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The effect of macroeconomic variables on non performance financing of Islamic Banks in Indonesia

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Abstract

This research is going to discuss about the determinant macro variables and bank's behavior determinant credit risk on Islamic rural bank in Indonesia. It could be seen on macro variables such as inflation, exchange rate, Jakarta Islamic index (JII) and money supply (M2), and bank's behavior such as financing. Research methodology used at this study is Vector Error Correction Model (VECM). Following these procedures, it applies Unit Roots Test, Augmented Dickey Fuller Test, Lag Length Criteria Test, Correlation Matrix – Johansen Julius Co-integration Test, VECM Estimation, Impulse Response and Variance Decomposition Test. The result show that both bank behaviors and macroeconomic variables are significant affecting non-performing financing (NPF). The banking need more careful to manage internal and external factors that influence non-performing financing (NPF).

Abstrak

Penelitian ini membahas tentang pengaruh variabel makro dan perilaku bank terhadap risiko kredit di BPR syariah di Indonesia. Variabel tersebut dapat dilihat pada variabel makro seperti inflasi, nilai tukar, indeks islamic jakarta (JII) dan uang beredar (M2), dan perilaku bank seperti pembiayaan. Metodologi penelitian yang digunakan pada penelitian ini adalah Vector Error Correction Model (VECM). Dengan mengikuti prosedur ini, maka digunaka analisis Unit Roots Uji Augmented Dickey Fuller, Lag Kriteria Panjang Test, Korelasi Matrix - Johansen Julius Co-integrasi Test, Estimasi VECM, Impulse Response dan Variance Decomposition. Hasil studi menunjukkan bahwa perilaku bank dan variabel makroekonomi secara signifikan mempengaruhi non-performing financing (NPF). Untuk itu perbankan perlu lebih hati-hati untuk menjaga faktor internal dan eksternal karena sangat mempengaruhi non-performing financing (NPF).

Introduction

Islamic banking was virtually unknown 30 years ago. It has been operated in 55 countries with the amount of deposit over $100 billion. There are more than 200 Islamic banking institutions which have been operated around the world. Islamic banking institution is one of the fastest growing financial services markets in the Islamic world. According to law No. 7 of 1992 on banking, it is explained that Indonesia is adopting dual banking system, namely conventional banking which is based on interest rate while Islamic banking is based on profit-loss sharing system. Moreover, its law is also explained about the permission for conventional banking to open Islamic business unit. It shows that government began to support the development of Islamic banking in order to participate and support economic growth in Indonesia. Then, by the legalization of law No.21 of 2008 which regulates about Islamic banking in Indonesia which has giving a great opportunity for Islamic banking in order to de-

veloping a variety of Islamic banking products that offered to customers.

Moreover, Islamic banking showed a good performance in facing economic global crisis. This can be shown by the growth of Islamic banking financing which is high with non-performing financing (NPF) is below 5 percent. Islamic banking in 2009 is increased by 14 percent, namely 33.3 percent in 2008 then 47.3 percent in 2009. Thus, it indicating that Islamic banking is more resistant and stable than conventional banking on economic crisis.

The development of Islamic banking in Indonesia for 10 years is rapidly growing. It can be seem from the total amount of Islamic banking in Indonesia. The total amount of Islamic banking on 2005 is 22 which is consist of 3 of Islamic banking, 19 of Islamic business unit and 92 of Islamic rural bank with total of offices are 550 offices. The total amount of Islamic banking in 2015 is 12 of Islamic banking, 22 of Islamic business unit and 164 of Islamic rural bank with total of offices are 2944 offices. Thus, the growing of Islamic banking is in line with the increasing of asset total and financing.

Based on table 1 shows the total of asset on Islamic banking by IDR 145.467 billion with financing was IDR 102.655 million in 2011. On 2012, the total of asset was IDR 195.018 billion with financing IDR 147.505 million. There was increased of asset and financing by IDR 49.551 million and IDR 44.85 million respectively. Total asset on 2013 was IDR 242.276 billion with financing IDR 184.120 million. While, the total asset on 2014 was 272.343 billion and financing was IDR 199.330 billion. There is increasing of asset is IDR 47.258 million and increase of financing was IDR 36.615million. While, the increasing of asset on 2014 was IDR 30.067 million and financing was IDR 15.21 million. The total of asset on 2015 was IDR 269.467billion with total of financing was IDR 201.526 million. There was decreased on total of asset on 2015 by IDR 2.876 million but there was increased of financing was IDR 2.196 billion. Thus, the increasing of total asset on Islamic banking goes smaller year by year from 2011-2014 but it is decreased on 2015. It gives impact on the decline of financing in Islamic banking caused by the economic slowdown conditions. The impact of lower economic growth caused by several factors such as the depreciation of exchange rate has an impact on higher the inflation rate and the unemployment rate. The high levels of unemployment rate caused by the decline in production due to high production costs. The decline of production has an impact on bankruptcy so the effect on NPF's in the banking sector.

From early 1960s, the existence of Islamic bank has been in a consistent phase. In 1963, the Mit Ghamr Saving Bank was founded. It is a small rural institution in Egypt. Later in 1971, the Mit Ghamr Saving Bank was incorporated into a new government controlled institution, the Nasser social bank. A major expansion in Islamic banking activities started to take place in 1970s. The expansion of Islamic banks is partly due to the oil revenue boom in the Gulf and the growing economic muscle of the more conservative Muslim states of the Gulf (Rahman, 2007).

Table 1: The Growth of Islamic Banking in Indonesia

Year	Total of Asset	Financing	Non-performing financing
2011	145.467	102.655	2.52%
2012	195.018	147.505	2.22%
2013	242.276	184.120	2.62%
2014	272.343	199.330	4.33%
2015	269.467	201.526	4.62%

(Sources: Report of Bank Indonesia, 2015)

In 1970s, a number of Islamic banks were established including the initiative of the Organization of Islamic Countries (OIC) that established the Islamic Development Bank (IDB). During the same period, Dubai Islamic Bank, Faisal Islamic Bank in Egypt, Kuwait Hose Finance, and Jordan Islamic Bank were established. In 1978, the Islamic banking system international holding was established in Luxemburg. This was the first Islamic financial institution on the western oil. The rapid development of Islamic banking worldwide portrays that the expansion of Islamic banking was not only confined to Middle East but it has also grabbed the attention of its international counterparts.

Indonesia laws have adopted a dual banking system through the promulgation of law No. 10 year 1998, concerning amendments to banking law which forms a legal basis for the development of Islamic Banking in Indonesia. Through the law No.23 year 1995, concerning bank Indonesia which paved the way for the creation of the shari'ah base regulatory and supervisory framework.

Islamic banking is a system that provides financial services to its customers free of riba or interest. According to sharia or Islamic law, paying and receiving interest is prohibited in all transactions. This ban on interest makes the Islamic banking system fundamentally different from western style or conventional banking. So serious is this ban that the Qur'an (2:278) states that those who disregard the ban on interest are at war with God and the Prophet Muhammad. Islam considers the charging of interest as exploitative because the lender gains money from the needs or misfortunes of the borrowers (Shahinpoor, 2009).

Islamic banking performs the same function of financial intermediation as performed in conventional banks such as it attracts financial resources from individual and institutions and directs them towards business firms, which need external finance to support their financial activities. However, these activities, instead of interest, rely on profit-loss sharing and other interest-free modules. Apart from these Islamic banks are also not allowed to issue securities involving interest like long and short term bonds, debentures and preference shares (Kaleem, 2000).

According to Chapra and Khan (2009) there are several kinds of risk faced by Islamic banking such as liquidity risk, market risk, operational risk and credit risk. Credit risk is risk that caused by failure of counterparty to fulfill their obligation which is called as non-performing financing. Bank is very concern about credit risk; mostly banking is doing credit as the main business. Credit risk is the major contributor for the bank; it is causing the condition deteriorated because the loss-value is bigger thereby reducing bank capital rapidly. Indicators reflected credit risk in Islamic banking, namely non performing finance (NPF). Non performing finance is the ratio between financing with total financing extended by Islamic banks. The formulation of non performing loan (NPL) or non performing finance (NPF) is:

$$\text{Ratio of NPL} = \frac{\textit{Total of non performing loan (NPL)}}{\textit{Total of credit}} \times 100\%$$

The magnitude of ratio on both non performing loan (NPL) and non performing finance (NPF) which is allowed by Bank of Indonesia is five percent (5%). If it is exceed 5% affecting the bank's health.

In the credit risk assessment process, usually the risk of a loan is mostly determined by the individual factors related to a loan applicant, and a less number of macroeconomic factors is used to explain it. In environments with lower macroeconomic risk, the weight of idiosyncratic risk is higher, and therefore the role of the financial indicators of loan applicants in decision-making is more important. When the financial condition of many debtors is ac-

ceptable and the macroeconomic factors are not considered enough, occasion for a credit boom arise.

Nkusu (2011) classifies literature into to three parts: the first of the literature has focused on explaining the NPL in credit institutions in the country demonstrating the role of macroeconomic performance, quality of management and political choices. The second part of the literature analyzed the relationship between NPL and macro-financial conditions showing the positive impact on NPL on the probability of the crisis and subsequently the key role played by the NPL in predicting banking crisis. The Third branch of literature focuses on explaining or predicting the NPL at the macro level. These aggregates may relate to total loans in one economy (total debt) or certain types of loans. Therefore, factors explaining NPL may be related to the macroeconomic environment or to specific characteristics of bank (Messai & Jouini, 2013).

Research Method

This research is conducted to knowing the effect of macroeconomic variables to non performing finance on Islamic banking in Indonesia. The data will be used are secondary monthly time series data which is starting from January 2012 up to April 2015. This data used secondary data starting from January 2012 up to April 2015 which is consisting of sixty-seven data observations. Data is obtained from various sources that are consisting of websites, books, and other relevant journals. This following table shows the data and its sources. Econometrics model defines the statistical relationship between variables in particular phenomena. This analysis adopted cointegration test and vector error correction model (VECM) to knowing the relationship among variables in the short-term and long-term.

In this research, we are using vector auto regressive (VAR)/vector error correction model. In general, VAR is used to analyze the dynamic impact of the surprise factor contained in the system variables. VAR analysis was conducted by considering some of the endogenous variables jointly in a single model. Each endogenous variable is explained by its value in the past and past values of all other endogenous variables in the model were analyzed. However, if there is a long-term relationship in a variable then the model can be developed into VECM. VECM is the form of vector auto regression that restricted. These additional restriction should be granted because of the existence of non stationary data or stationary at first difference which is cointegrated. VECM utilize cointegration restriction information into the specifications. Therefore, VECM called as VAR design for non stationary series or stationary at first difference level which is cointegrated.

Research framework examine the conceptual of systematic framework about the effect of macroeconomic variables consisting of inflation, exchange rate, money supply (M2) and financing on non-performing financing (NPF) in Islamic banking which is based on following below:

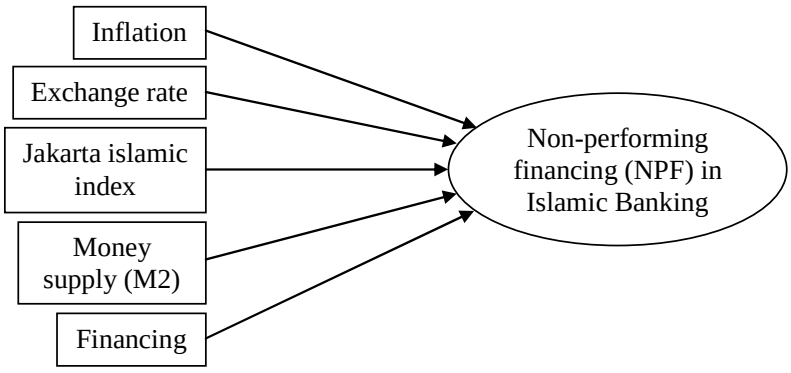

Figure 1: Research Framework

Data and model is transforming into Ln form, where the estimation result show the elasticity because all variables in the percentage, so that the relationship among variable are more rationale. This model can be followed below as:

$$NPFt = A0 + A1NPFt\text{-}1 + A2FNCt\text{-}1 + A3INFt\text{-}1 + A4LNERt\text{-}1 + A5JIIt\text{-}1 + A6LNM2t\text{-}1 + et$$

This method explained the relationship in the short-term and long-term among variables such as non-performing financing (NPF), financing, inflation, exchange rate, Jakarta Islamic index (JII) and money supply (M2). This study uses this following econometric model:

Model 1:

$$NPFt = A0 + A1NPFt\text{-}1 + A2FNCt\text{-}1 + A3INFt\text{-}1 + A4LNERt\text{-}1 + A5JIIt\text{-}1 + A6LNM2t\text{-}1 + et$$

Model 2:

$$FNCt = A0 + A1NPFt\text{-}1 + A2FNCt\text{-}1 + A3INFt\text{-}1 + A4LNERt\text{-}1 + A5JIIt\text{-}1 + A6LNM2t\text{-}1 + et$$

Model 3:

$$INFt = A0 + A1NPFt\text{-}1 + A2FNCt\text{-}1 + A3INFt\text{-}1 + A4LNERt\text{-}1 + A5JIIt\text{-}1 + A6LNM2t\text{-}1 + et$$

Model 4:

$$LNERt = A0 + A1NPFt\text{-}1 + A2FNCt\text{-}1 + A3INFt\text{-}1 + A4LNERt\text{-}1 + A5JIIt\text{-}1 + A6LNM2t\text{-}1 + et$$

Model 5:

$$JIIt = A0 + A1NPFt\text{-}1 + A2FNCt\text{-}1 + A3INFt\text{-}1 + A4LNERt\text{-}1 + A5JIIt\text{-}1 + A6LNM2t\text{-}1 + et$$

Model 6:

$$LNM2t = A0 + A1NPFt\text{-}1 + A2FNCt\text{-}1 + A3INFt\text{-}1 + A4LNERt\text{-}1 + A5JIIt\text{-}1 + A6LNM2t\text{-}1 + et$$

Where, NPF is Non-performing Finance, LNFC is ln of total financing, INF is inflation rate, LNER is ln of exchange rate, JII is Jakarta Islamic Index, LNM2 is ln of money supply, e1 is error term (t 1,2,3,4,5,6), *l* is lag length with *l* = 1,2,.....X and X is maximum lag.

Unit root test

Unit root test is testing to find out whether or not the indices are non-stationary. Stationary of a series is an important phenomenon because it can influence its behavior. If *x* and *y* series are non stationary random processes (integrated) then modeling the x and y relationship as a simple OLS relationship which is only generate a spurious regression.

$$Yt = \alpha + \beta Xt + \varepsilon t$$

Time series stationarity is the statistical characteristics of a series such as its mean and variance over time. If both are constant over time, then the series is said to be a stationary process (i.e. is not a random walk/has no unit root). Differencing a series using differencing operations produces other sets of observations such as the first-differenced values, the second-differenced values and so on.

X level	*Xt*
X first-differenced value	*Xt – Xt-1*
X second-differenced value	*Xt – Xt-2*

If a series is stationary without any differencing it is designated as I (0), or integrated of order 0. On the other hand, a series that has stationary first differences is designated I (1), or integrated of order one. Augmented Dickey-Fuller and Phillip-Perron test is tool for conducting stationary test of the variables.

Determination of lag

There are several criteria information for optimum lag test, which is likelihood ratio

(LR) final prediction error (FPE), Akaike information criterion (AIC), Schwarz information criterion (SC), and hannan-quinn criterion (HQ). Determination of optimal long lag is useful for losing autocorrelation. Determination of optimum long lag is important, if the optimum lag is too short, thus it cannot be explaining the dynamic model overall, but if the optimum lag is too long, thus the result of estimation will not efficient caused by lack of degree of freedom (special for model with few sample).

Contegration testing

Procedures use two tests to determine the number of cointegration vectors: the maximum eigenvalue test and trace test. The maximum eigenvalue statistic tests the null hypothesis of r cointegrating relations against the alternative of r+1 cointerating relationship for r = 0, 1, 2,....n-1 this test statistics are computed as:

Lrmax (r/n + 1) = -T*log (l - λ)

Where λ is the maximum eigenvalue and T is the sample size. Trace statistics investigate the null hypothesis of r cointegrating relationship against the alternative of n cointegrating relations, where n is the number of variables in the system for r = 0,1,2,...n-1.If cointegration is found between variables, then the standard causality test (Granger, 1969) can be applied. If there is cointegration, then causality can be examined using the vector error-correction model (VECM) (Granger, 1988) as below:

$$\Delta yt = \alpha 0 + \sum_{i=1}^{n} \alpha 1i \Delta yt - 1 + \sum_{i=1}^{n} \alpha 3 \Delta EC\, t - n + st$$

The short term causality of the VECM can be tested using the wald test (x^2), and the long-term causality is tested by examining whether the error-correction coefficient α3 in the model is significantly different from zero.

Vector Error Correction Model (VECM)

If cointegration has been detected between series we know that there exist a long-term equilibrium relationship between them. So we apply VECM in order to evaluate the short run properties of the cointegrated series. In case of no cointegration VECM is no longer required and we directly precede to granger causality tests to establish causal links between variables. In VECM the cointegration rank shows the number of cointegrating vectors. For instance a rank of two indicates that two linearly independent combinations of the non-stationary variables will be stationary.

Granger's causality test

Causality testing is to knowing the endogen variable can be act as exogenous variable. Causality test is conducting with any model, one of them are granger's causality and error correction model causality. This research is using granger causality method. This method used to knowing the existence of causality relation among variables. The prediction power from previous information shows the existence of causality relation among two variables in the long-term. For knowing the causality relation among two variables is if probability value is lower that alpha 0,05 percent, thus H0 is rejected which is indicates some variable is going to effecting other variable.

Impulse Response Function Analysis (IRF)

Since shocks to a particular variable can generate variations both in it and in other variables, we employ the orthogonalized methodology of Sims (1980) to determine impulse responses. Impulse response functions as an additional check of the cointegration testing. Choleskytype of contemporaneous identifying restrictions are employed to draw a meaningful interpretation. The recursive structure assumes that variables but not vice versa. It is important to list the most exogenous looking variables

earlier than the most endogenous looking variables.

Variance decomposition

Variance decomposition (VDC) is performed to obtain the degree of erogeneity among variables outside of sampling period. The VDC shows the percentage of forecast error variance for each variable that is attributed to its own shocks and to fluctuations in the other variables in the system. According to Sims (1980) impulse response function (IRF) illustrates the expectations of future period from variable forecast deviation due to other variable innovation effects. It exposes the existence of shock variable to other variable until its equilibrium point. Variance decomposition of forecast error variance decomposition becomes an instrument of VAR that separate estimated variable to be shock variable or innovation variable; where it assumes that the innovation variable do not correlate each others. The variance decomposition analysis provides information of the movement of shock variable to certain variables and so to another shock variable.

Results and Discussion

The first step in cointegration analysis is to test the unit roots in each variable. This study apply Augmented Dickey-Fuller (ADF) stationarity tests by using Akaike Information Criterion (AIC) and Schwarz and Criterion (SC). If the t-statistic value is bigger than critical value which means that data is stationary at level. Thus, it can be analyzed using VAR method. On the other hand, if the t-statistic is lesser than critical value which means that non-stationary at level and stationary at first difference. The unit root test result from each variable is shown on the table 2.

Based on Table 2, it indicates ADF results of each proxy at levels and differences with the significant value are 5%. It shows that non-performing financing (NPF), inflation (INF), Jakarta Islamic Index (JII) and financing (LNFNC) are not stationary at level with significant value is 5% but exchange rate (ER) and money supply are stationary at level. Therefore, non-performing financing (NPF), inflation (INF), Jakarta Islamic Financing (JII) and financing (FNC) must be continue into first difference. It shows that non-performing financing (NPF), inflation (INF), exchange rate (LNER), Jakarta Islamic index (JII), money supply (LNM2) and financing (LNFNC) are stationary at level and first differencing with significant value is less than 5%.

Cointegration rank is estimated using Johannes methodology. Johansen's approach derives two likelihood estimators for the co-integration rank which are trace test and maximum Eigen value. The co-integration rank can be formally tested with the trace and the maximum Eigen value statistics. The trace statistic either rejects the null hypothesis of no co-integration among the variables or does not reject the null hypothesis that there is one co-integration relation among variables with the level of 5%. If the H0 : r = 0 means that it is rejected leads to no co-integration. When the H0 : r = 1 means that it does not rejected leads to cointegration.

Table 2: Unit Root Test of Augemented Dicky-Fuller (ADF)

Variables	Level	Probability	Note	First Difference	Probability	Note
NPF	-2.056501	0.5561	Not Stationary	-6.283415	0.0000	Stationary
INF	-2.818029	0.1983	Not Stationary	-5.139511	0.0006	Stationary
ER	-7.398076	0.0000	Stationary	-10.99709	0.0000	Stationary
JII	-3.2699420	0.0837	Not Stationary	-7.948733	0.0000	Stationary
M2	-3.895945	0.0198	Stationary	-9.548166	0.0000	Stationary
FNC	-0.566817	0.9992	Not Stationary	-5.796054	0.0000	Stationary

Table 3: Cointegration Test

Hypothesis No. Of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Max-Eigen Statistic	0.05 Critical Value
None*	0.875708	279.8890	107.3466	91.74527	43.41977
At most 1*	0.783517	188.1438	79.34145	67.33063	37.16359
At most 2*	0.713822	120.8131	55.24578	55.05026	30.81507
At most 3*	0.544926	65.76287	35.01090	34.64100	24.25202
At most 4*	0.437618	31.12187	18.39771	25.32529	17.14769
At most 5*	0.123432	5.796582	3.841466	5.796582	3.841466

Trace test indicates 6 cointegrating eqn(s) at the 0.05 level
*denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug Michelis (1999) p-values
Max-eigenvalue test indicates 6 cointegrating eqn(s) at the 0.05 level
*denotes rejection of the hypothesis at the 0.05 level
**Mac-Kinnon-Haug-Michellis (1999) p-values

Table 4: Granger Causality Test

Null Hypothesis	Obs	F-Statistic	Prob.
INF does not Granger Cause NPF	45	0.60789	0.6595
NPF does not Granger cause INF		0.77605	0.5481
LOGER doest not Granger cause NPF	45	1.74170	0.1622
NPF does not Granger cause LOGER		3.62601	0.0139
JII does not Granger cause NPF	45	0.85581	0.4996
NPF does not Granger cause LOGM2		0.09496	0.9834
LOGM2 does not Granger cause NPF	45	3.57432	0.0149
NPF does not Granger cause LOGM2		1.33889	0.2744
LOGFNC does not Granger cause NPF	45	2.58498	0.0533
NPF does not Granger cause LOGFNC		3.17493	0.0247
LOGER does not Granger cause INF	45	0.62458	0.6480
INF does not Granger cause LOGER		1.09109	0.3756
JII does not Granger cause INF	45	1.66724	0.1789
INF does not Granger cause JII		1.42960	0.2441
LOGM2 does not Granger cause INF	45	1.20399	0.3260
INF does not Granger cause LOGM2		0.47055	0.7570
LOGFNC does not Granger cause INF	45	0.81655	0.5231
INF does not Granger cause LOGFNC		0.35383	0.8396
JII does not Granger cause LOGER	45	1.85015	0.1406
LOGER does not Granger cause JII		3.30963	0.0208
LOGM2 does not Granger cause LOGER	45	4.20968	0.0067
LOGER does not Granger cause LOGM2		0.18472	0.0208
LOGFNC does not Granger cause LOGER	45	1.91246	0.1295
LOGER does not Granger cause LOGFNC		4.18461	0.0070
LOGM2 does not Granger cause JII	45	3.00084	0.0310
JII does not Granger cause LOGM2		1.44625	0.2389
LOGFNC does not Granger cause JII	45	3..96385	0.0091
JII does not Granger cause LOGFNC		0.52656	0.7169
LOGFNC does not Granger cause LOGM2	45	0.37620	0.8241
LOGM2 does not Granger cause LOGFNC		5.46093	0.0015

Table 5: The Result of Vector Error Correction Model

Long-Term		
Variable	**Coefficient**	**T-statistic**
INF(-1)	0.050783	2.25802579**
LOGER(-1)	-0.748694	-17.716375**
JII(-1)	-0.006762	8.2463415***
LOGM2(-1)	-19.14838	-8.2260972***
LOGFNC(-1)	9.521842	21.4969115**

*, **, ***: denote significant at 10%, 5%, 1% respectively

Based on the Table 3, it indicates the result of Johannes co-integration testing. These testing can be seen through the value of trace statistic and maximum eigenvalue with r = 0 is smaller than critical value on significant value by 5%. This result indicates that H0 means there is no co-integration is rejected and H0 which means that has co-integration is accepted. If there is no co-integration, so it must be continued with VAR model but if there is cointegration then it can be continued into VEC model. In this case, denotes that all of the variables consisting of NPF, INF, JII, LNER, LNM2 and LNFNC have long-term relationship which is proven by trace statistic is more than critical value with 5%. Thus, this research can be continued with VECM.

Granger causality testing conducted to know the causality relationship among all variables consist of NPF, INF, JII, LNER, LNM2 and LNFNC. Through this testing showed that all variables become both endogenous variable and exogenous variable. This testing is using fourth lag based on lag length criteria. This table below showing the result of pair wise granger causality test (Table 4).

Table 4 shows the result of pair wise granger causality test. This testing indicates that INF, LOGER, JII and LOGFNC are not significant effecting NPF by 0.6595, 0.1622, 0.4996 and 0.0533 respectively. While, LOGM2 is significant effecting NPF by 0.0149. NPF is not significant effecting INF, JII, LOGM2, by 0.5481, 0.9834 and 0.2744 respectively. There is no two way causality among all variables. JII and LOGFNC have one way causality relationship, while LOGM2 has two way causality. LOGFNC and LOGFNC have one way causality which is LOGM2 and LOGFNC is affecting JII. Moreover, FNC has one way causality with LOGM2 is affecting LOGFNC.

The presence of cointegration between variables suggests a long-term relationship among the variables under consideration. In the cointegration testing denotes that all of variables have long-term relationship. Then, the VECM can be applied. In the VEC model, there are two possible sources of causality such as error correction term that indicates long-run causality and lagged explanatory variables that indicates short run causality. The long-run relationship between the variables can be seen in Table 5.

According to first normalized equation shows that there is long-term relationship among these variables. It indicates that non-performing financing (NPF) is not significantly positive relationship with inflation (INF) which means that the appreciation of INF 1 percent will increase 0f NPF by 0.050783. Inflation is a condition when the average of price level of goods and services tend to increased. Inflation may be divided into the demand side and supply side. When the central bank implements an expansionary monetary policy, the firms and household might get losses because of the demand inflation. Inflation is result of changing in money supply cannot be controlled by companies and households, the ability to meet their credit obligation reduce fall which consequently due to increase on NPF (Abduh & Nursechafia, 2014) by the increasing of all goods due to the purchasing power of society is de-

creased so that it makes production decreased. This condition makes enterprises is difficult to repay their debt so that it causing increase on NPF. It is in line with Skarica (2013) and Klein (2011) shows that inflation is positively affecting to credit risk in banking.

Besides, non-performing financing (NPF) is significantly positive relationship to financing (LNFNC) with the increasing 1 percent of LNFNC, so it will increase 9.521842 of NPF. The main function of banking is distributing fund which is mean that banking is giving fund to customer who needing in spite of to get profit. When the total of asset on Islamic banking is increased, then Islamic banking will increase its financing which is tends to credit risk called as non-performing financing on Islamic banking. This condition can be supported with the weakness of economy condition such as high inflation. In this situation, inflation makes all price level is higher. Thus, it makes purchasing power of society is decreased so that it will make enterprise fail to pay debt which is causing increasing of NPF.

The increasing of Jakarta Islamic Index 1 percent will decrease of NPF with 0.006762. This is not in line with Aver (2008) who found that credit risk positively is affected by Slovenian Stock Exchange Index. This condition is affected by the increasing of money supply which leads to lowest interest rate. The decreasing of interest rate will attract people for conducting investment which leads to increasing on expenditure, production and income.

In line with Jakarta Islamic Index (JII), the exchange rate has negative relationship towards non-performing financing (NPF) which means that the increasing of exchange rate 1 percent will decrease 0.748694 of NPF. It is in line with previous researched such as Klein (2013), Abduh and Nursechafia (2014) who found that exchange rate is negatively effect on credit risk on banking. According to Mankiw (2007) depreciation of currency influences the foreign goods to become relatively more expensive while causes domestic goods become relatively cheaper. It indicates the depreciation of rupiah will give positive impact on local product. It will be more competitive because of its price is cheaper than import product. Thus, it will increase on aggregate demand on local product which leads to increasing on profit, so enterprises can pay their debt. The depreciation of rupiah will give negative impact on firms whose running its business activity based on import. This condition is supported by research by Jiang , (2014) shows that exchange rate have a strong negative correlation with default rate for particular type of firms by the depreciation of RMB had negative impacts on three types of industries such as whose raw materials are imported, those industries which maintain a huge amount of foreign exchange liabilities and tourism industry. By the depreciation of rupiah will makes import price is higher than local price. Thus, this condition becomes an opportunity for local product so that their product can compete with import product. In order to test and capture the short-term dynamics of the model, there is disequilibrium on the short term VEC model, so it needs to put error correction term on the VEC model as equilibrium error. VEC model was applied. In this research, VECM was tested in lag 4 as a consistency on the test previously. The result can be seen in table 6.

Table 6 denotes the summary of VEC model in short-term analysis with knowing the effect and significant relationship among variables. There is error correction term which is showed the speed of adjustment from short-term to term to long-term. As two of the error correction term is negative signs of coefficient and t-statistic, hence the result is CointEq1 and CointEq5 by -1.739761 and 11.70983 respectively.

Table 6: Short Term VECM

Variable	Coefficient	T-Statistic
CointEq1	-1.739761	-2.65792***
CointEq2	0.216223	1.81162**
CointEq3	0.237849	0.57096
CointEq4	0.013341	2.64111***
CointEq5	11.70983	0.80329
D(NPF(-1))	1.291738	2.13880***
D(NPF(-2))	1.158831	1.158831
D(NPF(-3))	1.365048	2.96971****
D(NPF(-4))	0.744513	1.94501**
D(INF(-1))	-0.014063	-0.12954
D(INF(-2))	-0.239324	-1.89447**
D(INF(-3))	0.005383	0.05741
D(INF(-4))	-0.345466	-2.85015****
D(LOGER(-1))	-0.274543	-0.72377
D(LOGER(-2))	-0.307921	-0.97765
D(LOGER(-3))	-0.194953	-0.89080
D(LOGER(-4))	-0.073623	-0.66788
D(JII(-1))	-0.006515	-1.76654**
D(JII(-2))	-0.005862	-1.60095**
D(JII(-3))	-0.007523	-1.65503**
D(JII(-4))	-0.008596	-2.96974****
D(LOGM2(-1))	0.8859691	0.09689
D(LOGM2(-2))	10.88347	1.28137*
D(LOGM2(-3))	-1.836579	-0.22629
D(LOGM2(-4))	0.653420	0.10201
D(LOGFNC(-1))	6.987185	1.12301
D(LOGFNC(-2))	6.826135	1.11086
D(LOGFNC(-3))	2.123849	0.32301
D(LOGFNC(-4))	10.78079	1.67392**
C	-0.875037	-1.69644
@TREND(11M04)	0.009177	0.79628
R-squared	0.809829	
Adj. R-squared	0.370974	
F-statistic	1.845323	

*, **, ***, ****: indicate significance at 20%, 10%, 5% and 1%

On the table 6 denotes that NPF has short term relationship on return NPF its self in the first, second and third period. INF significantly affects short term relationship on the fourth period with -0.345466. It means that the increasing of INF by 1 percent will decrease of NPF with 0.345466. It indicates that inflation and credit risk has negative relation in the short term, while inflation has positive relation on credit risk in long-term. It refers that inflation in short-term is low risk rather than in the long-term. Thus, when inflation in the short-term is increased, the rate of credit risk does not changing drastically (Ahmad and Arif, 2007) it needs several times for society so that inflation can increase all price and goods. Besides, it means that debtor is still optimist to repay their obligation although inflation is high. Besides, the agreement is based on profit-loss sharing system which is not making difficult for customers to repay their debt.

This research conducts impulse response function for additional check of the cointegration test's findings. Impulse re-

sponse function on Islamic banking showed the respond of non-performing financing to each variables shock which is happened on the macroeconomic variable (INF, JII, LNER and LNM2) and baking's behavior (LNFNC) in the range of a certain period in order to see the length of time needed of dependent variable to respond the shock of independent variables.

Based on the images, it shows the respond of inflation to the shocking of economic variables such as positive respond or negative respond. If impulse responsive graphic is on above line equilibrium which is tends to positive respond or increasing. But if the impulse responsive is on below equilibrium which is tends to negative respond or decreasing. Besides, if the IRF's chart shows the movement has come closer to the equilibrium point or return to beforehand equilibrium, it means that variable responses due to the shocking as longer as will disappear so that the shock does not remove a permanent effect on those variables.

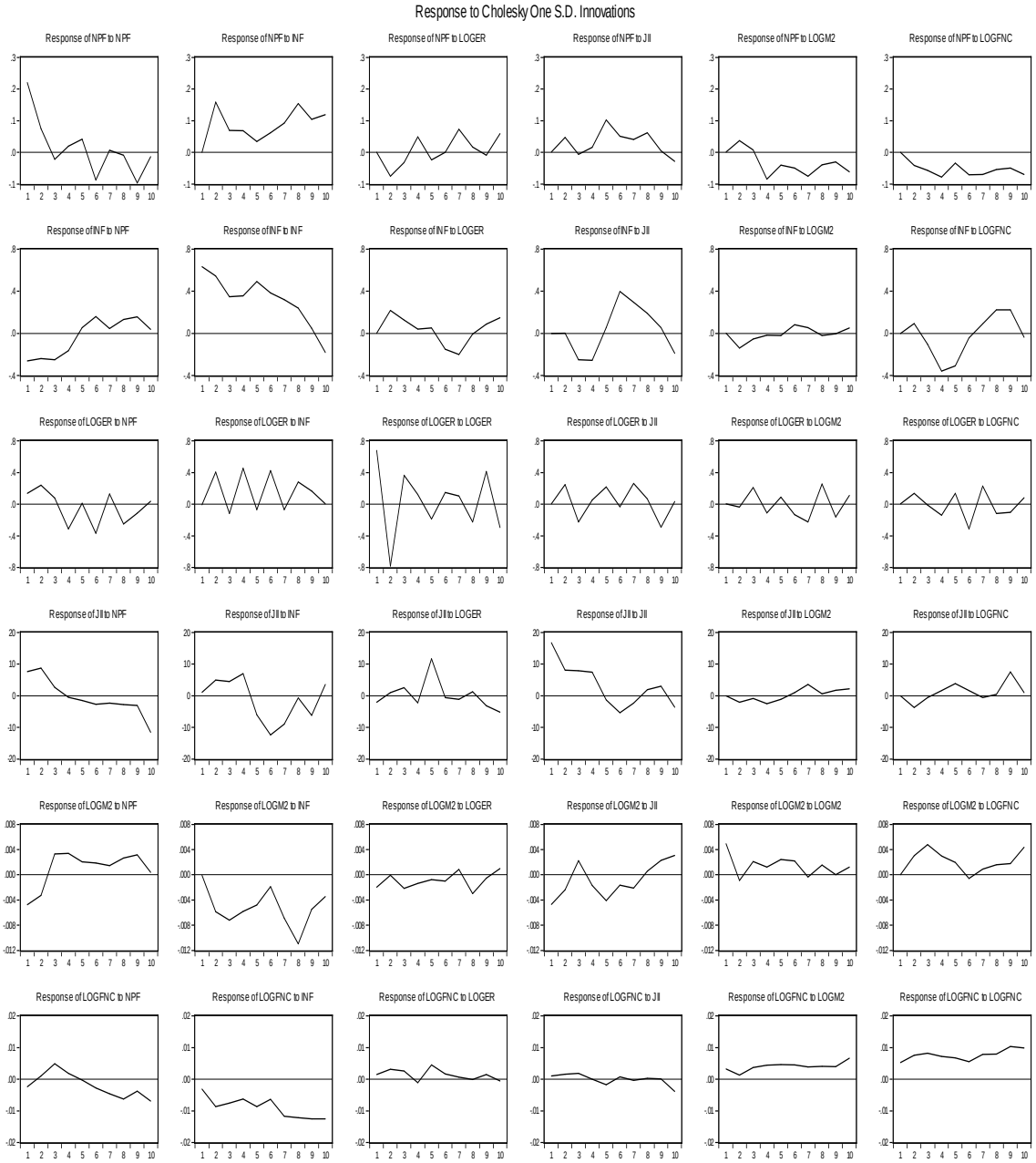

Figure 2: Impulse Response

Based on the result of IRF shows the response of non-performing financing (NPF) to inflation (INF) is tends to positive response with the fluctuation. The response of NPF to INF is highest in the first period with 0.163. But the movement is tends to decreasing with 0.034 in the fourth period. On the last period, the movement of IRF is increasing with 0.117. It shows that inflation make all price is higher so that it makes the purchasing power of society decreased due to decreasing on earning's firm. Therefore, this condition makes firm is difficult to pay its finance obligation.

While the response on non-performing financing (NPF) to Jakarta Islamic Index (JII) is increased on the second period with 0.05. Then, it tends to decreased on the fourth period with 0.01 and it is back to increase on the highest level with 0.11 on the fifth period. But it tends to decreasing until below equilibrium with -0.03. Thus, the response of NPF to JII is positive from the first up to ninth period but it shows negative response on the last period. By the increasing of money supply which is causing high inflation, central bank makes policy for decreasing on interest rate. Therefore, it will stimulate people to invest their money rather than spend it

The result of IRF of non-performing financing (NPF) to LNER is positive response to shocking of LNER. This movement shows the negative response with the lowest on below equilibrium line -0.07 on the second period. It shows that this condition is still dominated by import product. But it tends to positive response on above equilibrium line with 0.05 on the fourth period. It tends to decreased has come closer to equilibrium line on the fifth and sixth period. Then, this movement is back to increase on the last period with 0.05 while the highest value on the seventh period with 0.08. By the depreciation of rupiah will make local producer more competitive on the level price. It caused by the increasing of import product lead to decreasing on import demand and it will increase local demand product. By the increasing of local demand product will lead to increasing on firm's profit and decrease on NPF. Analysis of variance decomposition explain how large or portion of an economic variable to shock on the other economic variables which not directly can be known strengths and weaknesses of each variable to influencing other variables in a long period of time.

Based on table 7, it shows the result of variance decomposition of NPF. in the first period, NPF is the most dominant variable effecting NPF itself but its value is decrease although the value is still dominated in 1st period until 10th period. In the 2nd period, the fluctuation of LOGER is the most dominant variable up to 4th period effecting NPF with contribution 11.35 percent. But the fluctuation of LOGER tends decrease up to 10th period. While, the fluctuation of other variable such as JII, INF, LOGFNC and LOGM2 is come up in the 2nd period with contribution 1.80%, 1.67%, 0.73% and 0.003% respectively, although the fluctuation of LOGER variable is still dominated. In the 5th period, the fluctuation of LOGM2 is increase significantly with contribution 14.02103 and it tends to increase up to 10th period with contribution 19.34%. While, the fluctuation of LOGFNC tends to increase significantly in the 5th period with contribution 3.35% and it tends increase up to 10th period which is the fluctuation of LOGFNC becomes the most variable dominating in the 10th period. Moreover, the fluctuation of INF tends increase significantly in the 6th period with contribution 3.30% and it tends increase in the 10th period with contribution 4.13% . In contrast, the fluctuation of JII is increase up to 5th period with contribution 3.60% but it tends to decrease significantly up to 10th period.

Table 7: Variance Decomposition

Period	S.E.	NPF	INF	LOGER	JII	LOGM2	LOGFNC
1	0.248449	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.289473	93.80998	1.670135	1.972206	1.805664	0.003642	0.738375
3	0.308140	85.68693	1.556441	9.139982	2.624927	0.262282	0.729439
4	0.343574	75.34316	1.503777	11.35572	2.878156	7.975715	0.943477
5	0.374360	66.50736	1.393607	11.11050	3.608393	14.02103	3.359117
6	0.399879	58.49720	3.304642	10.83660	3.217565	17.69067	6.453335
7	0.420073	53.14161	4.522849	10.22240	2.934799	19.36376	9.814585
8	0.441484	48.25225	4.643587	10.54614	2.746848	19.88467	13.92650
9	0.458638	45.03469	4.323798	10.05395	2.623190	19.65642	18.30795
10	0.477402	42.37845	4.130207	9.981374	2.492314	19.34910	21.66856

Conclusion

This research is using Vector-error correction model (VECM) as a tool for analyze about the effect of bank behavior's, namely financing, and macro economic variables, namely inflation, exchange rate, money supply and Jakarta Islamic Index (JII) towards credit risk on Islamic banking. Based on result shows that both bank behavior's (Financing) and macroeconomic variables (inflation, exchange rate, money supply and Jakarta Islamic Index) are significantly effecting non-performing financing (NPF) with R-squared 80.98 percent.

Vector Error Correction model is to examine the short-term and long-term relationship among all variables. On the short-term relationship founds that inflation and Jakarta Islamic Index are negatively significant effecting non-performing financing (NPF). In the long-term relationship finds that inflation (INF) and financing (LOGFNC) are affecting non-performing financing on Islamic banking. Financing (FNC) is positively significant effecting non-performing financing (NPF), Meanwhile, Jakarta Islamic Index (JII), exchange rate (ER), and money supply (M2) are negatively significant affecting non-performing financing (NPF).

Impulse responsive finds that the shock of inflation (INF) and exchange rate (ER) give positive response toward non-performing financing (NPF). While, Jakarta Islamic Index (JII), financing (FNC) and money supply (M2) give negative response toward non-performing financing (NPF). Variance decomposition shows that financing (LOGFNC) is the most capable variable influencing non-performing financing (NPF) with contribution 21.66% rather than others variable. While, Jakarta Islamic Index (JII) has a small percentage influencing non-performing financing (NPF).

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