INVESTIGATION OF EXTERNAL AND INTERNAL SHOCK IN THE STABILITY OF INDONESIA'S FINANCIAL SYSTEM

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Abstract

The objective of this research is to develop a financial system stability index and analyze the internal and external factors that we expect to affect the stability of the Indonesian financial system. We measured the single model of financial system stability index (FSSI) from year 2004M03 to2014M09 in Indonesia, and compiled a single quantitative measure based on aggregate internal factors and external factors to capture and predict the shocks of the financial system stability. Stability parameters were composed of composite indicators on different bases. In addition, we developed a comprehensive index component associated with the relevant market conditions, including banking soundness index, financial vulnerability index, and regional economic climate index. Results stated that US economic growth and economic growth of ASEAN countries positively affected financial stability. In addition, current account, exchange rate, inflation, interest rate were shown to negatively affect financial stability. The results of this study imply that internal factors have a strong influence on the financial stability. Therefore, the central bank should give a fast and correct response to the changes of external and internal financial environment, especially for internal factors through monetary policy.

Keywords: Financial System Stability Index, Banking Soundness Index, Financial Vulnerability index, Regional Economic Climate Index

1. INTRODUCTION

Experience has taught us that financial crises tend to come about once a decade. The financial system's stability is therefore of utmost importance, as it is the main pillar in the economic recovery of the country. The financial crisis provides valuable lessons about how monetary policy affects the financial system, and on how banking institutions will respond to these policies either at the same time or gradually. Besides that, the weaknesses of a particular country's financial system may have a wider effect on the stability of the international financial system, due to increasing integration in the global financial environment and technological innovation.

There is a global consensus about the deep understanding that countries should have for detecting negative shocks in the financial market. Accordingly, it has been suggested that a stronger and more stable financial system be developed to prevent damage from financial risks. A broader horizon of indicators should monitored and assess the overall financial stability. Caruana (2010) has suggested a basic policy framework of management and monitoring for financial stability, reinforced with four basic principles known as "builder blocks," namely: (i) integration of basic and basic monetary reprimand; (ii) A combination of macroprudential and / or microprudential supervision of prudential regulation; (iii) Institutional Framework for prudential regulation; and (iv) International cooperation.

This framework is built for detecting potential threats against financial stability and taking correct macroprudential steps. The policy is not just for monitoring and assessing financial stability, but is also highlights the possibility of upcoming future financial system development activities. However, the early warning system should be used only as a starting point; the financial stability analysis contains more detail, involving the assessment of all sources of risks and mitigation for vulnerabilities of the banking sector or, more broadly, the financial sector (Cihák 2006; Schmieder et al, 2011; Buncic and Melecký 2012; Jakubík and Sutton, 2011).

In the case of Indonesia, the regulator is intensifying research and monitoring of the potential risks and negative shocks by identifying, monitoring and valuing banking institutions, non-

bank institutions, and the corporate sector. The aim of these activities is to initiate and establish the policy, regulate the institutions, and set up an additional supervision rule for supporting the effectiveness of supervision. Another objective is to develop the stability of the financial system, making it more effective and efficient, and more resilient against any negative shock – in this way, the allocation of financing sources can contribute to economic stability.

The stability of the financial system depends on the response of the central bank through monetary policy, both macro- and micro-prudential. For instance; capital adequacy, liquidity management and credit of banks. To strengthen the bank's capital, the central bank improves the requirement of Adequacy Ratio (CAR) to anticipate the impact on the economy of banking problems. Meanwhile, to overcome the increase in liquidity stress and at the same time to improve the quality of bank liquidity management, the regulator issues regulations such as the secondary reserve minimum, reducing the lending deposit ratio (LDR). In addition, the policy for the importance of credit bank is the improvement in the loan-to-value (LTV) policy. With this policy, the equity of home financing, opportunity of home ownership, the consumer protection is in place. It causes the property sector to become sounder, and to grow. (Bank of Indonesia, 2014).

In line with this issue, it can be explained that Bank of Indonesia (central bank) supervise and control the financial stability, and inherently the monetary stability. The main objective of the policy implemented by the central bank is to avoid and protect institutions from systematic risk. Maintaining an intermediary function is good for achieving the financial stability, and for the smooth functioning of the exchange or payment systems.

Financial stability and monetary stability are like two sides of the same coin. Monetary policy will significantly affect financial stability, and vice versa. Financial stability is the pillar for the effectiveness of monetary policy; the financial system is one of the transmitters of monetary policy, therefore when uncertainties in the financial system arise, the transmission of monetary policy will not run normally. On the other hand, instability in monetary policy will affect the financial system's stability, because the financial system does not function well.

Integrated supervision between bank, non-bank and capital markets exists in order to easily measure and mitigate systemic risk. A banking system model is continuously developed as a tool of the macroprudential policy. At the same time, the landscape of the financial system is developed that encourages greater protection for economic sectors. Thus, research on Indonesia's financial system stability is very important to support the financial services supervisory framework and guarantee schemes.

The current study of the stability of financial system in Indonesia is more focusing on separated issues and limited. This study proposes a single model of Indonesia's financial system stability index or FSSI. Besides being an early warning system and testing equipment, the developed index is a single quantitative measurement based on aggregate internal-external factors to capture and predict shocks to the financial system stability. Therefore, there is reasonable to address; 1) How to formulate an empirical model within the framework of financial system stability index? 2) How does the transformation of financial system stability to an index scale? 3) How to determine the shock effect of external and internal factors of resilience of the financial system?

In this study, the stability parameters were composed of composite indicators on different bases. We developed a comprehensive index component associated with the relevant market conditions including BSI (banking soundness index), VFI (vulnerability financial index) and RECI (regional economic climate index). The second step is the analysis of macroprudential indicators estimate the financial stability index dynamically, as well as the evolution of Indonesia's financial system stability index over the last 10 years.

Based on the background and the formulation of the problem, the purpose of this study is as follows: 1) To measure the financial system stability index time variation, 2) To measure the scale of the financial system stability index, and 3) To estimate the effect of external and internal factors on the stability of the financial system.

The rest of the discussion is organized as follows; 2) Literature review, in which we discuss monetary and financial system stability, as well and determinants of financial system stability; 3) Research method, in which we discuss the specification model, measurement and method analysis; 4) Result and discussion, in which we discuss in detail the economic implications, and 5) Conclusion and implication, it will present the conclusion of findings, implication, and suggestions for future research.

2. LITERATURE REVIEW

In the last two decades, the term 'stability' for financial systems has been widely used. There is no uniform definition of the vulnerability of the financial system, and even less uniformity on how it should be measured. Many researchers use the term "financial system stability" such as Mishkin (1991), Crockett (1997), Mc-Farlane (1999), Sinclair (2000) and Duisenberg (2001), while others use the term "financial instability" (De-Graeve, Kick and Koetter 2008; Klomp and De-Haan, 2009).

Terminology aside, a financial system can be characterized as being in a stable condition if there is no excessive volatility or crisis. A stable financial system is able to allocate resources and to absorb the shock (negative) that occurs in order to prevent disruption to the real sector activities. In other words, the stability of the financial system is the condition in which economic mechanisms can be fully carried out, including pricing, allocation of funds, performance of intermediary function, payments, good risk management, and the support of economic growth.

Conversely, unstable conditions can decrease public confidence in the banking system (causing bank runs) and ineffective intermediation (interest rate would be unrealistic). The risk will increase in developing countries where infection can be more dangerous and spread more easily to weak financial institutions. Experience from the financial crisis of

1997-1998 showed that an unstable financial system followed by a financial crisis results in high costs. The costs involved varied, including sizeable fiscal spending (40-60 percent of GDP) (Caprio and Klingeiel, 2000), loss of fixed deposits, and other less-obvious costs such as constrained access to finance.

The microprudential surveillance paradigm argues that risks arise from the irregularities of the financial institution development itself. Therefore, microprudential policy focuses on the health component of individual financial institutions. This regulation aims to improve the safety and health of individual financial institutions to monitor and limit financial risk distress. In addition, the main focus is to protect the client and reduce the risk of contagion and negative externalities in the overall financial system. However, the fact that the financial system as a whole may be exposed to the general risks is not fully taken into account.

While microprudential policy is essential to identify financial stability, macroprudential is more directed to the analysis of the overall financial system as a collection of individual financial institutions. Focus on the risk aggregate, for example, relates to changes in the collective behavior of financial institutions. Borio (2009) explained the difference between macroprudential and microprudential. There are three basic features to differentiate the approaches of macroprudential and microprudential: the purpose, the focus, and the risk characterization - as shown in **Table 1** (Appendix 1).

In practice, macroprudential instruments are not easily distinguished from microeconomic instruments. In order to manage risk characteristics, Borio (2009) suggested the consideration of macroprudential instruments that avoid excessive leverage, give adequate liquidity, prevent excessive lending, and regulate market activities that could be exposed to systemic risk.

In Indonesia, the related regulation and supervision of the authority - BI listed in the explanation of article 7 of law FSA (Financial Services Authority) is the regulatory and supervisory institutional, health, aspects of the prudential and bank inspection is the scope of regulation and supervision microprudential the duties and authority of the FSA. As for the scope of macro-prudential regulation and supervision, namely regulation and supervision in addition to those mentioned in this article, are the duties and authority of the Bank of Indonesia. In the framework of macro-prudential regulation and supervision, the FSA helped the Bank of Indonesia to make moral appeals to Banking. The explanation of Article 40 states that supervision of the bank is within the authority of FSA. However, BI can carry out the functions and duties, and when authorities need information through bank supervision, BI can perform inspection directly against systematically important banks and/or other banks in accordance with macroprudential authority.

3. RESEARCH METHODOLOGY

3.1. Development of the Financial System Stability Index

The aggregate index composition is performed with equal weight for each of the indicators in the sub-indices. Each of these sub-indices that establish the financial system stability aggregate index, as shown in Table 2 below:

Table 2. Indicators of Financial System Stability Index

Category	Indicators	Symbol	Sub-index
	1. Banking Soundness Index		I_b
Capital	*Capital Adequacy Ratio*	CAR	I_{b1}
Asset quality	*Non-Performing Loan*	NPL	I_{b2}
Liquidity	*Loans to Deposits Ratio*	LDR	I_{b3}
Profitability	*Return on Equity*	ROE	I_{b4}
	Net Interest Margin	NIM	I_{b5}
	2. Financial Vulnerability Index		I_v
External Factors	*Current Account balance to GDP Ratio*	CA/GDP	I_{v1}
	Ratio of Money Supply to Foreign Reserves	M2/FR	I_{v2}
	M2 *Multiplier*	M2/M1	I_{v3}
	Debt to GDP Ratio [*)]	DB/GDP	I_{v4}
	Exchange Rate	KURS	I_{v5}
	IHSG	IHSG	I_{v6}
Real Sectors	*Inflation*	INF	I_{v7}
	Growth GDP Nasional	GDPNA	I_{v8}
	3. Regional Economic Climate Index		I_r
Regional Economy	*Growth* GDP for USA	GDPUS	I_{r1}
	Growth GDP for ASEAN Countries [**)]	GDPSE	I_{r2}

[*)] *Foreign loans or debts public and private (financial institutions, banks, non-banks, including domestic securities).*
[**)] *The economic growth includes the ASEAN countries (Malaysia, Philippines, Singapore and Thailand) excluding Indonesia.*

The financial system stability index is constructed from indicators that refer to the development of the financial system in several countries. It is a single value that reflects the dimensional stability of the financial system, and can represent the sources of any instability. This index is a combination of a number of selected variables relevant to the stability and vulnerability of the financial sector. The stability index is not only an instrument to monitor and regularly assess the level of fragility of the financial sector, but also to allow comparisons over time to track the

historical episodes of financial system vulnerabilities that may not directly influence stability.

Illing and Liu (2003) developed a model of financial stress index (FSI) for the financial system in Canada. They provided an explanation of how to build a composite indicator of financial stability, choosing relevant variables themselves. This option is most often based on the literature of early warning indicators such as Demirgüç-Kunt and Detragiache (1998), Kaminsky, et al., (1998), Bordo and Schwartz (2000) and generally includes the banking system, foreign exchange markets, and equity markets.

Van den End (2006) developed a composite of financial stability conditional index (FSCI) in the Dutch banking system. FSCI is an aggregate of the monetary conditions index (MCI) and financial conditions index (FCI). Index combines interest rates, effective exchange rate, real estate and solvency of financial institutions, as well as the volatility of the stock index of financial institutions.

Geršl and Hermánek (2006) proposed an aggregate financial stability index indicator for the Czech National Bank, based on the financial health indicators that refer to the IMF. Both show that indicators of the aggregate index of financial stability (AFSI) could be used to make comparisons of other countries to rank the Czech Republic, together with the European Union countries other based on the level of their financial health.

Similarly, Yilmaz, D (2006) built an index of the strength of the financial system using six sub-indicators covering asset quality, liquidity, exchange rate risk, interest rate risk, profitability and capital adequacy. Broadly speaking, the empirical results show that the index of financial fragility developed could accurately reflect the financial stability situation. In addition, Verlis (2010) developed the aggregate index of financial stability for the Jamaican banking system, using quarterly data from the period 1997-2010. This index consists of micro-macroeconomic and macro-international factors. The index compiled was able to capture the key period of financial instability over the sample period.

Meanwhile, Albulescu (2010) developed the aggregate index of financial stability (AFSI) for Romanian banking during the period 1996-2008, using 20 indicators. These indicators measured the dimensions of the financial system using the development of the banking sector index, the index of banking health, climate vulnerability index and the index of the world economy. In addition, Albulescu (2010) also examined all the index's robust macroeconomic stability indicators that vary, using a stochastic simulation model to estimate the stability of the Romanian banking system. The test results showed that the variables which had a significant impact on the stability index were the total credits (in foreign currency) to GDP, GDP growth, and Bucharest stock market indices, among others.

3.2. Definition and Measurement of Variable

3.2.1. Indicator of Stability Indexes

The procedure of preparation of financial stability index first involved identifying the set of variables and conditions that can support the disruption to financial stability. In general, the individual indicators were chosen based on the following criteria: (i) relevance and significance and (ii) practical considerations. Some modifications of sub-indices that make up the financial stability index were based on practical considerations related to issues such as the availability of data and frequency of observation.

3.2.2. Banking Soundness Index

The first category was the index of financial health, adopting the broad framework of financial soundness indicators (FSIs) recommended by the IMF to monitor regularly the soundness and stability of the financial sector. This category focuses on four main aspects of the banking sector: capital adequacy, asset quality, liquidity, and profitability. Every aspect is represented by at least one indicator.

1. Capital Adequacy Ratio (CAR)
This ratio shows cushion against the potential risks of banks to absorb unexpected losses and provide an indication of the extent of the bank's assets financed by sources other than the bank's own capital.

2. Non-Performing Loans (NPLs)
This ratio is meant to identify problems with asset quality in the loan portfolio and the level of credit risk. Increasing the ratio may signal a decrease in loan portfolio quality indicators, although this usually retreats when problems arise.

3. Loan-to-Deposit Ratio (LDR)
The percentage of deposits that are bound in the loan portfolio and assess vulnerability to loss of access to deposits or deposits. This ratio implies that banks rely on loans to finance the loan.

4. Return on Equity (ROE)
The ratio between the profits for the year after tax with their own capital is a measure of bank profitability. The greater the earnings, the better the bank's financial performance and the higher the bank's subsequent durability to bank run.

5. Net Interest Margin (NIM)
These indicators are used to measure the ability of bank management to manage their productive assets to generate net interest income. The greater this ratio, the greater the net interest income earned on the assets managed by the bank.

3.2.3. Financial Vulnerability Index

The financial vulnerability index mainly focuses on two key areas that reflect the macro-economic conditions and the real sector. Every aspect is represented by at least one indicator.

1. Current Account Balance to GDP Ratio (CA / GDP)
The ratio of current account (current account) to GDP is one important indicator showing the macroeconomic performance of a country from the external side, which is also a reflection of the

internal economy, such as exports and imports in the real sector, as well as revenues and expenditures in the fiscal sector.

2. M2 to the Foreign Exchange Reserves Ratio (M2 / FR)
The ratio of money supply growth on foreign exchange reserves gives an indication of the adequacy of reserves. This ratio measures the ability to withstand external shocks and ensure the convertibility of the local currency.

3. M2 multiplier (M2 / M1)
M2 multiplier which defines the money multiplier, and is the ratio between the amounts of money supply M2 to M1 primary money. This ratio measures how much an increase in base money can lead to the expansion of the money supply through the banking system.

4. Debt to GDP Ratio (DB / GDP)
The ratio of debt to GDP shows the total amount of foreign debt on the amount of GDP annually. The ratio reflects the size of liabilities to the amount of production capacity in the country who entered in the GDP. The debt ratio is an indicator of budgetary financing policy, and not only aims to strengthen the level of self-reliance and reduce dependence on foreign financing, but also to encourage cautious debt management.

5. Composite Stock Price Index (CSPI)
JCI is one of the indicators to see investor sentiment and markets on the economy of a country. The rise and fall of JCI is a good reflection to see the economic prospects in the short and long term.

6. Exchange Rate (RATE)
Large exchange rate depreciation will put serious pressure on bank account imbalances. The condition can lead to the deterioration of national banks' performance.

7. Inflation (INF)
For the real sector, inflation is used as an indicator of the stability of the financial system. The high inflation is usually associated with economic conditions that are too hot (overheated). That is, the economy experienced a demand for a product that exceeds the capacity of its product offerings, so prices tend to rise. Inflation is too high and also causes a decrease in the purchasing power of money.

8. Economic Growth (GDPNA)
In addition to the inflation rate, another indicator of the real sector is the growth rate of GDP. This indicator is used to identify the level of stability of the financial system

3.2.4. Regional Economic Climate Index

The regional economic index component for economic growth GDP includes the United States and ASEAN countries that have been selected as control variables to represent the different levels of financial system stability and macroeconomic policies of a country.

3.3. Type and Source of Data

This study uses quantitative research, namely secondary data in the form of monthly financial reports of banks registered in the Bank and the FSA arranged period with a span of observational studies 2004M03 - 2014M09. A selection of the sample period is taken to represent the period before the global financial crisis of 2007-2008 and the post-global financial crisis.

Sources of data in this study were obtained from commercial bank publications. Banking health index data were taken from CFS Bank of Indonesia. Regional data and the economic vulnerability index were derived from the BI website, the FSA, the Central Bureau of Statistics, Bloomberg, Yahoo Finance and other related sources.

3.4. Research Methodology

3.4.1. Transformation of Indicators

Furthermore, all the individual indicators were used in the monthly frequency. To combine individual indicators described above into a single synthetic index, they should be put in general or scale. All individual indicators will be normalized before aggregation so as to have the same variance. In other words, we apply the same variance weighting method to calculate the aggregate index.

(i) Statistical Normalization converts each indicator sub-indices that make up the aggregate index of financial stability. Formulations for normalization mengukuti standard normal distribution are:

$$Z_t = \frac{(X_t - \mu)}{s_x} \qquad (1)$$

Xt indicator with the sub-index for period t, with an average value μ and standard deviation sx. Zt is a normal distribution with an average value equal to zero and variance equal to one N [0.1]. All individual indicators converted to a positive value indicate that the indicator above the historical average and negative values below the historical average which indicates that the development of less favorable to the stability of the financial system. Standard normalization digits ranging between $-3.08 \leq Z \leq 3.08$, with a probability of 99.9%.

(ii) Normalization empirical convert all the indicators that are identical to the numbers min = 0 and max = 1. The process of normalization is expressed as:

$$I_{it}^n = \frac{I_{it} - Min(I_i)}{Max(I_i) - Min(I_i)} \qquad (2)$$

I_{it} is an indicator of the i-th value during the time period t; Min (I_i) and Max (I_i) each of which is the minimum and maximum numbers recorded as an indicator of the i-th in the analyzed period and stated that the indicator has normal value.

3.4.2. Financial System Stability Index (FSSI)

Each indicator is equally important in the calculation of the sub-indices. The indicators have been normalized and then combined into one sub-composite index BSI, FVI and reci using arithmetic, according to the following formula:

$$\bar{I}_{Bt} = \frac{1}{5}\sum_{l=j}^{5} I_{Bj,t} \qquad (3)$$

$$\bar{I}_{Vt} = \frac{1}{8}\sum_{l=j}^{8} I_{Vj,t} \qquad (4)$$

$$\bar{I}_{Rt} = \frac{1}{2}\sum_{l=j}^{2} I_{Rj,t} \qquad (5)$$

There are several studies that assign different weights to the indicators sub-indices based on the experience of previous crises. However, an important indicator in a crisis that one may not be important in other countries. Financial system stability index is formulated as follows:

$$FSSI_t = w_1 * (\bar{I}_{Bt}) + w_2 * (\bar{I}_{Vt} + \bar{I}_{Rt}) \qquad (6)$$

In this study, the average weighted sub-indices of financial system stability refers to the results of research Cheang and Choy (2011); with w1 + w2 = 1 to w1 and w2 = 0.40 = 0.60.

3.4.3. Specification Model and Analysis

To see the dynamic index of financial system stability in Indonesia, we consider that the analysis of external factors and internal factors as a source of vulnerability is expected to affect the stability of the financial system. Using data time series, regression estimation model of financial system stability index used in the study are shown in the formulation:

$$\begin{aligned} FSSI_t = &\alpha_o + \alpha_1 FSSI_{t-1} + \beta_1 GDPUS_t + \beta_2 GDPSE_t + \beta_3 CA_t \\ &+ \beta_4 INF_t + \beta_5 SBI_t + \beta_6 LnKURS_t + \beta_7 GDPNA_t + \\ &\beta_8 DB/GDP_t + \beta_9 DUM_{2007/08} + e_t \end{aligned} \qquad (7)$$

Indicators of economic growth in the United States (GDPUS) and economic growth in ASEAN countries (GDPSE) were used as a control variable source of external vulnerability. The current account (CA) is a proxy indicator of internal vulnerability that comes from the slowing growth rate of the world economy. Current account balance is measured from the difference between the value of exports and imports and expressed as a percentage. The global economic slowdown led to declining import-export margin and may result in a worsening of the current account deficit (current account deficit). Inflation (INF) is a source of internal vulnerabilities anyway; whereby inflation pressure may result in shock to macroeconomic stability. Inflation emphasizes the inflexibility of the structure of the economy, especially in developing countries.

Another source of internal vulnerabilities is the exchange rate (RATE) and interest rate (SBI), which is an indicator of the stability of the financial system are very important. Higher interest rates indicate that the financial system is not efficient, in this case the role of banks in allocating resources that are not effective. In short, high interest rates are caused by the inefficiency of the information and institutional structure.

As control variables in the macro-economic level, we used national economic growth (GDPNA), the magnitude of the ratio of debt to gross domestic (DB / GDP), and dummy crisis (DUM). Economic growth data using monthly data were interpolated from the data of the quarter. The amount of debt recorded includes government debt and private debt. While the dummy variable takes the value of 1 for the period 2007-2008 crisis and the value 0 for the other years. The addition of these dummy variables was needed to capture the structural break of the current global economic crisis.

Shocks from external and internal factors to the stability of the financial system were explicitly captured by three sub-indices composed of 15 indicators that are assumed will affect the amount of financial system stability index. Various vulnerabilities both from external and internal influences potentially increase credit risk, market risk, and liquidity risk, which is feared, could disrupt financial stability in Indonesia.

3.4.4. Hypothesis Testing

We aimed to test whether external or internal source of vulnerability as independent variables significantly affect the financial system stability index. To answer this question, it is necessary to test the significance of the explanatory variables. Statistical hypothesis significance to estimate the financial stability index in equation (7) is:

Ho: β i = 0
Ha: β i ≠ 0

Criteria:

a. Ho: if the p-value ≥ 0.05 (level of significance), the indicator (external and internal vulnerability factors) give no significant influence on financial system stability index.

b. Ha: when p-value <0.05 (significance level), the indicator (external and internal vulnerability factors) gives significant influence on financial system stability index.

In general, test hypotheses regarding the effect of the impact of the independent variables (internal-external factors) to estimate the financial system stability index is shown in Table 3 below:

Table 3. Hypothesis Testing

Variable Dependent : Financial System Stability Index (FSSI)	*Hypothesis*	
Independent Variable	**Hypothesis Nol**	**Hypothesis Alt.**
a. External Factors		
- *Growth* economy Amerika Serikat (GDPUS)	Ho : $\beta_1 = 0$	Ha : $\beta_1 \neq 0$
- *Growth* economy ASEAN (GDPSE)	Ho : $\beta_2 = 0$	Ha : $\beta_2 \neq 0$
b. Internal Factors		
- Current account (CA)	Ho : $\beta_3 = 0$	Ha : $\beta_3 \neq 0$
- Inflation (INF)	Ho : $\beta_4 = 0$	Ha : $\beta_4 \neq 0$
- Certificate of Bank Indonesia (SBI)	Ho : $\beta_5 = 0$	Ha : $\beta_5 \neq 0$
- Foreign Exchange (KURS)	Ho : $\beta_6 = 0$	Ha : $\beta_6 \neq 0$
- *Growth* economic domestic (GDPNA)	Ho : $\beta_7 = 0$	Ha : $\beta_7 \neq 0$
- Debt to GDP Ratio (DB/GDP)	Ho : $\beta_8 = 0$	Ha : $\beta_8 \neq 0$
- *Dummy* crisis (DUM$_{2007/08}$)	Ho : $\beta_9 = 0$	Ha : $\beta_9 \neq 0$

Sources: Rearranged Data

3.4.5 Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model

The GARCH model was introduced by Bollerslev (1986). The model is a weighted average of past squared residuals, but it has declining weights that never go completely to zero. The most widely used GARCH specification asserts that the best predictor of the variance in the next period is a weighted average of the long-run average variance, the variance predicted for this period, and the new information in this period that is captured by the most recent squared residual.

GARCH model for variance: $h_{t+1} = \omega + \alpha (r_t - m_t)^2 + \beta h_t = \omega + \alpha h_t \varepsilon_t^2 + \beta h_t$ This model forecasts the variance of date t stability as a weighted average of a constant, yesterday's forecast, and yesterday's squared error.

The weights are $(1 - \alpha - \beta, \alpha, \beta)$ and the long run average variance is $\sqrt{w}/(1 - \alpha - \beta)$. It should be noted that this works only if $\alpha + \beta < 1$ and it makes sense only if the weights are positive. Requiring $\alpha > 0$, $\beta > 0$ and $\omega > 0$. In fact the GARCH process is weakly stationary if $\alpha + \beta < 1$ (Engle, et al. 2008).

4. RESULTS AND DISCUSSION

4.1. Performance Index Stabilities

Financial stability contributes to the health of the financial system, efficient allocation of resources, and effective management. Therefore, correct and accurate assessment of financial system stability becomes important and very interesting for the central bank.

Retaining and maintaining financial stability is a must for the authorities in each country; not only is the national financial system healthy and strong but it is also one that contributes to the overall health of global financial markets. It is important for policymakers to be aware of the dynamics in the financial system, to detect the risks and to share their view with market participants in order to raise awareness about the dangers of risk (systemic). Policy coordination between institutions at national and international level would be the most important aspect of this dynamic process.

Empirical research was carried out with the intent of understanding and capturing the performance of the Indonesian economy and the financial system in the aggregate more than one index. The variables and indicators were selected partly on the basis of theoretical assumptions and partly on the basis of practical considerations.

Sub-index is compiled using statistical normalization stating indicator on the average value and standard deviation. If the index value is greater than zero, it implies that financial stability is higher than average and vice versa for a lower index value below zero. Graphically, the sub-index of the stability of the financial system drawn up covering the period 2004M03-2014M09 is shown in Figure 1.

Figure 1 (a) illustrates the soundness of banking sub-index during the observation period. On average, banking soundness index (BSI) is above the zero line, indicating a fairly stable level of banking health. But during 2006Q1-2008Q1, the BSI index was below the average level, indicating some pressure (stress) in the financial system. Considerable pressure was contributed by indicators of non-performing loans in the period in which the number of bad debts reached 5.62 percent. Meanwhile, the average capitalization rate of 21 percent and the ratio of loans to deposits reached 64 percent. After the first quarter 2008Q1, BSI sub-index rose above the average, indicating the health of banks in a relatively stable condition.

Financial vulnerability index (FVI) recorded a very volatile pattern, as shown in Figure 1 (b). The instability of the financial system is affected by the high inflation of 18.3 percent 2005Q4-2006Q4 and subsequent inflation of more than 10 percent from May to December 2008. As for the sub-regional market economy (RECI), Figure 1 (c) shows the relative stability of the financial system. At the beginning of the crisis in the US, this index then fell gradually until 2008, which may have been caused by the world economic slowdown following the global financial crisis. US economic growth recorded since August 2008 reached minus 0.02 percent and peaked in June 2009, amounting to negative 5 percent. As for the ASEAN region (except Indonesia) the crisis impacted on economic growth, which slowed to negative 5.2 percent in March 2009. The economic growth rate for these region post-crisis averages 2.49 percent negative. All the above information is reflected in the stability of financial system index (SFSI) as shown by Figure 2.

Figure 1. Sub-index for the Stability of Financial System

(a) Sub-index BSI   (b) Sub-index FVI   (c) Sub-index RECI
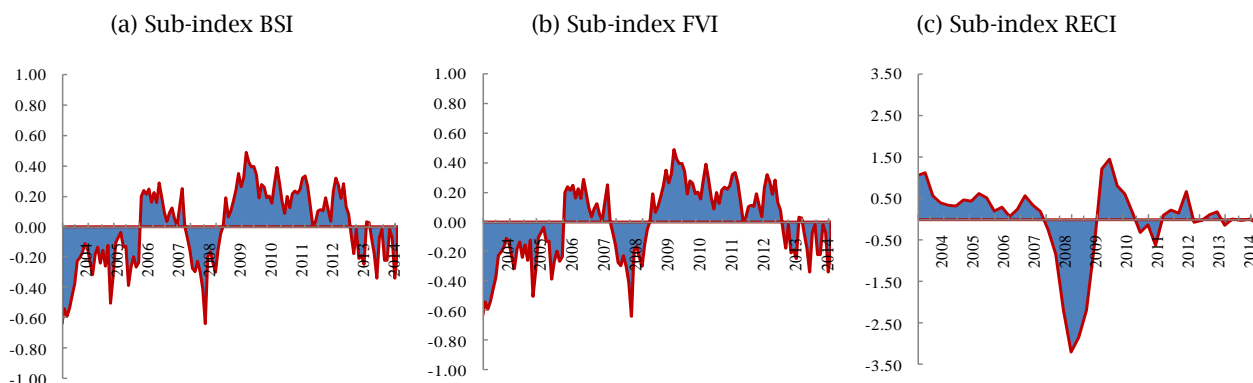
Compared to other countries in Southeast Asia, Indonesia's economic growth is the highest, with positive 4.60 per cent in 2009. This is because Indonesia's economic growth is supported by consumption portion to 57 per cent: government consumption 8 percent, an investment of about 24 percent, and the value of net exports of about 10 percent.

Figure 2. Financial System Stability Index (FSSI)
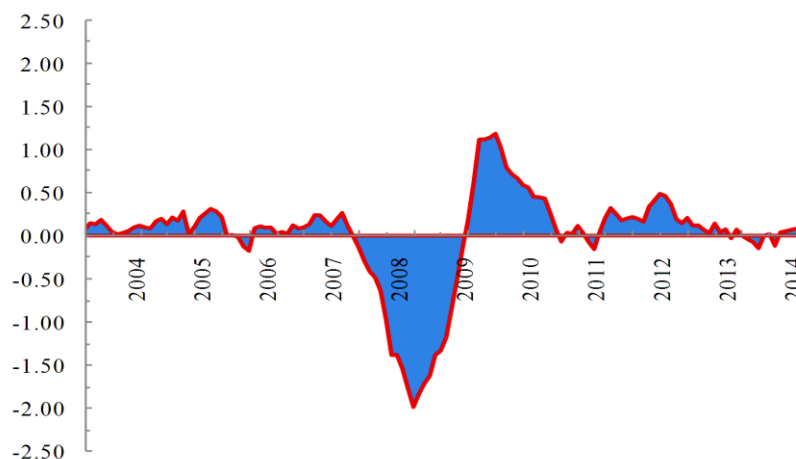
4.2. External and Internal Shock toward the Stability of Financial System

We evaluated the financial system stability index to capture an episode of global financial crisis year 2007-2008 that began with high-risk subprime loans. The impact of the banking sector implied the broader meaning is more than just a systemic crisis.

To estimate the effect of external and internal shock toward the financial system stability we use the GARCH regression method (1.1) in equation (7). Here, the index of the stability of the financial system is used as the dependent variable. Generally the results were taken from three regression models. External factors such as US economic growth (GDPUS) and economic growth of ASEAN countries (GDPSE) except Indonesia had a positive effect of 0.79. Thus, both indicators simultaneously as external independent variables can cause multicollinearity problems. To avoid multicollinearity between the two, we performed three different estimates. The first estimate is to enter and GDPSE GDPUS simultaneously, while the second and third estimates each use GDPUS and GDPSE separately.

In detail, as in the following the scenarios outlined before, table 4 shows that the external factors (GDPSE and GDPUS) have positive effect on FSSI. It can therefore be concluded that economic growth in the United States and ASEAN countries strengthened the stability of the financial system in Indonesia. This relationship remains significant even when two variables GDPUS and GDPSE are taken together or used separately. Furthermore, it can be observed that the positive relationship generated by economic growth tends to be more stable or robust.

Table 4. Effect of External and Internal Factors towards the Stability of Financial System

Variable Independent	*Analysis GARCH(1.1)*		
	FSSI	*FSSI*	*FSSI*
FSSI (-1)	**0.067268****	**0.675470***	**0.490095***
	(2.007215)	(22.19747)	(14.61817)
GDPUS	**0.112794***	**0.075881***	
	(17.55361)	(7.992871)	
GDPSE	**0.111331***		**0.093917***
	(27.60953)		(15.48226)
CA	**0.006783***	**0.000631**	**0.000081**
	(6.030811)	(0.971867)	(0.288390)
INF	**-0,008117***	**-0.017426***	**-0.016890***
	(-3.448797)	(-4.378416)	(-5.679163)
SBI	**-0,046726***	**0.014535****	**0.013682****
	(-9.438430)	(2.290843)	(2.579941)
LnKURS	**-0.424344***	**-0.397394***	**-0.098845**
	(-6.655217)	(-4.258423)	(-0.1670724)
GDPNA	**0.014966**	**-0.010070**	**0.096224***
	(1.144370)	(-0.631198)	(8.416813)
DB/GDP	**-0.026176***	**-0.009023***	**-0.013796***
	(-15.91559)	(-385397)	(-10.07414)
DUMMY	**-0.142124***	**-0.050311****	**-0.199534***
	(-8.587197)	(-2.599151)	(-9.110115)

Note: Estimation methods GARCH (1.1) considering the dimensions of the dummy variable to control the effects of the global economic crisis. In this estimation constant variables considered in the regression equation, but the results are not reported in the table for the purpose of efficiency. Statistical Tables (*, **, ***) indicate significance at the level of the coefficient of 1, 5 and 10 per cent (see Appendix).

The movement of budget balance has a pattern in line with the financial stability index during the observation period. This indicates that there may be positive effects between financial system stability with the current account surplus. However, when using the second and third scenarios the effect of current account on financial system stability is still difficult to unfold, due to the differences in the characteristics of fluctuations in regional and world economic growth for each country. Thus, there may be further observations on a specific range of observational data that can affect the stability of the financial system, so that the relationship between financial stability indexes can be seen clearly.

Other internal variables that will influence the financial stability is the exchange rate (exchange rate), inflation, interest rates and debt ratio. The empirical results of this section explain the implications of shocks to the financial stabilization of internal factors with opposite movement patterns. The negative relationship between the increase in foreign debt, high inflation and interest rates, and the depreciation of the local currency (Rupiah) exert serious pressure on the stability of the financial system. These four indicators relate negatively and significantly influence the stability of the financial system. High lending rates affect access to bank lending to the real sector, including small- and medium-size enterprises.

From the Indonesian experience during 2013, various challenges from both external and internal factors were withstood, and financial system stability was maintained. The external shock triggered by the global economic growth has not been fully recovered from, with falling commodity prices and the high uncertainty in global financial markets. The *tapering-off* plans of The Federal Reserve announced in May 2013 led to capital outflow, which in turn led to the depreciation of the rupiah. On the other hand, Indonesia is still facing problems in terms of economic dependence on

imports (exports less than imports) so as to encourage an increase in current account deficit. One of the efforts to overcome this is the reduction of fuel price subsidies. However, this condition is accompanied by an increase in inflation of 4.3 percent (y-o-y) at the end of 2012 to 8.38 percent at the end of 2013 after reaching a peak of 8.79 percent in August 2013 (Bank of Indonesia, 2014).

As a result, domestic economic conditions are less than favorable and there is a high level of uncertainty due to the pressures in the domestic market. Fortunately, the risks of the banking industry are still maintained even though some indicators have shown the pressure. During 2013Q3, liquidity risk increased partly due to credit growth, which was higher than the growth of deposits. Nevertheless, the ability of the banking industry liquidity is still quite stable against potential withdrawal of customer funds (Bank of Indonesia, 2014).

What is the impact of the global economic crisis on the development of financial system stability in Indonesia? The estimations and analysis the financial system stability at an episode of the global economic crisis are shown in table 4. When the dummy global economic crisis is used as a control variable, the estimated coefficients are all negative and statistically significant. This shows that the negative impact of the global economic crisis is important to financial stability in Indonesia.

Financial system stability is maintained and cannot be separated from Bank of Indonesia's policy response through policy mix of monetary, macroprudential, or microprudential as well as coordination with the Government over the "second wave". The policy response by the Government to stimulate economic activity included (i) fiscal stimulus (a decrease in income tax rates, increase in the non-taxable income limit is, the provision of tax subsidies, subsidies on food and non-food, the expansion of capital assistance for SMEs and

increased infrastructure spending), (ii) banking policy, the bailing-out of Bank Century, and LPS put some funds to safeguard the financial sector. This policy was intended to invest funds sourced from abroad in products with a longer maturity. Thus, in the case of a reversal of capital, impacts would be minimized.

4.3. Surveillance: Evaluation and Monitoring

Surveillance activities include monitoring, exchanging information and providing a view of the policies of individual countries. Surveillance activities are generally carried out to evaluate and discuss the economic outlook and implemented by a multilateral forums or agencies such as the World Bank, the IMF and/or international institutions of its kind.

The factors that were observed at the time of monitoring the economic and financial sectors included: (i) prospects and macroeconomic trends and policy changes, (ii) financial market developments, and (iii) changes in the institutional and legal aspects. Monitoring activity allowed for an evaluation to assess whether everything had been running as expected or otherwise. Deviations allow the crisis to occur, so there was a clear need to develop methods that can help the process of monitoring and the implications for the prevention of crisis (Arifin et al., 2007).

In addition to surveillance, in order to prevent the crisis, a method of early warning system would ideally be developed. Making an effort to anticipate the crisis, including maintaining financial system stability, is a critical step carried out in each country. In this case, the development model of early warning system (EWS) was used to analyze the macroeconomic indicators that can detect vulnerabilities against any threat of crisis. In addition, a variety of recent crises experiences from other countries has allowed analytical models to be developed, showing the symptoms of crisis mapping patterns. It is necessary to be able to recognise the pattern of this crisis in order to learn from the experience of the past and make a comparison with other countries. The pattern of the crisis is very important to assess the causes and symptoms, and to prevent or mitigate the onset of the crisis. This is not an easy task, however, because the causes and symptoms vary with the country where there are different background conditions for different crises.

5. CONCLUSION AND IMPLICATION

The research was carried out experimentally in order to understand and capture the performance of the Indonesian economy and the stability of the financial system of a single aggregate index. With some additional indicators and built by three sub-indices, we have been able to more easily investigate which indicators have a significant effect on the stability of the financial system. The stability of the financial system is associated with the linkages between the financial sector and the real sector. The stability of the financial system in this paper was developed through a proxy of 15 indicators developed into three sub-indices, namely banking soundness (5 indicators), financial vulnerability (8

indicators), and regional economic climate index (2-indicator).

Results from three regression models show external effect from US economic growth (GDPUS) and economic growth of ASEAN countries (GDPSE) had a positive effect on the financial stability. It is implied that the Indonesia's financial system has integrated to the global's financial system. Therefore, what's happen to the global financial system (positive or negative shock) will affect to the financial system in Indonesia. The exchange rate, inflation, interest rates and levels of debt. The empirical results of this section explain the implications of shock to the financial stabilization of internal factors with opposite movement patterns. The negative relationship between the increase in foreign debt, high inflation and interest rates, and the depreciation of the rupiah bring serious pressure to the instability of the financial system.

The implications of the study highlight the need to maintain stability in the financial system – this requires a monitoring strategy and solution to stabilize the financial system in the event of a crisis. Thus, various instruments of financial system stability should be used, not only determined by the central bank but also by other authorities. For information management and policy effectiveness in the stabilization of the financial system, there is a need for coordination among the institutions. There are two indicators which should be the target of monitoring, i.e. microprudential and macroeconomic indicators. With microprudential indicators we can identify potential liquidity risk, credit risk, market risk, operational risk and profitability of financial institutions, while macroeconomic indicators can cover economic conditions (domestic and international) that have a significant impact on the stability of the financial system.

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APPENDIXE 1

Tabel 1. Stability Approach of Financial System

	Macroprudential	*Microprudential*
Intermediate aims	Monitoring and supervision of the financial system overall	Monitoring and supervision of the individual financial institution
Final aims	Stress on crisis cost (% GDP)	Consumer protection
Focus	Systemically important financial institution, SIFIs	Individually important financial institution, IIFIs
Characteristics of Risk	Endogenous	Exogenous
Correlation and Financial Institution Exposure	Relevance	Inrelevance
Calibration of prudential policy	Focus on systemic risk	Focus on individual risk

Sources: Borio, C., (2009) and Bank Indonesia (2014).