier, the resulting matrix and its vector still remain consistent. It is this consistent vector w that reflects the priority ranking of the elements within each level. Thus, in a standard hierarchy with three levels (objectives, criteria, and policy alternatives), elements at each level are compared pairwise with respect to elements in the level above, and the resulting vector for the base level reflects the ranking of policy alternatives.

Research Steps

ANP has several advantages over other approaches, such as:

1. This approach allows for a holistic and not partial analysis, where all factors and criteria are considered within the framework of the model both in terms of hierarchy and the relationship between one factor and another and between one criteria and another. (Saaty, 2006)

2. This approach requires a deep understanding and experience of the subject to be studied, and does not rely on the ability to organize logically. Feeling and intuition play a very important role to make a decision or to draw conclusions on a problem. (Saaty, 2006)

3. Lower respondent costs, as in-depth interviews are conducted directly with experts who understand the issues well and deeply.

4. Survey implementation that does not require a long time.

Therefore, the respondents to be involved in this study include various parties who understand financial system stability issues in Indonesia, especially from the perspective of banking practitioners. The total number of respondents in this study is 7 people consisting of both conventional and sharia banking practitioners.

Research using the ANP method includes three main phases, namely model construction, model quantification and result analysis. The complete research steps can be seen in Figure 2.

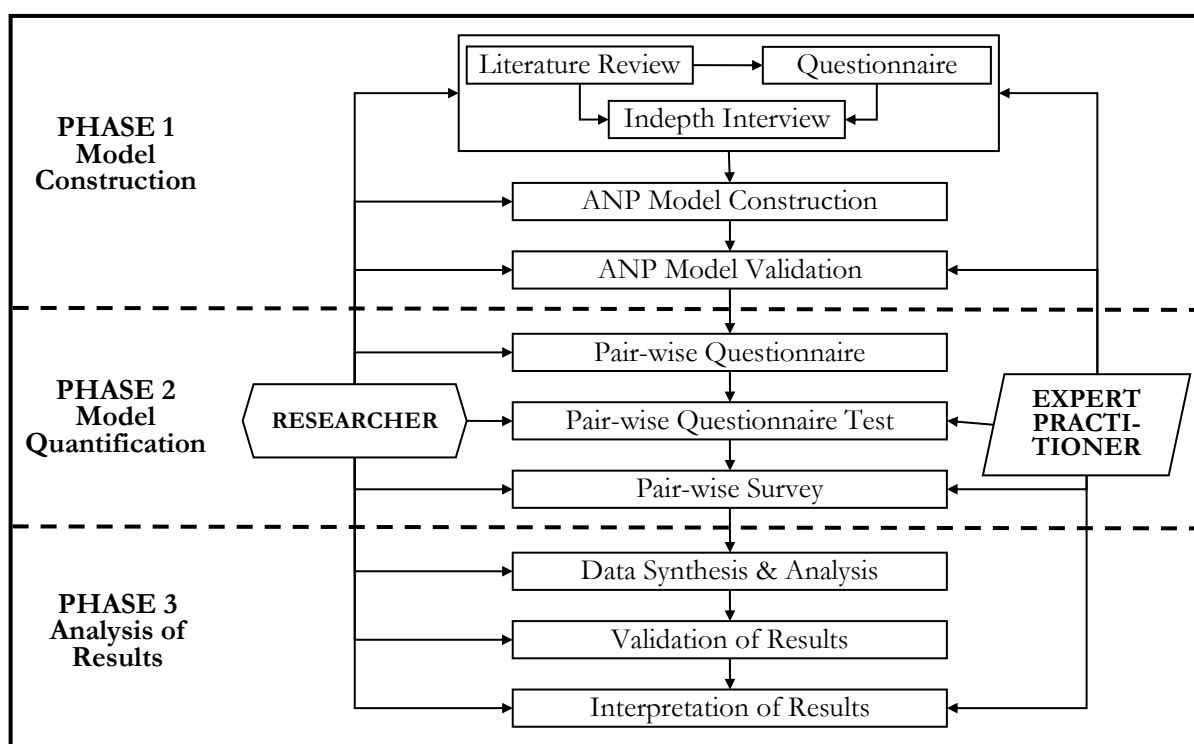


Figure 2. ANP Research Steps

Phase 1 is model construction or decomposition to identify, analyze and structure the complexity of the problem into an appropriate ANP network, which includes: a) literature review, questionnaires and indepth interviews with experts and practitioners to understand financial system stability issues; b) building ANP networks based on the above understanding; c)

validating the designed ANP network to banking experts and practitioners.

Phase 2 is model quantification using pair-wise comparison, which includes: a) designing a pair-wise questionnaire that corresponds to the ANP network designed in phase 1; b) testing the pair-wise questionnaire to potential expert and practitioner

respondents; and c) surveying expert and practitioner respondents to guide them to fill out the pair-wise questionnaire correctly and consistently.

Phase 3 is the synthesis and analysis of results, which includes: a) processing the data obtained in phase 2 with ANP software (superdecisions), synthesizing and obtaining the results, and calculating the geometric mean and rater agreement ; b) validating the results obtained; and c) interpreting the results, analyzing the results, and providing policy recommendations. In practice, the use of ANP methods in research varies greatly in various fields, as stated by [Sipahi & Timor \(2010\)](#), [Lee \(2010\)](#) and [Ho \(2008\)](#).

ANALYSIS

Based on the results of ANP analysis, from the perspective of criteria related to the most important indicators of financial system stability in the opinion of banking practitioners, both microprudential and macroprudential criteria are equally considered important and priority. However, from the practitioners' perspective, the microprudential aspect is a more important factor (0.506) than the macroprudential aspect (0.494). The same thing was also proven in a study conducted by [Diaconua and Oanea \(2015\)](#). [Diaconua and Oanea \(2015\)](#) stated that microprudential criteria are the most important criteria affecting financial system stability. Microprudential criteria is a support tool of the financial system. If this support tool is not good, then the stability of the financial system will falter.

In the MICROPRUDENTIAL aspect, based on the results of interviews with banking experts/practitioners, the 3 (three) most important aspects are Profitability (0.189), Capital & Asset side (0.183) and Asset Quality aspect (0.178). The next important indicators of financial system stability from the microprudential aspect are Liquidity (0.176), Market-based Indicators (0.140) and finally Risk Sensitivity (0.135).

In the Macroprudential aspect, based on the results of interviews with banking experts/practitioners, the 3 (three) most important aspects are Debt aspect (0.225), Macro Indicator (0.222) and Balance of Payment aspect (0.217). The next important indicator of financial system stability from the macroprudential aspect is related to Contagion Effect (0.178) and finally Labor Aspect (0.159).

After knowing the weight of the most important indicators of financial system stability in the opinion of banking practitioners, from the microprudential and macroprudential criteria, then the importance of each aspect will be explained. Of the 3 (three) indicators of CAPITAL & ASSET relevance in financial system stability, the largest weight results are Aggregate Capital Ratio (0.364) and Financial Assets (0.324). Next is Total Banking Loans (0.312).

Furthermore, the amount of bank loans affects the value of capital and assets in the bank. The more the amount of credit provided by the bank will cause the bank to be more risky, so that it will affect the stability of the financial system. This is also evidenced in research conducted by [Diaconua and Oanea \(2015\)](#) and [Koong et al. \(2017\)](#). [Koong et al. \(2017\)](#) examined two types of credit expansion in the banking sector, namely: expansion of the amount of credit for businesses and households. From the study, [Koong et al. \(2017\)](#) proved that the expansion of business credit triggers instability in the financial system because the level of risk that must be borne by banks due to fluctuations in the business sector will be greater. As a result, efforts to expand business credit will be difficult. On the other hand, there is not enough evidence to prove that the higher expansion of household credit has a negative impact on financial stability.

Microprudential aspects

Asset quality in financial institutions, especially the banking sector is one of the important factors in the stability of the financial system in Indonesia. The high level of assets in a bank cannot be used as an indicator that the bank is in a healthy and stable condition, nor can it be used as a guarantee that a country with high total assets in its banking sector is not vulnerable to financial fragility ([Nimmo and Tarassow, 2016](#)). The quality of these assets is the main assessment.

Of the 3 (three) Asset Quality indicators relevant to financial system stability in Indonesia, the largest weight result is the value of NPL or Non Performing Loan (0.377). Next are Debt Equity Ratio or DER (0.345) and Loans in Foreign Exchange (0.278).

NPL (Non Performing Loan) shows the total non-performing loans in banks. The high value of NPLs at a bank indicates that the distribution of loans made by the bank is not running smoothly and this is a bad assessment for the bank because the bank is unable to analyze properly the credit application by creditors. If the NPL value continues to increase, the financial

stability of the bank sector and other financial institutions will be disrupted because they cannot return the debtors' funds channeled to creditors. In addition, the stability of the banking subsector will be disrupted and will further affect the stability of the financial system in Indonesia. In addition, economic conditions and interest rates can also indirectly affect the position of banking NPLs.

Based on data compiled from the Financial Services Authority (OJK), as of May 2018, the position of banking NPLs was at the level of 2.79%. This position is relatively stable compared to April 2018, but is considered to have increased when compared to the end of March 2018, which amounted to 2.75%. The increase in NPLs in May 2018 mostly came from property projects, namely: non-subsidized mortgage loans and apartment loans. There are several things that can be used as a solution to reduce the value of NPLs, including recalculating and restructuring problematic debtors, simplifying terms, extending tenors, lowering the maturity interest rate, and so on. Another important thing that banks need to pay attention to is to apply the principle of vigilance and caution when extending credit to the public.

Apart from NPLs, other factors that have an impact on the level of asset quality are the level of DER and the amount of loans in foreign exchange. DER (Debt to Equity Ratio) DER shows how much the company's debt depends and how much of the company's capital is financed by debt (Kasmir, 2013: 158). The higher the DER value indicates that the company's debt is greater than its capital value or in other words, almost most of the company's capital is debt. Financial institutions (in this case the banking industry) with a high DER value indicate that the bank is very risky. Furthermore, this will have an impact on public judgment of banks and also on public demand for banking products (Nimmo and Tarassow, 2016; Diaconua and Oanea, 2015).

Borrowing at foreign exchange rates is closely related to exchange rate risk. The most dangerous thing for the stability of the financial system is when the exchange rate of the domestic currency against foreign currencies weakens. When the domestic exchange rate depreciates, the bank has to repay the loan at a value greater than the total loan initially or in other words the value of the loan becomes higher. If this happens not only to one bank and occurs continuously, it can cause the domestic currency exchange rate to devalue and will then have an impact on other economic variables, such

as inflation rates, interest rates, income levels, NPLs, and fragility in the monetary sector.

Of the 3 (three) Profitability indicators, their relevance to financial system stability in Indonesia, the largest weight result is the value of ROE or Return on Equity (0.349). Next is the value of BOPO (0.345) and the value of ROA or Return on Asset (0.306).

In addition, BOPO has the next biggest impact on the level of profitability in the financial system in Indonesia, one of which is the banking industry. This relates to the expenses and income received by the bank. The higher the BOPO value indicates that the expenses or costs faced by the bank are greater than the level of income received. Furthermore, this can reduce the profit of the bank. If this happens, the stability of the banking industry and financial system will be disrupted. The same results have been proven in research conducted by Diaconua and Oanea (2015), where an increase in a bank's operating expenses will reduce its profitability and stability.

Of the 4 (four) Liquidity indicators relevant to financial system stability in Indonesia, the largest weight results are Liquid Liability (0.279), and LDR or Loan to Deposit Ratio (0.251). Next is Total Third Party Funds (0.249) and finally Total Central Bank Loans to Financial Institutions (0.222).

Although the economic and financial system is in a normal condition, there are several risks that need to be watched out for because they can disrupt financial system stability. Of the 3 (three) Risk Sensitivity indicators related to financial system stability in Indonesia, the largest weight result is Exchange Rate Risk (0.358). Next are Interest Rate Risk (0.328) and Stock Price Risk (0.314).

Exchange rate risk greatly affects investment selection for investors. Abdrakhmanova et al., (2016) examined the risk of Kazakhstan's currency exchange rate on the banking industry. The KZT currency devaluation event that occurred in previous years affected the demand for currency by investors in the current year, namely more investors investing their money in foreign currencies. If this continued, the situation on the money market would worsen and the value of the domestic currency would deteriorate further. To stabilize the condition, the government took a policy to combine monetary and fiscal instruments. Policies taken by a country with regard to these three indicators can create new problems in several other countries. Therefore, each country should take the right policy to maintain the stability of the national financial system where the policy should be

combined with the right regulatory supervisory structure in controlling the level of liquidity in the banking system. [Kunitsyna and Sitnikova \(2016\)](#) propose a currency risk hedging mechanism to help banks develop finance and improve the quality of their loan portfolio.

In Indonesia, the monetary authority in charge of maintaining exchange rate stability is Bank Indonesia. The task of Bank Indonesia is to maintain the stability of the exchange rate of the rupiah against other foreign currencies and to maintain the stability of the exchange rate which is directly related to the price of domestic goods and services against foreign goods and services ([Simorangkir and Suseno, 2014](#)).

In addition, another task of Bank Indonesia is to maintain monetary stability through the interest instrument. Bank Indonesia has the authority to set the benchmark interest rate which will then be followed by interest rate adjustments at commercial banks. The risks arising from the setting of interest rates can disrupt the stability of the financial system in Indonesia. Monetary policy through the application of interest rates that are too tight, will have an impact on the cessation of economic activity (stagnation), money circulation tends to decrease, so that economic and financial stability will be disrupted.

Apart from that, another risk that must be watched out for because it can disrupt the stability of the financial system is stock price risk. The risk of ups and downs in stock prices is an accumulation of the previous two risks. Fluctuations in stock prices followed by interest rates and changes in currency exchange rates are things that investors consider when making investment decisions. Funds from investors channeled through the purchase of shares will then affect the value of additional capital obtained by the company. Of course, this will also have an impact on the stability of the company.

Of the 3 (three) market-based indicators related to financial system stability in Indonesia, the largest weight result is the value of Sovereign Yield Spread (0.345). Next are Market Price of Financial Instruments (0.334) and Credit Rating (0.321).

The market price of financial instruments affects the attractiveness of the public in choosing financial instruments to invest their funds. The market price of financial instruments is usually influenced by the performance of the issuing company and at the same time represents the value of the issuing company ([Pakpahan, 2010](#)). Comparison of financial instruments usually occurs by comparing the price of financial

instruments such as stocks to the interest rate on bank deposits. This is related to the level of risk that will be borne by the public as investors. The imbalance between the level of profit and the level of investment risk will keep investors away from buying these financial instruments ([Abdrakhmanova et al., 2016](#)).

Credit rating is a standardized assessment of the ability of a country or company to pay its debts ([Pertiwi, 2014](#)). Ratings are issued by rating companies and usually to become a rating company must obtain an official license from the government. Rating is one of the variables considered by investors when deciding to invest in a company ([Manurung, 2008](#)). The information contained in the rating will show the extent of a company's ability to pay its obligations for the funds invested by investors. Companies that have a high rating are usually preferred by investors compared to companies that have a very low rating. Furthermore, this will be a consideration for potential investors to invest their funds. The higher the investment funds that enter the company, the higher the amount of additional capital for the company. The company's activities will be better and economic stability will be maintained.

After explaining various indicators of financial system stability from the Microprudential perspective, the indicators of financial system stability from the Macroprudential side will be elaborated next. Of the 5 (five) Balance of Payment indicators, the largest weight results are Current Account Deficit (0.230), and Adequacy of Foreign Exchange Reserves (0.220). Next are Composition & Duration of Capital Flows (0.198), Export-Import Value (0.192) and Term of Trade/ToT (0.161).

Foreign exchange reserves, also known as International Reserves and Foreign Currency Liquidity (IRCL) or Official Reserve Assets, are all foreign assets controlled by the monetary authority and can be used at any time, to finance balance of payments imbalances and in order to maintain monetary stability by intervening in the foreign exchange market and for other purposes ([Bank Indonesia, 2006](#)). So it can be said that foreign exchange reserves have two functions, namely: to finance balance of payments imbalances and to maintain economic stability. In relation to the balance of payments, foreign exchange reserves are usually used to finance imports and foreign liabilities, while another function to maintain monetary stability is to maintain the exchange rate. The size of a country's accumulated foreign exchange reserves is determined by its trade activities (exports and imports) and capital

flows. Meanwhile, the adequacy of foreign exchange reserves is determined by the amount of import needs and the exchange rate system used.

The balance of export and import activities in Indonesia indirectly affects the stability of the Indonesian economy and financial system. The balance of export and import values can be seen in the TOT calculation, which is the ratio of export value to import value. the greater the TOT value, the greater the export activity against imports and vice versa. A higher import value than the export value indicates that the outflow of domestic currency is more than the inflow of domestic currency. Furthermore, this can lead to the depreciation of the domestic currency against foreign currencies (Simorangkir and Suseno, 2014: 13), which can disrupt economic and financial stability in Indonesia. The result of the TOT calculation is affected by the exchange rate of the domestic currency against the foreign currency.

Macroprudential Aspects

Macroeconomics reflects overall economic conditions on a macro scale. Macroeconomic conditions indirectly affect the stability of the financial system and vice versa. We can see this in one of the cases in the past economic crisis. These two things affect each other. One example can be seen during the economic crisis in the past. Based on the results of this study, there are seven macroeconomic indicators that have a direct impact on financial stability in Indonesia. Of the seven macroeconomic indicators related to financial system stability in Indonesia, the three variables with the largest weight results are Exchange Rate Volatility (0.157), Economic Growth (0.156), and Interest Rate Volatility (0.154). Furthermore, the macro variables with the largest weights are the Fed Interest Rate (0.142), Inflation Volatility (0.137), Household CPI (0.129) and finally the Domestic Interest Rate (0.125).

These macroeconomic variables are interrelated with each other. Currency exchange rate volatility is the macroeconomic variable that has the most influence. Exchange rate volatility is related to the demand and supply of domestic currency against foreign currencies. If the demand for foreign currency is greater than the demand for domestic currency, it will cause the depreciation of the domestic currency. One of the factors that cause greater demand for foreign currency is transactions or activities that cause a lot of domestic currency flows abroad, one of which is imports (Simorangkir and Suseno, 2004: 6). The amount of

domestic money circulating in the community has increased. Over time, when the exchange rate of the domestic currency weakens, this can cause the prices of imported goods (which in turn affects the prices of domestic consumer goods) to soar, triggering inflation, and economic growth will decline, which will lead to a deep economic contraction.

Furthermore, the volatility of the exchange rate will have an impact on the volatility of domestic interest rates. To balance the impact caused by exchange rate volatility, the monetary authority uses an interest instrument. In this case, Bank Indonesia has the authority to determine the benchmark interest rate, which in turn will influence the determination of deposit and lending rates at commercial banks. This is done to maintain currency stability and subsequently impact on the maintenance of financial system stability. When the domestic currency depreciates against foreign currencies, Bank Indonesia tends to raise the benchmark interest rate to control the amount of domestic money in circulation. Subsequently, commercial banks will adjust to the benchmark interest rate.

In addition, the weakening of the exchange rate results in higher foreign debt obligations of companies so that the balance sheets of companies and banks deteriorate (Simorangkir and Suseno, 2004: 3). Indirectly, exchange rate volatility will affect the stability of the financial system. Therefore, in accordance with Law No. 4 of 2003, Bank Indonesia has the duty to safeguard and maintain the stability of the Rupiah. Bank Indonesia not only maintains the stability of the value of the Rupiah so that the price of goods and services (inflation rate) can be controlled, but also to maintain the stability of the value of the Rupiah against foreign currencies.

Diaconu and Oanea (2014) analyzed the relationship between macroeconomic indicators proxied by GDP growth and inflation rate; financial market conditions proxied by BET rate; and banking sector proxied by interbank offering rate for 3 months on financial stability in the banking industry in Romania during the financial crisis. In their research, Diaconu and Oanea (2014) divided into two models, namely on commercial banks and cooperative banks. Only indicators of GDP growth and interbank offering rate for 3 months have a significant impact with a positive direction on financial stability in cooperative banks. In contrast, none of these indicators have a significant impact on the financial stability of commercial banks.

Contagion effect is a phenomenon when a financial crisis that occurs in one country will trigger a financial or economic crisis in another country. Contagion effect on financial system stability is usually related to payment system activities and cross-border financial flows as a result of financial globalization (Trihadmini, 2011). If the smoothness of the payment system is disrupted due to failure to settle, it will cause a contagion effect and subsequently lead to systemic disturbances in the financial system. There are several indicators that can represent the contagion effect. Of the 3 (three) indicators of contagion effect in relation to financial system stability in Indonesia, the largest weight results are Financial Market Correlation (0.358), and Falling Economic Sectors (0.331). Next is Trade Spillover (0.311).

Based on the interviews and data analysis, financial market correlation is the main factor affecting the contagion effect. Contagion effect arises as a consequence of the globalization of the financial system. Correlation between financial markets has an important role in maintaining the smoothness of the payment system. Moreover, in the current condition of financial globalization, where financial markets are connected not only domestic financial markets, but also broader financial markets, namely at the international level (correlation between Indonesian financial markets and international financial markets), both in terms of market participants involved and institutions. The stronger the correlation between financial markets in the world, the higher the chance of contagion effect. To anticipate the occurrence of undesirable things, Bank Indonesia as the central bank needs to increase vigilance in responding to volatility in the nearest regional financial market.

As one of its duties in maintaining the stability of the payment system, Bank Indonesia must strive to realize a good correlation between financial markets, so that the payment system is expected to run smoothly. This is because the risk of contagion effect caused by the payment system tends to increase. One of the efforts to overcome this is that Bank Indonesia developed a real time payment system mechanism called the RTGS (Real Time Gross Settlement) system. It is hoped that this system will be able to further improve the security and speed of the payment system.

As was the case with the global economic and financial crisis that occurred in 2008, falling economic sectors can also trigger a contagion effect from one country to another. With the globalization of finance, the collapse of the economic sector that occurs in one

country will quickly spread to other countries. Therefore, vigilance and anticipatory strategies are needed by each central bank in each country.

In addition to falling economic sectors, the contagion effect can also occur due to the expansion of trade activity (trade spillover) to the international level. From this trade activity, all economic indicators in one country will be transmitted to other countries, such as interest rates, inflation rates, currency exchange rates, and so on.

The management of debt is an important thing to consider in an effort to maintain the stability of the financial system in Indonesia. Moreover, Indonesia has a record of so much debt. The decision to take debt and its repayment strategy must be arranged in such a way as not to disturb the stability of the financial system in Indonesia. The decision to take on debt has both a positive and negative impact on the stability of the financial system in Indonesia.

Furthermore, of the 3 (three) Debt indicators related to financial system stability in Indonesia, the largest weight results are Maturing Debt (0.341), and the Ratio of Foreign Debt to Gross Domestic Product/GDP (0.38). Next is Foreign Loan (0.321).

Matured debt is the amount of debt or obligation that has reached the payment deadline. Matured debt is categorized as current debt. Based on the results of interviews and data analysis in this study, current debt has a strong relationship with maintaining financial system stability in Indonesia. Immediate repayment of maturing debts will help to maintain financial stability in Indonesia.

Another image that reflects debt is foreign loans. There are several factors that are considered to make foreign loans compared to domestic loans, among others: lower repayment costs, the potential to make loans abroad is higher than domestically, diplomatic relations between countries, and so on. Things that need to be considered in making foreign loans are currency exchange rates and loan maturity. Borrowing abroad is allowed if it is profitable and necessary to maintain domestic economic stability. The standard limit of foreign loans allowed so that domestic economic stability is maintained is by comparing with the output generated by the loan activity. This is proxied by the value of GDP, namely by calculating the ratio of foreign debt to Gross Domestic Product / GDP. The limit of foreign loans or debts allowed is not greater than the value of GDP, so that economic stability is maintained.

The last but not least is related to labor aspects. Of the 3 (three) Labor Aspects indicators related to financial system stability in Indonesia, the largest

weight results are Employment Rate (0.351), and Labor Market (0.346). Next is the value of Average Annual Wages (0.304).

Table 1. Complete Eigenvalue Weighting Results

CRITERIA	SUMMARY		
1. Microprudential	0.506		
2. Macroprudential	0.494		
MICROPRUDENTIAL		MACROPRUDENTIAL	SUMMARY
1. Capital & Asset	0.183	1. Balance of Payment	0.217
2. Asset Quality	0.178	2. Macro Indicator	0.222
3. Profitability	0.189	3. Contagion Effect	0.178
4. Liquidity	0.176	4. Debt	0.225
5. Risk Sensitivity	0.135	5. Labor Aspect	0.159
6. Market based Indicator	0.140	BALANCE OF PAYMENT	
CAPITAL & ASSET		1a. Current account deficit	0.230
1a. Aggregate Capital Ratio	0.364	1b. Adequate foreign exchange reserve	0.220
1b. Total of Bank Credit	0.312	1c. Term of Trade (ToT)	0.161
1c. Financial Asset	0.324	1d. Capital flow composition & period	0.198
ASSET QUALITY		1e. Export import	0.192
2a. Non Performing Loan	0.377	MACRO INDICATOR	
2b. Debt Equity Ratio	0.345	2a. Economic growth	0.156
2c. Loans in Foreign Exchange	0.278	2b. Inflation rate volatility	0.137
PROFITABILITY		2c. Interest rate volatility	0.154
3a. ROA	0.306	2d. Exchange rate volatility	0.157
3b. ROE	0.349	2e. Household CPI	0.129
3c. BOPO	0.345	2f. Domestic interest rate	0.125
LIQUIDITY		2g. The Fed rate	0.142
4a. LDR	0.250	CONTAGION EFFECT	
4b. Central Bank Credit on FI	0.222	3a. Trade spillover	0.311
4c. Liquid Liability	0.279	3b. Financial market correlation	0.358
4d. Total of TPF	0.250	3c. Falling economic sector	0.331
RISK SENSITIVITY		DEBT	
5a. Exchange Rate Risk	0.358	4a. Foreign loans	0.321
5b. Interest Rate Risk	0.328	4b. Due debt	0.341
5c. Stock Price Risk	0.314	4c. Foreign debt ratio on GDP	0.338
MARKET BASED INDICATOR		LABOR ASPECT	
6a. Market price of financial instrument	0.334	5a. Employment rate	0.351
6b. Credit rating	0.321	5b. Average annual wages	0.304
6c. Sovereign yield spread	0.345	5c. Labor market	0.346

The labor aspect has an important influence on the management of investment and financial funds. Employment rate and unemployment rate show how much of the labor force is working and how much of the labor force is not working (unemployment rate). A high employment rate indicates that the number of jobs is able to absorb the number of workers optimally. Conversely, a high unemployment rate indicates that the number of jobs is able to absorb the number of available workers optimally. There are many factors

that influence this, including: insufficient number of jobs, unqualified labor, and so on. A high unemployment rate indicates that the level of household income will be reduced and may even be zero. As a result, this can disrupt household consumption patterns, which in turn will disrupt a country's total production level. In addition, a high unemployment rate will also trigger a high crime rate. The implication of these two conditions is that it will indirectly disrupt the stability of a country's economy

and financial system. The same thing is also explained by Moinescu (2008) in his research, where Moinescu sees a significant positive impact between the unemployment rate and banking stability in Romania. An increase in the unemployment rate will cause a contraction in the income level and consumption capacity of households. Furthermore, this will trigger an increase in the default rate and increase non-performing loans (NPLs) in the banking industry.

Labor demand and supply in the labor market will affect the determination of the average annual wages value. If the demand for labor is greater than the supply of labor, it will increase the value of average annual wages and vice versa.

The following are the results of the complete eigenvalue weights related to the most important indicators of financial system stability in Indonesia according to the opinions of banking practitioners, both microprudential and macroprudential criteria along with details of each aspect.

CONCLUSIONS

Based on the results of interviews with banking practitioner experts, regarding the most important indicators of financial system stability in Indonesia, both microprudential and macroprudential criteria, both aspects are equally considered important and priority. However, from the practitioners' perspective, the microprudential aspect is a more important factor (0.506) than the macroprudential aspect (0.494). In the MICROPRUDENTIAL aspect, based on the results of interviews with banking experts/practitioners, the 3 (three) most important aspects are Profitability (0.189), Capital & Asset side (0.183) and Asset Quality aspect (0.178). The next important indicators of financial system stability from the microprudential aspect are Liquidity (0.176), Market-based Indicators (0.140) and finally Risk Sensitivity (0.135).

In the Macroprudential aspect, based on the results of interviews with banking experts or practitioners, the 3 (three) most important aspects are Debt aspect (0.225), Macro Indicator (0.222) and Balance of Payment aspect (0.217). The next important indicator of financial system stability from the macroprudential aspect is related to Contagion Effect (0.178) and finally Labor Aspect (0.159). From each sub-criteria, some important indicators of the MICROPRUDENTIAL aspect are: Aggregate capital ratio, Non-Performing Loan (NPL) ratio, Return on Equity (ROE), Liquid liability, Exchange rate risk and Sovereign yield spread. Meanwhile, some important

indicators from the macro-prudential aspect are: Current account deficit, Exchange rate volatility, Financial market correlation, Debt maturity and Employment rate.

From the research findings, interested parties, both Bank Indonesia, the Financial Services Authority and the Deposit Insurance Corporation, need to pay close attention to the indicators that are considered the most important from the perspective of banking and financial practitioners in general. Thus, policies to be taken in the future can be appropriately and quickly executed.

Macroprudential and Microprudential policies issued by Bank Indonesia as the central bank with full authority play an important role in maintaining Financial System Stability (SSK). The presence of the Financial System Stability Coordination Forum (FKSSK) which consists of several financial authorities is expected to be able to save the economic conditions of the Indonesian nation in the financial sector.

The synergy of Micro and Macroprudential Policies is also expected to continue to be able to maintain inflation that can provide economic stability. Although in the process, Macroprudential Policy cannot be separated from Monetary Policy in Bank Indonesia as well. Moreover, synergizing with Microprudential Policy, in maintaining Financial System Stability (SSK) will be healthier to anticipate various economic turmoil or global crises that occur unexpectedly in the future

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