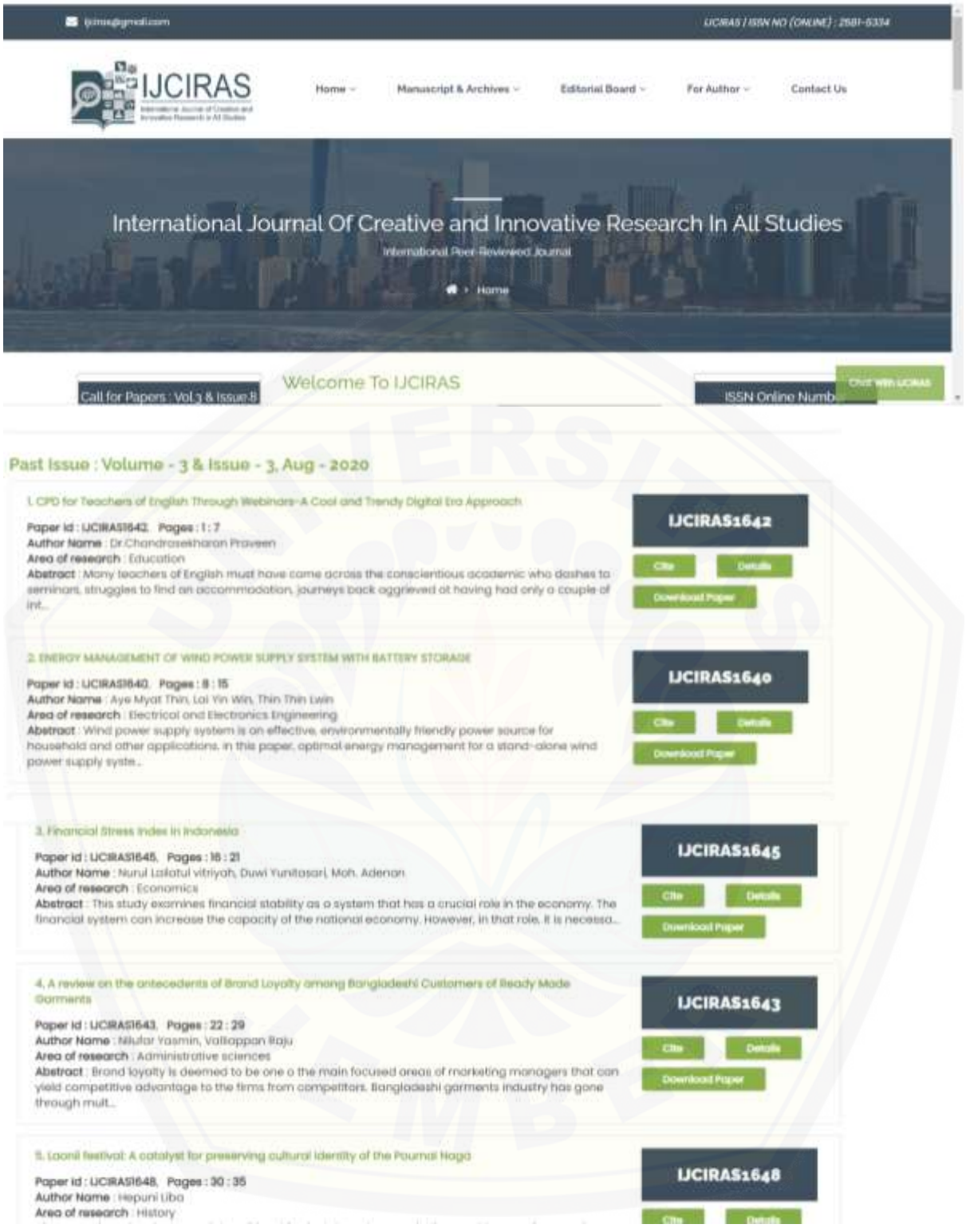

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Financial Stress Index in Indonesia

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Abstract

This study examines financial stability as a system that has a crucial role in the economy. The financial system can increase the capacity of the national economy. However, in that role, it is necessary to remember that financial instability occurrence results in systemic risk. In preventing or reducing the risk of the possibility of financial system instability, it requires identification using several indicators of financial system stability. The formation of the Financial Stability Index in Indonesia, which was built based on the development pattern of two elements, namely banking and money markets, is one of the applicable ways to measure financial system stability. Based on the results of the analysis using explanatory factors and index calculation of the forming indicators of the financial system stability and the formation of Financial Stress Index on inflation, the Financial Stress Index can be used to measure the stability of the financial sector in Indonesia.

Keywords: Financial system stability, Financial Stress Index, Inflation

1. INTRODUCTION

In maintaining financial system stability, macroprudential policy is needed in resolving systemic risk managed by Bank Indonesia as stipulated in Law of the Republic of Indonesia No. 21 of 2011 concerning the Financial Services Authority (OJK). It is in line with the shifting of the bank's regulation and supervision (microprudential) function to the financial services authority. The supervision of macroprudential is a government policy to maintain the financial system stability and provide an efficient and effective conditions since macroprudential does not only include financial institutions but also other elements of the financial system. Macroprudential policy is defined as a policy that aims to limit the risks and costs of the systemic crisis (Galati, 2011 in Gunadi, 2013). Systemic risk is defined as potential instability in consequence of contagion occurring in some or all financial systems due to the interaction of size, complexity, the connection among institutions, and/or money markets (interconnectedness). It also includes the tendency for excessive behavior of financial actors or institutions to follow the economic cycle (procyclicality) based on the definition by Bank Indonesia Regulation (PBI) No 16/11/PBI/2014 concerning macroprudential regulation and supervision.

The phenomenon of the crisis in Indonesia that occurred during 1997-1998 and 2008 might generate its own trauma in a very short time but required a great deal of time and heavy cost in recovering the country's economy as before. The financial system is an integrated system by which the instability arising from one system will impact on other sectors. Thus, the information related to financial system stability is essential in determining the focus of policy when the financial system conditions are vulnerable to crisis. To prevent or reduce the risk of the possibility of financial system instability, it requires identification in the form of financial system stability indicators. The formation of a Financial Stability Index in Indonesia is based on a development pattern of two elements, namely banking and money markets. One of the applicable ways to measure financial system stability is the Financial Stress Index, which is a recognizable formation of financial system indicators to avoid risk. In the case of systemic risk in the financial system occurs, it will reduce the level of public trust in the financial system and increase uncertainty in the financial system. According to Group of Ten in Harun (2015), the negative effect of systemic risk on the economy can be indicated from the

increase in the number of error in the payment system, credit flow, and impairment in assets.

2. LITERATURE REVIEW

Financial stability consists of various institutions in an economy that assist in intermediating savings owned by any person with someone else's investment (Mankiw, 2006). It becomes a crucial part in supporting the real sector in development (Todaro, 2006). In financial institutions, Gunadi (2013) employed the trinity of financial system stability to describe conditions that enable the financial system to work effectively and efficiently, as well as to be able to survive in the internal and external shocks, so that the allocation of funding or financing can contribute to the growth and stability of the national economy. Pressure, intermediation, and efficiency become the main objectives in the indicator selection.

Financial system stability index, formed from banking pillars based on the trinity of banking financial system stability, i.e., pressure, intermediation, and efficiency with NPL (Non-Performing loan), Delta AL-GWM (Liquid Assests-Minimum Statutory Reserves)/TA (Total Asset), CAR (Capital Performing Loan), and ROA (Return On Assets) indicators in terms of pressure; spreads as credit, LDR (Loan to Deposit Ratio) gap, and credit/GDP gap in terms of intermediation; and NIM (Net Interest Margin), BOPO (Operational Payment and Operational Income), CIR and OHC/PO in terms of efficiency. Meanwhile, the financial system stability index of the pillars of money market stability index has the forming indicators of the PUAB-DF (Interbank Money Market- Deposit Facility) Rate, CSPI (Composite Share Price Index), Government Bonds, as well as USD, IDR, and CDS exchange rates.

Various studies have developed an early warning system, one of which is the financial stability stress index. In general, the financial stress index is an index built by one or more stress variables in the financial sector. The components for building financial stress index vary, depending on which sub-sector is the most dominant in a country's financial sector (Asfari, 2015). Several studies have measured and analyzed financial stability, as seen from the stress caused. Illing and Liu (2003) revealed that financial system stability could be identified from the stress proxy by creating financial stress index, and believing that stress on the financial sector is one of the measuring instrument of the financial sector stability. Albulescu and Goyeau (2010) opined that stress index testing techniques allowed the identification of potential shocks, and predicted the financial system resilience.

The most commonly used indicators of financial stress index formation include the banking sub-sector represented by non-performing loan variables, the stock market represented by the idiosyncratic stress variable, the bond market represented by the risk spread, and foreign exchange market represented by the CMAX variable. The rate on the financial stress index can be formed from various types of indexes, i.e., composite index, Z-index, and fiscal index, which differ in terms of formation method. Asfari (2015), in his research, employed the fiscal index because the pension fund sub-sector had a financial stress index. It was caused by the existence of Non-Bank Financial Intermediaries (NBFIs) of pension funds as a government policy, which could affect not only financial sector stability but also fiscal sector stability.

3. RESEARCH METHOD

This research was a quantitative and descriptive study which aimed to identify the most appropriate composition, which reflected financial system stability through the financial stress index, as the indicator of financial system stability variables. This research also aimed to observe the index movement using secondary data with monthly time series from January 2015 to December 2019. Meanwhile, the data sources were obtained from the Financial Services Authority and Bank Indonesia. The initial step taken was by conducting factor analysis on the indicators of financial system stability to determine the indicator variables that would be formed to be financial stress index to be analyzed on variables representing the proxy of non-bank financial institutions. The second step was creating a financial system stability index using the financial stress index, which was generally constructed by one or

more stress variables from different financial sectors by using a composite index at two stages.

The first stage was by using factor analysis as the process of finding interrelationship among a number of independent variables so that they can be reduced fewer than the initial variables (Santoso, 2003). Correlation is the main principle in factor analysis, so the assumptions to fulfil, concerning correlation according to Santoso (2003), are Kaiser Meyer Olkin (KMO) Test, Barlett Test of Sphericity, and Measure of Sampling Adequacy (MSA).

The next step was calculating each index in each variable with the following formula:

$$I(i) = \frac{\mathrm{X(i)} - \mathrm{X(i)min}}{\mathrm{X(i)max} - \mathrm{X(i)min}}$$

Remarks:

I(i) : the index of variable i
X(i) : the value of variable i
X(i) min : the smallest value of variable i
X(i) max : the largest value of variable i

In the next stage, the financial stress index was a composite index of several variables combination that had been formed in one factor. The formula employed was as follows:

$$FSI = \frac{1}{n}(X(i) + X(j) + \cdots + X(n))$$

Remarks:

FSI : financial stress index
n : number of variables
X(i): the value of variable i
X(j): the value of variable j
X(n): the value of variable n

FSI was one of the correlation measure indexes utilized to measure the correlation of two or more variables with Pearson correlation numbers ranged from -1 to 1. The next step was forming an index and financial stress index from the composition of FSI 1, FSI 2, and FSI 3, then creating the movement of FSI 1, FSI 2, and FSI 3 towards inflation.

This study employed the formation indicators of financial stress index through factor analysis, which was decomposite indicators of financial stress index, which served as an independent variable. The variables utilized in the factor analysis of this study were as follows:

Indicator		Ratio	Data source
LDR	Loan-to-Deposit Ratio Indicator of Financial System Stability	% Percent	IFSS
BOPO	Operational Cost and Operating Income Indicator of Financial System Stability	% Percent	IFSS
ROA	Return On Assets Indicator of Financial System Stability	% Percent	IFSS
CSPI	Composite Stock Price Index Indicator of Financial System Stability	% Percent	IFSS
NPL	Non-Performing Loans Indicator of Financial System Stability	% Percent	IFSS
CAR	Capital Adequacy Ratio Indicator of Financial System Stability	% Percent	IFSS
NIM	Net Interest Margin Indicator of Financial System Stability	% Percent	IFSS
Government Bond	Government Bond Indicator of Financial System Stability	% Percent	IFSS
IDR/USD Exchange Rates	IDR exchange rate to USD Indicator of Financial System Stability	% Percent	IFSS

Table 1. Indicators Financial Stress Index

After analyzing the factors, several composites of factor from the 9 (nine) formation indicators of the financial stress index will be formed. Then, the formed factors consist of several variable decompositions.

4. RESULTS AND DISCUSSION

The indicators of financial system stability use nine formation indicators through the stage of explanatory factor analysis with the fundamental principles that should be fulfilled: The KMO (Kaiser Meyer Olkin) test, the correlation between independent variables with the KMO (Kaiser Meyer Olkin) test, should be significant, which is above 0.50 used to measure the sampling adequacy.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.503
Bartlett's Test of Sphericity	Approx. Chi-Square	343.786
	df	36
	Sig.	0

Table 2. KMO and Barlett's Test

With the KMO MSA value is higher than 0.50, the factor analysis technique can be continued. Based on these data, the KMO MSA of (0.503), it can be continued using the factor analysis, the value of Barlett's (sig) is less than 0.05 then it can be continued (0,000).

There are three component factors of formation indicators. Those are: the formation components of financial stress index 1 consist of LDR, CSPI, CAR and Government Bonds, the composition of financial stress index 2 consists of ROA, CAR, and NIM, and the composition of financial stress index 3 is NPL, NIM and IDR/USD Exchange Rate.

Component Matrix			
Component			
	1	2	3
LDR	0.859	0.01	0.032
BOPO	-0.142	0.409	-0.415
ROA	-0.281	0.512	0.353
CSPI	0.832	-0.25	-0.143
NPL	-0.37	-0.234	0.552
CAR	0.533	0.625	0.425
NIM	-0.151	0.706	0.567
EXCHANGE RATE	0.271	0.368	0.602
BOND	0.927	-0.022	0.186

Table 3. Component Matrix

There are three component factors of formation indicators. Those are: the formation components of financial stress index 1 consist of LDR, CSPI, CAR and Government Bonds, the composition of financial stress index 2 consists of ROA, CAR, and NIM, and the composition of financial stress index 3 is NPL, NIM and IDR/USD Exchange Rate.

Formation composition of the financial stress index 1 consisting of LDR, CSPI, CAR, and Bonds is an indicator composition formed from banking factors in terms of intermediary of Loan to Deposit Ratio (LDR), on the composition pressure derives from the Capital Adequacy Ratio (CAR). The money market stability index, the components formed, are derived from the Composite Stock Price Index (CSPI), and Government Bonds. In FSI 1, the highest stress was occurred in 2017 in the fourth quarter, i.e., from 0.02 to 0.038, then decreased in 2018, and the second quarter decreased to 0.028, then reoccurred in 2019 in the third quarter of 0.043 and increased in the fourth quarter of 0.056. This happened because of the easing of aspects of lower lending rates, longer credit terms, and cheaper loan approval fees (Media, 2018). This is due to an external side, i.e., US global trade which affects the global investment climate system (Setiawan, 2017)

Financial Stress index 2 is in the form of a pressure index from banks, i.e., Return on Assets (ROA), and Capital Adequacy Ratio (CAR) as well as in terms of banking efficiency Net Interest margin (NIM). In FSI 2, stress occurred in 2019 in the third quarter of 0.019, increasing in the fourth quarter of 0.038, this was due to weak global demand which resulted in credit channelling at 6.08% in 2019 along with the

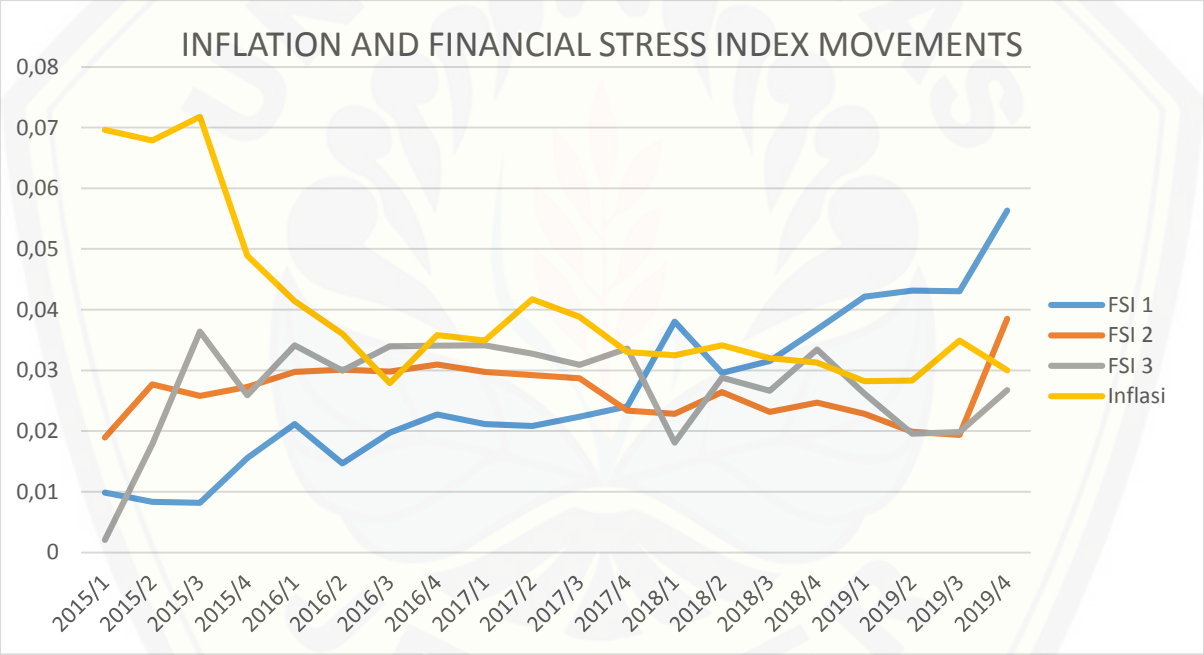
slowing demand for global commodities (Walfajri, 2020)

In the composition formation of the financial stress index 3 were formed from the banking pressure of Non-Performing loans (NPL), Net Interest margin (NIM), in terms of efficiency, and the exchange rate from the money market stability index. In FSI 3, stress occurred in 2015 2015 (CEIC and BI, 2015) Based on the formation decomposition, the third movement of the Financial stress index based on this composite and inflation can be seen in Graphic 1 as follows: Graphic 1. *Financial Stress index*

in the first quarter of 0.0020 up to the third quarter of 0.036. This is due to an increase in credit risk from NPLs that increased and caused economic conditions that tended to slow down, the development of NIM recorded higher than previously encouraged a decrease in the BI Rate so that it was responded by the bank to reduce in deposit interest rates, as well as the weakening rupiah exchange rate in early May

5. Conclusion

This study aims to find the forming composition factors of the financial stress index resulting in three factors—the components forming the financial stress index 1 consist of LDR, IHSG, CAR, and Bonds.



Graphic 1. Inflation and Financial Stress Index Movements as Macroeconomic Variables

The composition of indicators formed from banking factors of the intermediation, Loan to Deposit Ratio (LDR) on the forming composition pressure is derived from the Capital Adequacy Ratio (CAR) and the money market stabilization index formed by the CSPI and Government Bonds. The composition of the financial stress index 2 consists of ROA, CAR and NIM formed by a pressure index from banks, i.e., Return On Assets (ROA), and Capital Adequacy Ratio (CAR) as well as Net Interest Margin (NIM) in terms of banking efficiency. Furthermore, the composition of the financial stress index 3 comprises of the NPL, NIM, and IDR/USA exchange rate formed by Non-Performing loan (NPL) banking pressure, Net Interest margin (NIM) regarding the efficiency, and the USD/IDR exchange rate from the financial market stability index. The third, the Financial Stress Index, can be used to monitor the development of financial sector stress in Indonesia. Each financial stress index

has a composition from the banking sub-sector. Therefore, it is highly relevant to use as the banking sub-sector still dominates the financial sector in Indonesia.

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