International Journal of Innovation, Creativity and Change. www.ijicc.net
Volume 10, Issue 6, 2019

Non-Performing Financing and Asset Quality: Evidence from Indonesian Islamic Banks

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The current development of Islamic banks in Indonesia is quite rapid, but unfortunately cases of non-performing financing (NPF) among these banks are also on the rise. Within the bank risk management (BRM) theoretical framework, this study aims to investigate the causal-effect analysis between NPF and bank-specific factors over both the short run and the long run. This study utilises quarterly financial data involving a group of 11 Islamic banks in Indonesia from June 2014 to January 2018. Also, the study deploys both Johansen-Juselius cointegration test and Vector Error Correction Model (VECM) as estimation tools. The empirical findings from Johansen-Juselius reveal the existence of cointegration between NPF and the tested variables. From the VECM analysis, the financing deposit ratio (FDR) model is the only credible model with long-run significant relationship. Interestingly, its Granger causality test shows a significant unidirectional causality running from return on assets (ROA) to FDR. It is now evident that bank's profitability is of paramount importance in determining future growth of its financial assets.

Key words: *Non-Performing Financing, Indonesia Islamic Banks, Johansen-Juselius Cointegration Test, Bank Risk Management.*

Introduction

During the peak of the Asian Financial Crisis 1997–1998, the conventional banking in Indonesia was revamped by the International Monetary Fund (IMF) as it was associated with operational weaknesses coupled with excessive lending activities. Islamic banking, on the other hand, was seen as intact with its profit-and-loss sharing principles blending well with the economic activities of developing countries like Indonesia (Imam & Kpodar, 2015). It has also been observed that the performance of Islamic banking is better than its counterpart during

times of economic crisis (Beck, Demirgüç-kunt, & Merrouche, 2013). Despite the relative strength of Islamic banks, they still have to deal with the problem of non-performing financing (NPF). This is an adverse situation for any bank as it is triggered by the failure of customers to repay their loans within the specified time period. Bank lending is considered to be an asset to the bank but the presence of NPF will deteriorate the quality of its assets. Subsequently, the bank will suffer from liquidity problems, ultimately disrupting the bank's future earnings. NPF is one of the measures in determining the health of a bank and any good bank must be backed by sufficient paid-up capital.

Besides factors that affect NPF, research on Islamic banking has focused mostly on its application of Islamic principles, internal management, risk management, corporate governance, behaviour, financial performance, and macroeconomic variables (Setiawan & Putri, 2013; Bitar, Hassan & Hippler, 2018; Srairi, 2015; Shibani, & Fuentes, 2017; Bitar, Hassan, & Walker, 2017; Bitar, Madiès & Taramasco, 2017; Setyawati, Suroso, Suryanto, & Nurjannah, 2017; Rahman, Sulaiman, & Said, 2018; Trinugroho, Risfandy & Ariefianto, 2018; Alhalboni, Baldwin & Helmi, 2018; Mahdi & Abbes, 2018; Naqvi, Rizvi, Uqaili, & Chaudhry, 2018; Hassan, Khan, & Paltrinieri, 2019; Rizvi, Narayan, Sakti & Syarifuddin, 2019; Safiullah & Shamsuddin, 2019).

The studies on Islamic banking have also discussed *mudarabah* and *musharakah* principles extensively, financing risk, long-run financial structure, long-run liquidity risk, and credit access (Misman, Bhatti, Lou, Samsudin, & Rahman, 2015; Kabir, Worthington, & Gupta, 2015; Misman, Bhatti, Lou, Samsudin, & Rahman, 2015; Sorwar, Pappas, Pereira, & Nurullah, 2016; Othman, Majid, & Rahman, 2017; Mongi, 2018; Hamza & Saadaoui, 2018; Abdul-Rahman, Sulaiman, & Said, 2018; Leon, & Weill, 2018; Warninda, Ekaputra, & Rokhim, 2019;). However, little has been known about factors contributing to NPF among Indonesian Islamic banks, both in the short and in the long run. As such, this study is aimed at addressing this gap.

In Indonesia, the development of Islamic banks is very rapid. As a country with the largest Muslim population, Indonesia has huge market potential for Islamic banking. To accommodate the public need for the Islamic banking system, the Indonesian Government issued regulation in 1992 in the form of operational licenses for Islamic banks (Venardos, 2012). Although their economic contribution is rather small at the onset, Islamic banks in Indonesia have the potential to grow in the long run (Rizvi, Narayan, Sakti, & Syarifuddin, 2019).

Data released by the Indonesian Financial Services Authority (IFSA, 2018) in 2018 show that within 17 years, the total assets of the Islamic bank industry have increased by 161 times, from Indonesian Rupiah (IDR) 1.79 trillion in year 2000 to IDR 288.03 trillion at the end of year 2017. The average growth rate of Islamic bank assets is 9.4% per year, and their annual financing growth in the last five years has reached an average of 18.29%. Table 1 shows the

performance of 11 Indonesian Islamic banks in 2018 as measured by Net Operating Profit after Tax (NOPAT). It is interesting to note that Islamic banking has no significant impact on long-run profitability but rather on the stability of the banking industry itself (Rizvi, Narayan, Sakti, & Syarifuddin, 2019).

Table 1: Performance of Indonesian Islamic Banks in 2018

Bank	Year Established	NOPAT (in IDR)
1. PT BANK MUAMALAT INDONESIA	1991	112,600,000,000
2. PT BANK BNI SYARIAH	2010	416,080,000,000
3. PT BANK SYARIAH MANDIRI	1999	605,000,000,000
4. PT BANK MEGA SYARIAH	2004	1,600,000,000,000
5. PT BANK MAYBANK SYARIAH INDONESIA	2010	-64,720,000,000
6. PT BANK VICTORIA SYARIAH	2009	4,974,000,000
7. PT BANK BRISYARIAH	2008	106,600,000,000
8. PT BANK JABAR BANTEN SYARIAH	2010	35,437,000,000
9. PT BANK PANIN DUBAI SYARIAH	2009	20,800,000,000
10. PT BANK SYARIAH BUKOPIN	2008	190,000,000,000
11. PT BANK BCA SYARIAH	2010	58,400,000,000

Source: IFSA

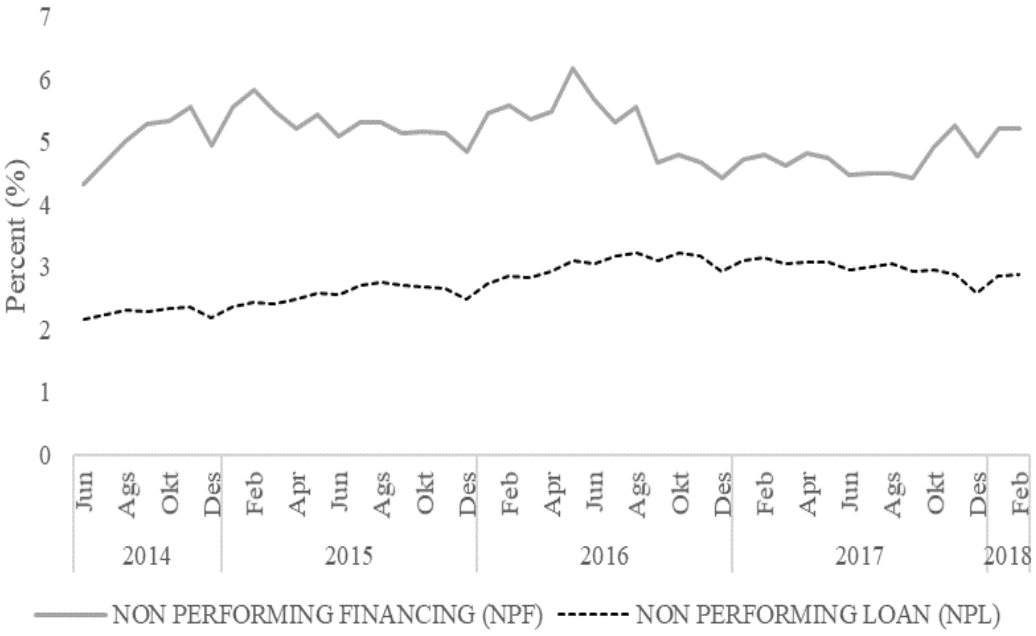
The development of Islamic banks in Indonesia is encouraged by the preference of Indonesian Muslims for depositing their funds in Islamic banks. This trend seems to show that Islamic banks' profit-sharing ratio and product margin is more competitive than conventional banks' interests (IFSA, 2017). However, Islamic banks often face the risk of NPF triggered by the failure of customers to pay back within the predetermined term.

Within the Bank Risk Management (BRM) framework, this study examines the roles of banks' capital (paid-up capital and working capital) and its profitability in managing the risk of NPF. The main objective of our study is to examine the influence of factors specific to Islamic banks, namely financing to debt ratio (FDR), capital adequacy ratio (CAR), return on assets (ROA) and net operating margin (NOM) on non-performing financing (NPF) both in the short and long run. This study on bank specific-determinants over NPF among Indonesian Islamic banks is important because the findings will later help top management in making informed business decisions.

Indonesian Islamic Bank Non-Performing Financing

The trend in NPF among Indonesian Islamic banks continues to increase as highlighted by the Indonesian monetary authority (IFSA, 2018). National NPF in January 2018 reached 5.21% with total financing of IDR 187.05 trillion, whereby 34.49% is contributed by profit sharing financing. There has been a significant increase from 4.84% in NPF and total financing of IDR 154.53 trillion since 2015. On the other hand, Indonesian conventional banks' non-performing loans (NPL) in January 2018 were reported at only 2.66% with a total credit of IDR 75.39 trillion. This is a much better performance compared to Islamic banks' NPF. The comparative analysis is illustrated in Graph 1 below.

Graph 1. Comparison of Islamic banks' NPF and conventional banks' NPL in Indonesia



Source: Indonesian Financial Services Authority

Graph 1 shows that Islamic banks' NPF risk averages at 5.08% annually, greater than conventional banks' NPL risk averaging at 2.77%. This trend is worth close scrutiny and is the background on which the present study is conducted.

Islamic Bank-Credit Risk and determinants of NPF

An Islamic bank is a bank whose services are offered based on the principles of Islamic teachings (Ullah and Khanam, 2018). These principles include being free of interest, free of *gharar* (ambiguity), and free of *maysir* (gambling), prohibition of financing illegal sectors, and profit-and-loss sharing (Taktak & Zouari, 2014). Through their interest-free financing, Islamic

banks offer alternative access to credit normally offered by conventional banks (Leon& Weill, 2018). Islamic banks offer a *halal* way of banking through such practices as *asmusharakah* (joint venture), *mudarabah* (profit-sharing and loss-bearing), *baisalam* (forward sale agreement), and *ijarah* (leasing) in social development (Jalil & Rahman, 2010; Imam and Kpodar, 2010; Rarick, 2009; Bidabad & Allahyarifard, 2008; Rahman, 2007). Islamic banking also plays an effective and intermediary role that channels funds from surplus households to deficit households (Furqani, Hafas, & Mulyany, 2009).

It is important to point out that Sharia-compliance is not without its weaknesses. New Islamic banking products must go through the Sharia Council's approval and Sharia-compliant procedures do make these Islamic banking products appear to be less flexible than the conventional banks. Nevertheless, previous studies have showed that Islamic banks not only performed better, but also carried out social programs better than their counterparts (Ullah & Khanam, 2018; Hakimi et al., 2018; Olson & Zoubi, 2008). The capitalisation of Islamic banks will work well in economically stable countries as indicated by the low NPF (Hassan & Hippler, 2018). It has also been proven that there is a positive correlation between GDP and credit risk (Rostami, Nabizade, & Shahi, n.d.). Credit risk is derived from the issue of information asymmetry. Islamic banks with high levels of information asymmetry are potentially exposed to high level of credit risk (Mongi, 2018). On the contrary, there is a negative correlation between liquidity and credit risk (Hassan, Khan & Paltrinieri, 2019).
FDR shows the ability of Islamic banks to distribute funds deposited by the third parties through its financing schemes. FDR reflects how well an Islamic bank plays its intermediary function. Another factor that may contribute to NPF is CAR. This is the ratio of a bank's paid-up capital to its risk-weighted assets. Capital adequacy is a very important buffer for banks to accommodate the risk of losses, particularly the NPF. According to Circular Letter of Bank Indonesia No.9/24/DPbS of 2007, a healthy CAR is the one that stays above 12%. A high CAR value reflects the flexibility and confidence level of a bank in distributing its financing funds. However, this may also bring about a moral hazard because the bank will be more lenient with certain regulations.

Another influential factor that can contribute to NPF is ROA. It measures how profitable a bank is in relation to its total assets. Alternatively, it is the net income generated by a bank relative to its total assets (IFSA, 2017). The greater this ROA is, the greater the level of profitability and the lower the risk of NPF. The final determinant of NPF in our study is NOM. It measures the ability of productive assets in generating net income. In short, NOM is a measure of efficiency and profitability. It indicates how well the banks have been able to keep up with the growth of their revenues (primarily coming from the bank's financing activities, investment and services fees) ahead of the rising costs (principally the interest on deposits for mainstream banks or income attributable to depositors for the Islamic bank, money market financing, employee salaries and benefits) (Azhar & Afandi, 2003).

Methodology

Our study deploys both Johansen-Juselius Multivariate cointegration test and Vector Error Correction Model (VECM) as estimation tools to examine the magnitude of the effects. The out-of-sample analysis involves the use of Impulse Response Function (IRF) and Variance Decomposition (VDC). To specifically examine causal-effect relationship between non-performing financing and bank's specific factors, our theoretical model is developed as follows:

$$NPF = f(FDR, CAR, ROA, NOM) \dots\dots\dots\dots\dots\dots (1)$$

Where:

NPF = Indonesian Islamic Bank non performing financing
FDR = Indonesian Islamic Bank financing to deposit ratio
CAR = Indonesian Islamic Bank capital adequacy ratio
ROA = Indonesian Islamic Bank return on assets
NOM = Indonesian Islamic Bank and net operating margin ratio

This study utilises quarterly financial data involving 11 Islamic Indonesian banks from reports published by Indonesian Financial Services Authority (IFSA henceforth) starting from June 2014 till January 2018. The period is chosen because of robust annual growth rate in bank assets. The mathematical expression of our model is formulated as follows:

$$NPF = \beta_0 + \beta_1 FDR + \beta_2 CAR + \beta_3 ROA + \beta_4 NOM + \mu_1 \dots\dots\dots\dots\dots (2)$$

Where:

μ_1 = Error Term
β_0 = Intercept

Justification of the Model Variables

Credit risk belongs to financial institutions. It is high risk if financial institutions do not manage their credit properly. Risk credit is affected by net interest income to total income, non-interest income to total income and ratio of loan loss provisions to total assets (Bulbül, Hakenes & Lambert, 2019). These independent variables are indicators of the performance of financial institutions. It is determined by concentration in the loan market bank and sector competition (Owen & Pereira, 2018; Bülbül, Hakenes & Lambert, 2019). According to Trinugroho et al., (2018), one of the concentration ratios in the loan market measurement is Total Loans to Total Assets (TLTA). It could affect net margin in financial institutions. In addition, Trinugroho et al. (2018) also states that the performance of financial institutions depends on the market structure that is strongly influenced by economic development. Nevertheless, the variables

chosen in this study are internal variables of financial institutions and are considered to determine the high credit risk of Indonesian Islamic banks, namely non-performing financing (NPF). The bank's specific variables which are chosen in this model are financing to debt ratio (FDR), capital adequacy ratio (CAR), (OER), return on assets (ROA) and net operating margin (NOM).

Model Specifications

Our empirical model is based upon the bank risk management framework with special attention given to bank specific factors that may influence Islamic bank non-performing financing. Following the work of Abdul Hadi et al. (2013), the research framework attempts to identify the type and strength of the relationship (long-term and dynamic relations) between the endogenous and exogenous variables. Johansen-Juselius Cointegration Test (1990) is used to determine the number of cointegrating vectors. Johansen (1988) suggests two statistic tests to determine the cointegration rank, namely lamda trace and lamda max. Engle-Granger Cointegration test (1987) is an econometric technique for testing the correlation between non-stationary time series variables (Granger & Weiss, 1981 and Engle & Granger, 1987). Two variables are said to be cointegrated when a linear combination of the two is stationary, even though each variable is non-stationary at level. Generally, when two variables are non-stationary, it is highly probable that their linear combination will also be non-stationary. Nonetheless, Engle-Granger (1987) has proven otherwise. In line with Granger and Weiss (1981) and Engle-Granger (1987), components in vector X_t are cointegrated at d,b degree if every component in X_t is integrated at first difference or I(d).

Given that d is the number of differencing, and b the number of cointegrating vector, there exists a nonzero vector $\beta = (\beta 1, \beta 2, \ldots, \beta n)$ such that the linear combination of $\beta X_t = \beta 1 X 1_t + \beta 2 X 2_t + \ldots + \beta n X_{nt}$ is cointegrated at d,b degree, where b> 0. The vector β is called the cointegration vector.

In order to avoid the non-stationarity problem, it is necessary to utilise the first differentiated (or differentiated at a higher level) data. Still, this may result in a loss of valuable data points on long-run attributes of the data. However, if there is an equilibrium association between such variables, the error terms should be stationary (Engle & Granger, 1987). The unit root test is essential in determining the stationarity of time series data. The Augmented Dickey Fuller (ADF) is the most common unit root test and expressed as follows:

$$\Delta X_t = \lambda 0 + \lambda 1 T + \lambda 2 X_{t-1} + \Sigma \lambda i \Delta X_{t-i} + \varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Where i = 1, 2, 3…k

The hypotheses being tested are:

H0: λ2 = 0 (the data is not stationary, it contains unit root)
H1: λ2< 0 (data is stationary, it does not contain unit root)

Once this condition of stationarity is satisfied, both variables are assumed to be cointegrated. Then, the Vector Error Correction Model (VECM) estimation method can be mobilised to allow for short run adjustments while confining the long-run behaviour of the endogenous variables to converge to their cointegrating relationship. The VECM allows us to break up the short-term and long-term associations. The VAR model is formulated as follows:

$X_t = A_0 + \sum_{k=1}^{P} A_k X_{t-k} + e_t$ .....(4)
Where:
X_t is in the form of n ×1 vector of variables
A_0 is an n × 1 vector of constant terms
A_k is an n × n matrix of coefficients
e_t is an n × 1 vector of error terms

The outcome from the cointegration test will depict the long-term relationship among the variables. The short run dynamics will be represented by the VAR model. If the variables are non-stationary and are not cointegrated, then the VAR model above (in first differences) will be used instead. If the variables are found to be cointegrated, then the VECM model (a restricted VAR) will be deployed.
The econometric procedure begins with the unit root tests which are performed on all time-series variables. This is followed by the Johansen-Juselius cointegration test. Then, the Granger Causality test via Vector Error Correction Modelling is conducted. In order to observe the dynamic interaction between endogenous and exogenous variables, we incorporate Impulse Response Functions (IRF) and Variance Decomposition (VDC) into our out-of-sample analysis.

Empirical Findings

Table 2 presents the results of group unit root tests at level and first difference respectively. At level, the test results from Levin, Lin & Chu show the acceptance of a null hypothesis indicating that all the five time series variables are non-stationary. On the contrary, all unit root tests on the first differenced data series reject the null hypothesis suggesting that those data series under consideration are stationary at first difference. From these test results, we can deduce that all investigated variables are integrated at first difference or I (1).

Table 2: Results of group unit root tests (at level and first difference)

	At Level		At First Difference	
Method Null: Unit root (assumes common unit root process)	Statistics	Prob.**	Statistics	Prob.**
Levin, Lin & Chu t*	-0.4521	0.3256	-15.0196	0.0000
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.7191	0.0428	-14.7722	0.0000
ADF- Fisher Chi-square	22.7178	0.0118	151.687	0.0000
PP-Fisher Chi-square	24.1270	0.0073	182.784	0.0000

**Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

In determining the optimum lag-length of our model, we use AIC and SC statistics. From Table 3, it is obvious that the best model can be derived at Lag 1. To test the level of significance of the error correction term (ECT henceforth) in each individual model, the p-value is reported.

Table 3: Akaike Information Criterion (AIC) and Schwarz Information Criterion (SC)

VAR Lag Order Selection Criteria						
Endogenous Variables: NPF CAR FDR NOM ROA						
Exogenous variables: C						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-142.3555	NA	0.0009	7.1880	7.3970	7.2641
1	-40.6554	173.6343*	2.18e-05*	3.4466*	4.7004*	3.9031*
*indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

The statistical results from Johensen-Juselius cointegration test are reported in Table 4 below. Both lamda trace and lamda max statistics support the presence of cointegration among the variables in the system of equation. Null hypothesis of no cointegrating vector (r=0) is rejected at both 5% and 1% significance levels. Since both lamda trace and lamda max are greater than their respective critical values, we conclude that there is at least one cointegrating vector for the time series variables in the system. This cointegrating vector (or r) is the variable that pulls

all the five variables in the equation to be cointegrated in the long run. In other words, r indicates the number of cointegrating relationships (Masih & Masih, 1996).

Table 4: Johansen-Juselius Cointegration Test Results

Series: NPF CAR FDR NOM ROA								
Lags interval (in first differences): 1 to 1								
Hypothesised No. of CE(s)	Eigenvalue	Trace Statistics	5 Percent Critical Value	1 Percent Critical Value	Eigenvalue	Max-Eigen Statistics	5 Percent Critical Value	1 Percent Critical Value
None**	0.616222	85.35132	68.52	76.06	0.616222	40.22298	33.46	38.77
At most 1**	0.442664	45.12834	47.21	54.46	0.442664	24.55266	27.07	32.24
At most 2*	0.310011	20.57568	29.68	35.65	0.310011	15.58536	20.97	25.52
At most 3	0.11008	4.990319	15.41	20.04	0.11008	4.894787	14.07	18.63

Trace test and Max-eigenvalue tests indicate 1 co-integrating equation(s) at both 5% and 1% levels
*(**) denotes rejection of the hypothesis at the 5% (1%) level

Table 5 presents the normalised long-run (variables at level) coefficients which are derived from the Johansen-Juselius cointegration procedure. It is interesting to note that all the four independent variables are significantly related to NPF. Specifically, there is a negative relationship between NPF and the three bank specific variables—CAR, FDR and ROA. Meanwhile, it is quite intriguing to observe the positive relationship between NPF and NOM (statistical interpretations consider the opposite sign). It is somewhat undesirable to find that the two profitability measures (ROA and NOM) seem inconsistent in relation to NPF.

Table 5: Normalised equation results

Normalised co-integrating coefficients (standard error in parentheses)				
NPF	CAR	FDR	NOM	ROA
1.000000	1.804768 (0.3603)	0.323082 (0.0761)	-15.07233 (2.1700)	16.74173 (2.3510)
t-statistics	5.0080*	4.2444*	-6.9447*	7.1234*
Adjustment coefficients				
D(NPF)		0.050256		
D(CAR)		-0.000938		
D(FDR)		-0.476175		
D(NOM)		0.070956		
D(ROA)		-0.019976		

*significant at 5% level

The statistical results from VECM estimation are summarised in Table 6 below. We put up our emphasis solely on FDR model since this is the only model whose error correction terms (ECT) are significant at 5% level. It is imperative to note that VECM requires the ECT to be in negative value and fall within the range of 0.00 and -1.00 (0.00>ECT>-1.00). Observing the t-value and the coefficient of ECT (also known as speed of adjustment) corresponding to -0.4761, we therefore confirm the presence of equilibrium relation between FDR and the four explanatory variables. There is relatively high speed of adjustment approximately 48% towards equilibrium made by FDR in the system. This adjustment process is moderately fast and could be due to the current Islamic banking scenario in Indonesia. Technically, we desire higher speed of adjustment because a statistically credible endogenous variable should be able to demonstrate higher speed of adjustment in its model specification. All in all, the empirical findings are very much in line with our expectation in that profitability measures like ROA are vital in determining growth in lending activities as proxied by FDR. This is consistent with prior research that revealed the significant relation between bank's profitability and loan growth (Abdul Hadi et al., 2018). Interestingly, the test result from Granger Causality within sample indicates a presence of dynamic relation between FDR and ROA. This implies that ROA 'Granger-causes' FDR in the short run.

Table 6: Vector Error Correction Estimates via VECM (1)

Error Correction:	D(NPF)	D(CAR)	D(FDR)	D(NOM)	D(ROA)
CointEq1	0.050256	0.000938	--0.476175	0.070956	-0.019976
	(0.045113)	(0.06234)	(0.16561)	(0.01824)	(0.02601)
	[1.11347]	[-0.01505]	[-2.87526]	[3.89059]	[-0.76814]
D(NPF(-1))	-0.343423	0.405433	0.045082	-0.117429	-0.064040
	(0.17440)	(0.24087)	(0.63992)	(0.07047)	(0.10049)
	[-1.96917]	[1.68321]	[0.07045]	[-1.66634]	[-0.63729]
D(CAR(-1))	-0.195451	0.126547	0.477850	-0.055827	-0.056086
	(0.14080)	(0.19446)	(0.51664)	(0.05690)	(0.08113)
	[-1.38814]	[0.65074]	0.92492]	[-0.98122]	[-0.69132]
D(FDR(-1))	-0.006430	0.079425	-0.211951	-0.007824	-0.027200
	(0.04375)	(0.06042)	(0.16053)	(0.01768)	(0.02521)
	[-0.14699]	[1.31448]	[-1.32035]	[-0.44258]	[-1.07901
D(NOM (-1))	0.391253	-0.265391	-1.626862	0.042678	-0.100591
	(0.30330)	(0.41890)	(1.11291)	(0.12256)	(0.17476)
	[1.28997]	[-0.63354]	[-1.46181]	[0.34822]	[-0.57559]
D(ROA(-1))	-0.520803	0.426516	5.174804	-0.111173	-0.156914
	(0.60609)	(0.83708)	(2.22390)	(0.24491)	(0.34923)
	[-0.85942]	[0.50953]	[2.32690]*	[-0.45394]	[-0.44932
C	0.022318	0.098418	-0.475014	-0.009050	-0.014461
	(0.05608)	(0.07745)	(0.20576)	(0.02266)	(0.03231)
	[0.39798]	[1.27073]	[-2.30856]	[-0.39939]	[-0.44756]
R-squared	0.138423	0.158368	0.235887	0.720097	0.208487
Adj. R-squared	-0.009276	0.014089	0.104896	0.672113	0.072799
F-statistic	0.937200	1.097648	1.800787	15.00721	1.536520
Akaike AIC	0.870636	1.516442	3.470629	-0.941643	-0.231974
Schwarz SC	1.160247	1.806054	3.760240	-0.652031	0.057638

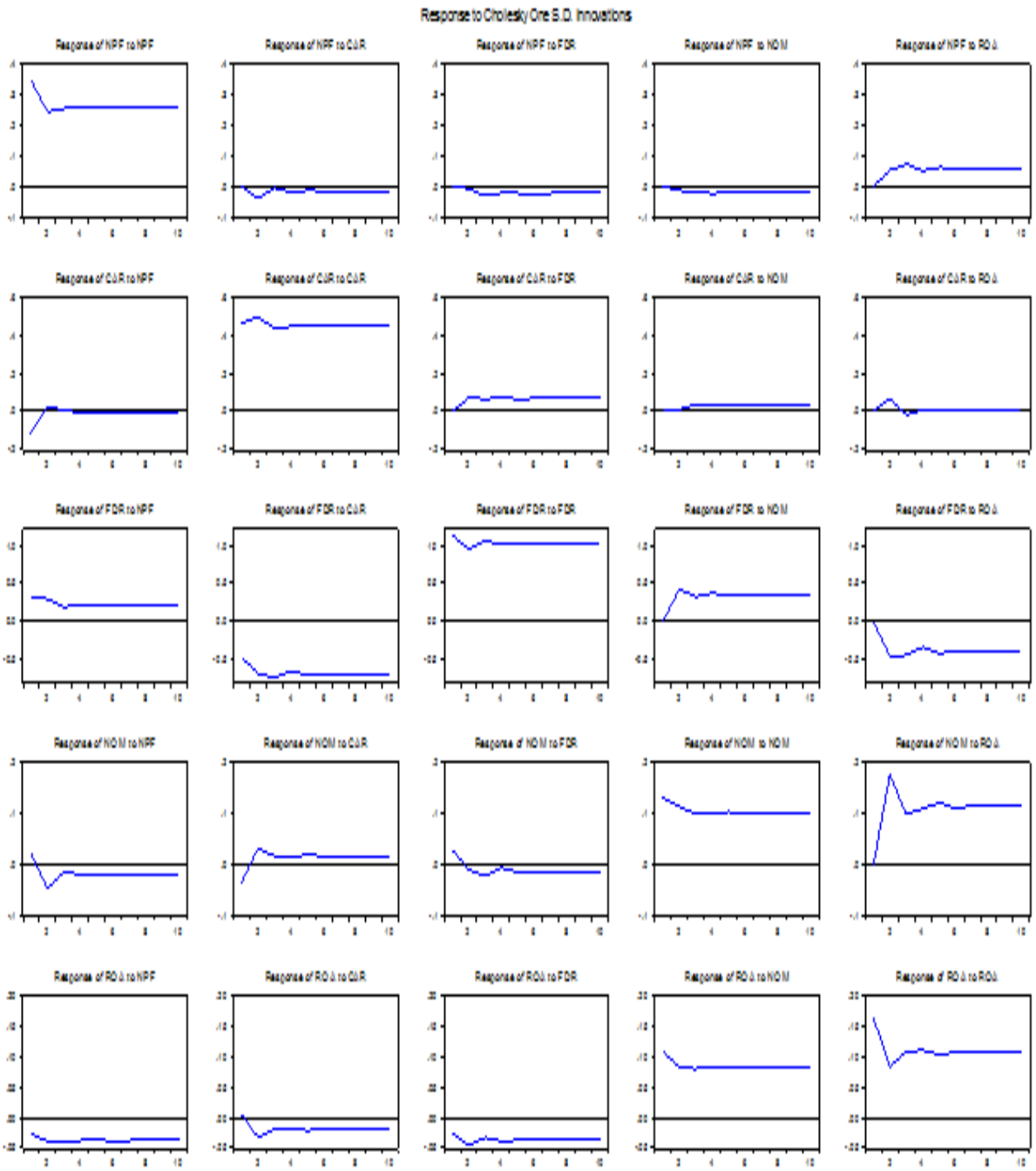
Standard errors in ( ) & t-statistics in [ ]

From the Granger Causality tests within the VECM estimates, the FDR model is the only credible model that produces significant results. Table 7 presents the statistical results of Simultaneous Wald F Test from the FRD model.

Table 7: Vector Error Correction Granger Causality Test

Dependent Variable: D(FDR)			
Excluded	Chi-Square	Df	Prob.
D(NPF)	0.004963	1	0.9438
D(CAR)	0.855475	1	0.3550
D(NOM)	2.136897	1	0.1438
D(ROA)	5.414481	1	0.0200*
All	5.750218	4	0.2186

In order to substantiate the results obtained from VECM, dynamic simulations via impulse response function (IRF) and variance decomposition (VDC) are employed. Given one standard deviation shock in ROA as shown in IRF Multiple-Table below, the response of FDR is significant even though it moves in the opposite direction. A similar finding is also observed on the impact of ROA upon NOM. It is now evident that bank's profitability is one the key components in bank risk management framework.



The analysis of variance decomposition (VDC) is summarised in Table 8 below. The ten-period horizon is chosen to demonstrate a sense of the dynamics in the system. The Granger-causal chain implied by the VDC analysis tends to suggest that CAR is relatively the leading variable, being the most exogenous of all, followed by NPF. Decomposition of variance in FDR, besides being explained by its own (57.90%), can also be explained by CAR (24%) and ROA (8%). Interestingly, the same can be implied for NPF, in which 4.20% of its variation is explained by

ROA, while the other 0.61% is explained by FDR. Lastly, NOM is the most endogenous of all and ROA comes second.

Table 8: Analysis of Variance Decomposition (VDC) involving: a) NPF

Period	S.E.	NPF	CAR	FDR	NOM	ROA
1	0.346759	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.429410	97.53868	0.848229	0.028091	0.093840	1.491165
3	0.506137	95.66815	0.620285	0.389627	0.173354	3.148584
4	0.573585	95.42874	0.585691	0.449421	0.312104	3.224048
5	0.633246	95.00709	0.526930	0.493298	0.353790	3.618894
6	0.687907	94.77664	0.491320	0.537510	0.391229	3.803301
7	0.738467	94.61709	0.467577	0.561872	0.420604	3.932860
8	0.785803	94.47819	0.446757	0.583012	0.440803	4.051243
9	0.830446	94.37713	0.431488	0.599615	0.457819	4.133948
10	0.872802	94.29278	0.418852	0.612687	0.471383	4.204301

b) CAR

Period	S.E.	NPF	CAR	FDR	NOM	ROA
1	0.478919	5.603134	94.39687	0.000000	0.000000	0.000000
2	0.697117	2.752217	95.20942	1.080303	0.028404	0.929656
3	0.825451	1.972274	95.71201	1.400448	0.197807	0.717463
4	0.941862	1.519910	95.98443	1.667603	0.264554	0.563508
5	1.047148	1.229818	96.24432	1.741883	0.316274	0.467702
6	1.140757	1.036344	96.39568	1.832209	0.340771	0.394996
7	1.228232	0.894284	96.50480	1.890549	0.364448	0.345923
8	1.309596	0.786759	96.59334	1.932115	0.380756	0.307029
9	1.386183	0.702375	96.65987	1.967690	0.393473	0.276595
10	1.458819	0.634314	96.71430	1.995025	0.404075	0.252289

c) FDR

Period	S.E.	NPF	CAR	FDR	NOM	ROA
1	1.272356	6.776442	13.82988	79.39368	0.000000	0.000000

2	1.857525	5.664708	19.87547	63.19192	5.197434	6.070463
3	2.334627	4.264043	22.56437	60.57637	5.197718	7.397500
4	2.679025	3.857045	23.03106	60.07018	5.869008	7.172711
5	3.008342	3.603521	23.66704	59.11044	5.973317	7.645680
6	3.298737	3.412889	23.97748	58.77093	6.128931	7.709766
7	3.564811	3.288752	24.21639	58.46005	6.236277	7.798537
8	3.813985	3.193204	24.40160	58.22159	6.303885	7.879720
9	4.046943	3.118699	24.53818	58.05267	6.364659	7.925792
10	4.267466	3.059897	24.65058	57.90865	6.410395	7.970478

d) NOM

Period	S.E.	NPF	CAR	FDR	NOM	ROA
1	0.140119	2.188655	6.071994	4.155483	87.58387	0.000000
2	0.258853	4.126838	3.249188	1.367848	44.93502	46.32111
3	0.295874	3.350258	2.790217	1.666431	45.63623	46.55687
4	0.331778	3.041704	2.356610	1.364860	45.13359	48.10324
5	0.369675	2.774061	2.203185	1.262795	44.21980	49.54016
6	0.399624	2.606908	2.025366	1.185196	44.11900	50.06353
7	0.429263	2.484994	1.913295	1.111810	43.82694	50.66296
8	0.456666	2.387472	1.826485	1.066445	43.64820	51.07140
9	0.482357	2.312203	1.754195	1.026460	43.51909	51.38805
10	0.506918	2.250760	1.698007	0.994555	43.39807	51.65860

e) ROA

Period	S.E.	NPF	CAR	FDR	NOM	ROA
1	0.199801	1.751132	0.034461	1.504427	29.65196	67.05802
2	0.240997	3.839533	1.785148	4.503877	31.85464	58.01680
3	0.281457	4.762108	1.772307	4.667792	31.50244	57.29535
4	0.318856	5.082617	1.645289	5.148862	31.42956	56.69367
5	0.349342	5.358744	1.728951	5.405890	31.58606	55.92036
6	0.378961	5.554018	1.710930	5.550060	31.57161	55.61338
7	0.405970	5.689821	1.713553	5.690880	31.60008	55.30567
8	0.431258	5.799708	1.718871	5.785398	31.62082	55.07521
9	0.455260	5.885452	1.718116	5.863034	31.63112	54.90228
10	0.477988	5.955406	1.720043	5.927380	31.64366	54.75351

Conclusion

The current development of Islamic banks in Indonesia is rapid and encouraging, but it is ironic to see the cases of non-performing financing (NPF) among these banks are also on the rise. Within the framework of bank risk management (capital and asset liability management), this study sheds light on the causal-effect analysis between NPF and bank-specific factors over both short run and long run. Using quarterly financial data involving a group of 11 Islamic banks in Indonesia, the empirical findings from Johansen-Juselius show the presence of cointegration between NPF and the tested variables. From the VECM analysis, the financing deposit ratio (FDR) model emerges as the only credible model with its significant long-run causality. Interestingly, its Granger causality test shows a significant unidirectional causality running from ROA to FDR. It is now evident that the bank's profitability is of paramount importance in determining future growth of its financial assets. Islamic bank must diversify their business portfolios into more productive investments so as to beef up its on-profit growth. The limitation of the research is that it only focuses the case of Indonesian Islamic banks and the scope should be extended to include other Muslim countries like Malaysia and Brunei.

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