

Financing diversification and Indonesian Islamic bank's non-performing financing

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Abstract

Purpose – This study empirically analyzes the effect of the financing diversification with some control variables including both bank-specific variables such as bank's size, CAR, efficiency and the macroeconomic variables such as the inflation and exchange rate, on the Islamic bank's non-performing financing (NPF).

Methodology – The aggregate Islamic bank data encompassing Islamic commercial banks and Islamic business units are used. The Autoregressive Distributed Lag Model (ARDL) is employed using the monthly data covering January 2011 to December 2019.

Findings – The cointegration test indicates that the long-run relationship among variables being studied exists. Our results document that higher concentrated financing generates high NPF. Higher asset significantly contributes to reducing NPF. In addition, higher operating efficiency can reduce NPF. The instability of the exchange rate also generates the high NPF.

Practical implications – Our results suggest that Islamic banks must lessen the high concentrated financing by optimizing both PLS and non-PLS contracts to reduce Islamic banks' financing risk.

Research limitations – This study employs aggregate data but applying them may conceal for individual Islamic bank.

Originality – Our study includes financing diversification to examine Islamic bank's financing risk. The existing empirical studies, to the best of our knowledge, have not addressed the impact of financing diversification on financing risk.

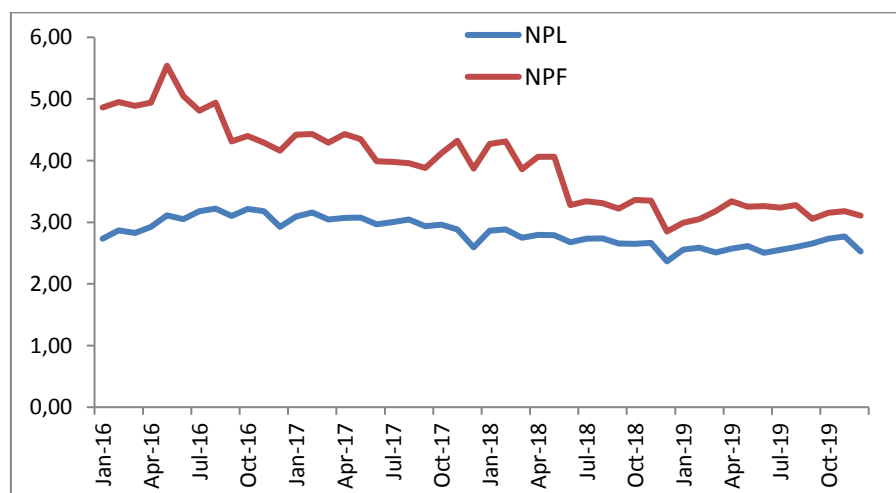
Introduction

Islamic banks are obviously different from conventional banks in that the latter uses interest rates in their financial contracts and the former utilizes profit-loss sharing (PLS) contracts and non-PLS contracts. In addition, Islamic banks are also prohibited from engaging in speculative transactions that are against Islamic principles to avoid bank failure. The PLS contracts consist of *musyarakah* and *mudharaba* in which profits are shared between the bank and its customers. Meanwhile, the non-PLS contracts comprise Murabaha with a margin system, Salam, and Isthisna with a contract system, and Ijarah with a rent system. The PLS system is indeed beneficial for both parties, but this PLS contract creates problems, especially mudharaba contracts because it generates a moral hazard (Azmat et al., 2015). The Mudharaba contract generates higher non-performing financing as many

studies found that PLS contracts lead to Islamic banks having higher non-performing financing (NPF) (Kabir et al., 2015; Warninda et al., 2019).

The practice of Islamic banking in Indonesia began in 1992 and Islamic banking became one of the pillars of banking in Indonesia after the government passed Law No. 21 in 2008 concerning the Islamic Banking law. Thus, Indonesia practices two banking systems, namely conventional banks and Islamic banks. The Indonesian central bank provides a guideline to measure the financial performance of Islamic banks as well as conventional banks covering five financial performances. The first measure relates to capital adequacy as measured by CAR with a minimum CAR of 12%. The second measure is the bank profit rate as measured by return on assets (ROA) with a minimum rate of 1.5%. The next measure is non-performing financing, which measures non-performing financing with a maximum rate of 5%. The fourth measure is operating efficiency, as measured by the ratio of operating costs to operating income with a maximum rate of 94%. The last measure is the financing rate by measuring the ratio of financing to deposits with a maximum rate of 100%.

Based on financial performance, the Islamic banks was a quite good financial performance from 2014 to 2018. Capital adequacy measured by CAR was 15.74% in 2014 and increased to 19.82% in 2018. During that period, CAR was above the minimum CAR of 12%. Return on assets (ROA), which measures the profitability, tends to increase. It was 0.79% in 2014 and increased to 1.57 % in 2018. The average ROA, however, was below the minimum threshold level of 1.5%. The next financial performance is bad financing, which is known as non-performing financing (NPF). The average NPF was 4.06% and was below the threshold of 5%. However, bad financing is close to the threshold. The next measurement is the level of operational efficiency (CIR), which is measured by operating costs over operating income. If the CIR is less than 94%, Islamic banking is categorized as very healthy. CIR indicates a trend to decline, and its value is above 90% in 1994 and then to less than 90% in 2018. Whereas based on the financing deposit ratio (FDR), FDR is below 100%. In 2014 it was 91.5% and then amounted to 86.4% in 2018. This FDR is below 100%, demonstrating the high commitment of Islamic banks to be careful in financing its fund.



Source: (Financial Services Authority, 2019)

Figure 1. NPF and NPL 2016: M1 to 2019:M12

Of the five aspects of financial performance, non-performing financing should receive special attention from Islamic banks because PLS contracts cause a high risk of financing. Figure 1 illustrates the NPFs of Islamic banks and non-performing loans (NPLs) of conventional banks from 2016M1 to 2019M12. The average NPF in that period was 3.39% but the NPF was above the 5% threshold in May and June 2016, and then it tends to decrease until now. The average NPLs of conventional banks was 2.83 in the same period but the NPLs were relatively stable at 3%. The higher NPFs of Islamic banks compared to conventional banks' NPLs implies that Islamic banks face a higher financing risk than conventional banks as their counterparts.

Our study empirically examines the impact of financing diversification and some control variables consisting of Islamic bank's specific variables as well as macroeconomic variables on the Indonesian Islamic banks' non-performing financing. This study contributes to empirical literatures in some ways. First, some previous studies have examined the Islamic commercial banks' non-performing financing (Kabir & Worthington, 2017; Hassan et al., 2019; Widarjono, 2020; Rahmah & Armina, 2020) as well as conventional banks such as Rachman et al. (2018), Tran & Nguyen (2020), Le & Diep (2020). However, to the best of our knowledge, they have not addressed the impact of financing diversification on NPF. Second, our study employs the Herfindahl-Hirschman index (HHI) to measure financing diversification. HHI is widely applied to measure income diversification as well as asset diversification for the conventional bank. Indeed, the existing empirical studies apply HHI for measuring financing diversification for Indonesian Islamic rural banks (Widarjono et al., 2020).

Literature Review

Many studies have been conducted to analyze the factors that influence non-performing financing, both conventional and Islamic banks. Louzis et al. (2012) examined non-performing loans (NPL) of Greek conventional banks based on the types of each loan encompassing consumer, business and mortgages loans. Their findings indicated that some macroeconomic variables such as GDP, unemployment, interest rates, and public debt significantly affect NPLs for all types of loans and management quality such as operating efficiency also contributes to all loan categories. Ben Jabra et al. (2017) empirically tested the bank risk-taking of European conventional banks during the global financial crisis. Macroeconomic variables GDP and inflation negatively influence NPF which supports the study of Castro (2013). Some bank-specific variables such as bank size and bank capitalization are linked to lower NPF which is similar to the study of Rahman et al. (2017). Furthermore, regulatory policy obviously also affect bank risk-taking behavior by reducing non-performing financing.

Islamic banks as an alternative financial intermediary after the failure of many conventional banks during the crisis in 2009-2010, several studies analyzed the financing risk of Islamic banks due to different business risks. Some previous studies found that bank size and abundant capital reduce NPF due to economies of scale which generates more diversification and lower financing risk (Abedifar et al., 2013; Trad et al., 2017). A Study by Chamberlain et al. (2020) indicates that the lower financing risk of Islamic banks is linked to greater liquidity, higher capitalization, and higher inefficiency. More interestingly, a higher Mudharabah and Musharakah financing obviously generate high credit risk because PLS contracts may generate moral hazard, in turn, increase the financing risk of Islamic banks (Warninda et al., 2019; Belkhaoui et al., 2020). In addition, some macroeconomic variables such as GDP negatively affect NPF but inflation positively affects NPF (Adebola, 2011; Kabir et al., 2015)

Empirical research on the risk-taking attitude of both conventional and Islamic banks in Indonesia has also been widely conducted. Rachman et al. (2018), employing 36 conventional banks and covering 2008–2015, found that banks' profitability and loans decrease NPLs because higher profitability generates better credit management and higher loans lead to better credit management to specialized loan activity. The study by Lin et al. (2016) found that some macroeconomic variables such as inflation, exchange rate, financial crisis, central bank interest rate, and market share affect the loan risk of conventional banks. In general, each bank tries to reduce bank failure by using bank credit diversification strategies to manage credit risk and to avoid credit defaults. Prastiwi and Anik (2020), who empirically tested credit diversification strategies of Indonesian conventional banks during 2015-2018, found that the loan diversification in the different economic sectors contributes to lower NPLs.

Several studies also show that bank-specific variables and macroeconomic variables contribute to the risk-taking behavior of Indonesian Islamic banks. Firmansyah (2015), who employed monthly data from 2010-2012, shows that the Islamic bank's NPFs are positively linked to the bank's liquidity. Moreover, some internal factors such as CAR and operating efficiency also contribute to the financing risk of Islamic banks. CAR negatively affects NPF and inefficient

operating also contributes to higher NPF. (Havidz & Setiawan, 2015; Setiawan & Bagaskara, 2016; Widarjono, 2020). In addition, some macroeconomic variables such as GDP, inflation, and exchange rate also contribute to Islamic banks' NPF (Havidz & Setiawan, 2015; Lin et al., 2016; Widarjono, 2020). Some previous studies also addressed the NPF of Islamic rural banks, which is above the maximum of thresholds and higher than those conventional rural banks (Hosen & Muhari, 2019; Widarjono et al., 2020; Muhammad et al., 2020). The bank-specific variables such as that bank's size, CAR, and income diversification seem to have a non-negligible effect on Islamic rural banks' NPF.

Research Methods

Our study empirically examines the effect of financing diversification, including some control variables both bank's specific variable as well as macroeconomic economy on Indonesian Islamic bank's non-performing financing. The aggregate Islamic bank data encompassing Islamic commercial bank and Islamic bank units are employed using the monthly time series data from January 2011 to December 2019. Our study follows the previous empirical literatures such as Mahdi and Abbes (2018), Hassan et al. (2019) and Widarjono et al. (2020). We employ the ARDL model in investigating the non-performing financing of Islamic banks. The advantage of ARDL can investigate both short-run conditions and long-run conditions and without requiring all variables are integrated at the same level. The relationship between the non-performing financing of Islamic banks and its explanatory variables can be written in a regression equation as:

$$NPF_t = \beta_0 + \beta_1 HHIF_t + \beta_2 LASSET_t + \beta_3 CAR_t + \beta_4 CIR_t + \beta_5 INF_t + \beta_6 LEXC_t + e_t \quad (1)$$

Where NPF is non-performing financing, HHIF is the Herfindahl-Hirschman index of financing to measure financing diversification, the asset is total assets, CAR is capital adequacy ratio, CIR is the cost-income ratio, INF is inflation, and EXC is the exchange rate.

Non-performing financing (NPF) is the ratio of non-performing financing over total financing. Islamic banks provide both profit and loss sharing (PLS) contracts and non-PLS. PLS contracts consist of Musyaraka (Musy) and Mudharaba (Mudh), and non-PLS contracts comprise Murabaha (Mur), Salam, Isthisna, Ijarah, and Qardh. Financing diversification (HHIF) is calculated using the Herfindahl-Hirschman index (HHI) as follows:

$$HHIF = \left(\frac{Musy}{TFin}\right)^2 + \left(\frac{Mudh}{TFin}\right)^2 + \left(\frac{Mur}{TFin}\right)^2 + \left(\frac{salam}{TFin}\right)^2 + \left(\frac{isthisna}{TFin}\right)^2 + \left(\frac{ljarah}{TFin}\right)^2 + \left(\frac{Qardh}{TFin}\right)^2 \quad (2)$$

where TFin is total financing.

The asset is total asset expressed in natural logarithm, Capital Adequacy Ratio (CAR) is the ratio of capital to risk-weighted assets, CIR is the ratio of operations expenses to operations income, Inflation (INF), which is based on the consumer price index, is monthly inflation. The exchange rate (EXC) is a monthly average of the Indonesia Rupiah (IDR) against the US dollar expressed in the natural logarithm.

Financing diversification represents how Islamic banks diversify their financing into many contracts to reduce financing risks. High HHIF indicates that financings of Islamic banks are concentrated and otherwise financings are diversified, so our study expects that relationship between financing diversification and NPF is positive. The total asset, which represents the Islamic bank size, may cause either negative or a positive link to financing risk. The income diversification and economies of scale stem from a larger Islamic bank. Consequently, larger Islamic bank benefits it and can reduce higher NPF (Trad et al., 2017). By contrast, improper financing involves because large Islamic banks face uncontrolled financing and, in turn, generate higher NPF (Mirzaei et al., 2013).

CAR indicates the ability of Islamic banks to preserve their abundant capital. CAR may link to a positive or negative relationship to NPF. Islamic banks with higher CAR can spread out their business to generate higher profit but also cause high financing failure (Hamid, 2017). Due to the PLS contracts which may cause higher financing risk, Islamic bank operates prudentially by maintaining a higher capital buffer so higher CAR reduces the bad financing (Trinugroho et al.,

2018). The ratio of cost to income (CIR) represents the operating efficiency. Lower CIR shows high operating efficiency so we expect that a relationship between CIR and NPF is positive. Inflation lowers the capability of the Islamic bank to generate high profit but increase financing risk due to the lower purchasing power of consumers, so we expect that inflation increases the Islamic bank's NPF. Depreciation (appreciation) of Rupiah against US \$ indicates that the price of goods and services are more (less) expensive in the domestic market because depreciation (appreciation) leads to higher imported goods and services both intermediated and final goods. Consequently, our study hypothesizes that the exchange rate positively affects Islamic bank's NPF. Table1 presents the variable definition and expected sign of each independent variable.

Table 1. Variable definition and hypothesized sign

Variable	Definition	Hypothesized sign
Dependent variable		
NPF	Net profit over the total asset (%). It measures profit.	
Independent variable		
Bank-specific		
HHIF	Herfindahl-Hirschman index of financing	+
Size	Total asset (IDR Trillions).	+/-
CAR	Equity over total assets (%).	+
CIR	Cost income ratio (%).	+
Macroeconomic		
INF	Inflation (%)	+
EXC	Exchange rate of rupiah against U.S dollar	+

Source: (Data processing)

The equation (1) can be re-written in the ARDL model as follows:

$$\begin{aligned} \Delta NPF_t = & \theta_0 + \theta_1 NPF_{t-1} + \theta_2 HHIF_{t-1} + \theta_3 LASSET_{t-1} + \theta_4 CAR_{t-1} + \theta_5 CIR_{t-1} + \\ & \theta_6 INF_{t-1} + \theta_7 LEXC_{t-1} + \sum_{i=1}^p \vartheta_{1i} \Delta NPF_{t-1} + \sum_{i=1}^p \vartheta_{2i} \Delta HHIF_{t-1} + \\ & \sum_{i=1}^p \vartheta_{3i} \Delta LASSET_{t-1} + \sum_{i=1}^p \vartheta_{4i} \Delta CAR_{t-1} + \sum_{i=1}^p \vartheta_{5i} \Delta CIR_{t-1} + \sum_{i=1}^p \vartheta_{6i} \Delta INF_{t-1} + \\ & \sum_{i=1}^p \vartheta_{7i} \Delta LEXC_{t-1} + e_t \end{aligned} \tag{3}$$

Δ represents the first difference variable. The estimated coefficients of $\vartheta_{1i} - \vartheta_{6i}$ and $(\theta_1 - \theta_7)$ correspond to the short-run and long-run relationship.

Some steps are required to estimate the ARDL model. The stationary test to test the disequilibrium or equilibrium condition of variables being studied is taken in the first step. Our study employs two unit root tests consisting of the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) test to warrants unbiased results of stationary data. The second step is to test evidence of a long-run relationship among variables using the Bound testing approach following the F test (Pesaran et al., 2001). The critical bound test provides lower bound I (0) and upper bound I (1). The computed F statistics exceeds I(1), the cointegration is found between independent and dependent variables. When the computed F value between I(0) and I(1), there is no decision about cointegration. Finally, the computed F value is less than I(0), it means that cointegration is not found. The null hypothesis with no long-run relationship can be written as

$$H_0: \theta_1 = \theta_2 = \theta_3 = \theta_4 = \theta_5 = \theta_6 = \theta_7 = 0 \tag{4}$$

The alternative hypotheses of cointegration can be stated as:

$$H_a: \theta_1 \neq \theta_2 \neq \theta_3 \neq \theta_4 \neq \theta_5 \neq \theta_6 \neq \theta_7 \neq 0 \tag{5}$$

If the cointegration exists among variables, equation (3) can be formulated in term of the Error Correction Model (ECM) of ARDL as follows:

$$\begin{aligned} \Delta NPF_t = & \delta_0 + \sum_{i=1}^r \delta_{1i} \Delta NPF_{t-1} + \sum_{i=1}^r \delta_{2i} \Delta HHIF_{t-1} + \sum_{i=1}^r \delta_{3i} \Delta LASSET_{t-1} + \\ & \sum_{i=1}^r \delta_{4i} \Delta CAR_{t-1} + \sum_{i=1}^r \delta_{5i} \Delta CIR_{t-1} + \sum_{i=1}^r \delta_{6i} \Delta INF_{t-1} + \sum_{i=1}^r \delta_{7i} \Delta LEXC_{t-1} + \\ & \delta_8 ECT_t + u_t \end{aligned} \tag{6}$$

Results and Discussion

Descriptive Statistics

The descriptive statistics for all variables under study are exhibited in Table 2. The average NPF is 3.78% with a standard deviation of 0.80, which is lower than 5% as the maximum NPF threshold. The average financing diversification is 40.37%, which is close to 50%, meaning that financing diversification is highly concentrated for some financing products such as *Murabahah* (57%) and *Musyarakah* (32%). Islamic banks prefer to provide PLS contracts such as *mudharabah* to reduce lower financing risk. The average total asset of Islamic banks is IDR 267.841 trillion. The average CAR is 16.25% with a low standard deviation of 2.35, implying that CAR is stable over time because Islamic banks are prohibited from any speculative and excessive contracts raising moral Hazard (Azmat et al., 2015). Operating efficiency (CIR) is 83.81, ranging from 70.43 to 94.38 with a standard deviation of 6.69 which is overall less than the maximum rate of 95%. Among macroeconomic variables, with an average of 0.39 and a standard deviation of 0.51, inflation is relatively stable. However, volatility and instability of the exchange rate are found due to a high standard deviation of 1913.44 and an average of IDR 11803.71 per US\$.

Table 2. Descriptive Statistics

Variable	Mean	Maximum	Minimum	Std. Dev.
NPF (%)	3.78	5.54	2.22	0.80
HHIF (%)	40.37	43.16	35.33	1.90
ASSET (IRD Trillion)	267841.00	524564.00	67436.00	126778.90
CAR(%)	16.25	21.39	11.07	2.35
CI(%)	83.81	94.38	70.43	6.69
INF(%)	0.39	3.29	-0.45	0.51
EXC(IDR/\$)	11803.71	15178.87	8526.80	2116.69

Source: (Data processing)

ARDL model

Before estimating the ARDL, our study test stationary data using both the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) with a maximum lag of 12. Table 3 presents the results of ADF and PP unit root tests with constant, constant and trend using the Akaike Info Criterion (AIC) to choosing the optimal lag. Some variables such as LASSET and INF are stationary at the level data I(0) but NPF, HHIF, CAR, CIR, AND LEXC are not stationary at level data. However, all variables are stationary at the first difference data I(1). Generally, all variables are stationary at I(1) and none of them are stationary at the second difference data I(2). Our results confirm that the ARDL model is applicable to estimate the non-performing financing of the Indonesian Islamic Bank during the period of 2011:M1 to 2019:M12.

Table 3. Stationary Test: ADF and PP Test

Variable	Level				Difference			
	ADF		PP		ADF		PP	
	Constant	Trend	Constant	Trend	Constant	Trend	Constant	Ttrend
NPF	-1.60	-1.63	-2.56	-2.56	-10.83***	-10.78***	-15.19***	-15.12***
HHIF	-1.40	-1.30	-1.24	-1.04	-8.14***	-8.14***	-8.17***	-8.13***
LASSET	-4.55***	-1.68	-3.57***	-2.28	-5.48***	-11.86***	-17.83***	-21.79***
CAR	-1.80	-2.24	-2.27	-3.34*	-11.78***	-11.73***	-13.10***	-13.04***
CIR	-1.82	-2.07	-2.50	-3.47**	-17.65***	-17.58***	-20.21***	-20.19***
INF	-9.81***	-10.17***	-7.11***	-7.24***	-10.54***	-10.49***	-21.69***	-21.55***
Lexc	-0.78	-1.62	-0.77	-1.59	-8.30***	-8.26***	-8.28***	-8.24***

Note: ***, **, * are stationer at $\alpha=1\%$, 5% and 10% respectively

Source: (Data processing)

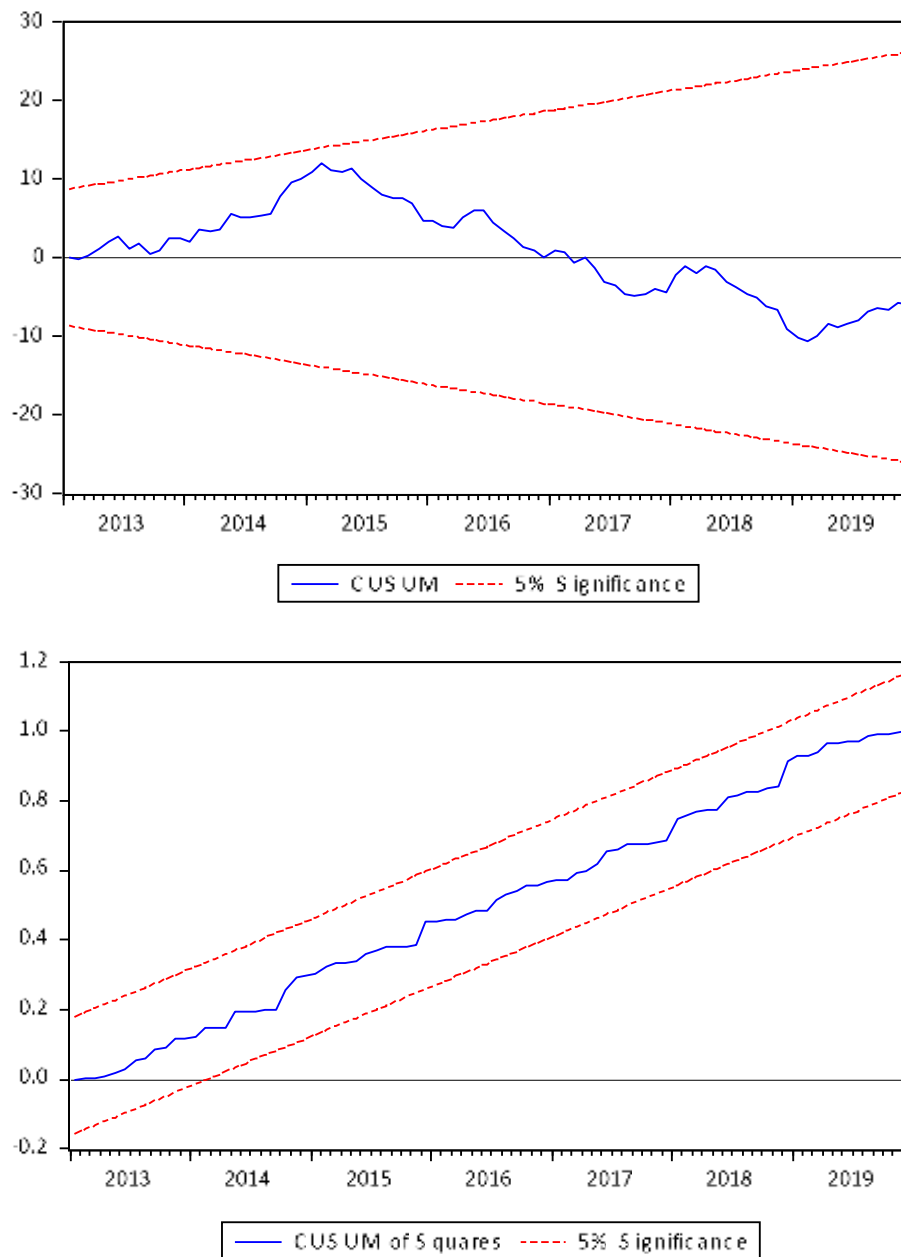
ARDL estimation is subject to the lag order because of the distributed lag model. Consequently, our study has to select optimal lag using the AIC. The best selected ARDL model with a maximum lag of 6 is ARDL (6, 6, 0, 6, 0, 5, 0) and it is presented in Table 3. The upper part of the table indicates the results of ARDL model estimation and the diagnostic test of OLS assumptions is exhibited in the bottom part of the table consisting of the Jarque-Berra (JB) test for residual normality, Lagrange Multiplier (LM) test for autocorrelation, and the autoregressive Conditional Heteroskedasticity (ARCH) test for heteroskedasticity. The results pass homoskedasticity but the presence of autocorrelation. Accordingly, we re-estimate the ARDL model using the Heteroskedasticity and Autocorrelation Consistent Covariance Matrix (HAC) method to generate a robust OLS estimator due to unbiased and consistent estimator but not efficient. Our ARDL model also passes the stability test using the CUSUM and CUSUM of squares as presented in Figure 2. Our study rejects the null hypothesis for 12 of 28 independent variables using the standard OLS method but the null hypothesis for 16 variables is rejected using the HAC method at $t \alpha = 10\%$ or less.

Table 4. ARDL Estimation Results

Variable	OLS estimator		OLS with robust estimator	
	Coeff.	t-stat	Coeff.	t-Stat
<i>C</i>	-6.5487*	-1.8035	-6.5487**	-2.0342
<i>NFP</i> _{<i>t</i>-1}	0.5258***	5.3555	0.5258***	4.5366
<i>NFP</i> _{<i>t</i>-2}	0.1751	1.6196	0.1751*	1.8442
<i>NFP</i> _{<i>t</i>-3}	0.1117	1.0081	0.1117	0.8239
<i>NFP</i> _{<i>t</i>-4}	-0.0569	-0.5381	-0.0569	-0.4717
<i>NFP</i> _{<i>t</i>-5}	-0.1862*	-1.8645	-0.1862***	-2.6723
<i>NFP</i> _{<i>t</i>-6}	0.1556*	1.8397	0.1556***	2.7051
<i>HHIF</i> _{<i>t</i>}	-0.0653	-0.6852	-0.0653	-0.6221
<i>HHIF</i> _{<i>t</i>-1}	0.3854***	2.7697	0.3854*	1.9147
<i>HHIF</i> _{<i>t</i>-2}	-0.3604**	-2.4781	-0.3604**	-2.5838
<i>HHIF</i> _{<i>t</i>-3}	0.0514	0.3378	0.0514	0.4558
<i>HHIF</i> _{<i>t</i>-4}	0.1687	1.0800	0.1687	0.9279
<i>HHIF</i> _{<i>t</i>-5}	-0.2749*	-1.7254	-0.2749*	-1.7460
<i>HHIF</i> _{<i>t</i>-6}	0.2059**	2.0407	0.2059**	2.3697
<i>Lasset</i>	-0.8420***	-2.8874	-0.8420***	-2.8379
<i>CAR</i> _{<i>t</i>}	-0.0974***	-3.0355	-0.0974**	-2.5532
<i>CAR</i> _{<i>t</i>-1}	0.0390	1.0234	0.0390	1.3844
<i>CAR</i> _{<i>t</i>-2}	-0.0437	-1.1616	-0.0437	-1.3395
<i>CAR</i> _{<i>t</i>-3}	0.1268***	3.3319	0.1268**	2.3488
<i>CAR</i> _{<i>t</i>-4}	0.0865**	2.2005	0.0865***	2.9139
<i>CAR</i> _{<i>t</i>-5}	-0.0487	-1.2438	-0.0487*	-1.7122
<i>CAR</i> _{<i>t</i>-6}	-0.0463	-1.3096	-0.0463	-1.0423
<i>CIR</i> _{<i>t</i>}	0.0136	1.3011	0.0136	1.4816
<i>Inf</i> _{<i>t</i>}	0.0468	0.6449	0.0468	0.5469
<i>Inf</i> _{<i>t</i>-1}	0.0248	0.3321	0.0248	0.4893
<i>Inf</i> _{<i>t</i>-2}	-0.0210	-0.2676	-0.0210	-0.2064
<i>Inf</i> _{<i>t</i>-3}	-0.1103	-1.4192	-0.1103	-1.5809
<i>Inf</i> _{<i>t</i>-4}	-0.1157	-1.5859	-0.1157**	-2.5441
<i>Inf</i> _{<i>t</i>-5}	-0.1362*	-1.9547	-0.1362*	-1.7357
<i>Lexc</i>	1.3102*	1.8456	1.3102**	2.0033
R-squared	0.9137		0.9137	
JB	1.5597			
LM(1)	5.5913			
LM(3)	5.6474			
ARCH(1)	0.6143			
ARCH(3)	2.3119			

Note: ***, **, * stands for statistically significant at $\alpha=1\%$, 5% and 10% respectively. J-B is the Jarque-Bera test for normality, LM is the Lagrange Multiplier test for autocorrelation, and ARCH is the autoregressive conditional heteroskedasticity test for heteroskedasticity.

Source: (Data processing)



Source: (Data processing)

Figure 2. Stability test of Islamic banks' NPF

The next step is to examine the long-run relationship among variables by checking the cointegration test following the bound testing approach for which the cointegration test is subject to lag order. Our study uses the Akaike Info Criterion (AIC) to select the optimal lag and the cointegration results are presented in Table 4. Our computed F value is 2.98 which exceeds upper bound $I(1)$ at $\alpha = 10\%$. This bound testing approach shows that the long-run relationship between NPF as the dependent variable (ROA) and HHIF, LASSET, CAR, CIRR, INF, and LEXC as independent variables are present. For that reason, the relationship between Islamic banks' financing risk and its explanatory variables can be assessed in both short-run and long-run conditions.

The presence of cointegration ensures that ECM-ARDL exists to explain the short-run condition. The short-run coefficients of the ECM-ARDL model are shown in table 5. The coefficient of lagged error (EC_{t-1}) to correct disequilibrium condition in the short-run is a negative sign and significant at $\alpha=1\%$, implying that we have a valid ECM-ARDL model. Some variables such as lag of NPF, HHIF, CAR, and INF significantly affect NPF in the short-run which support the previous study such as Widarjono (2020). Financing diversification is positive and significant at lag 1 but it is negative and significant at lag 5, meaning that less diversified financing leads to

higher non-performing financing in the short run. CAR is negative and significant up to lag 3 but this coefficient is positive and significant at lag 5. The Islamic bank which has higher CAR can benefit from economies of scale due to excessive financing so it reduces financing risk.

Table 5. the Bound Test for Cointegration

Test Statistics	Value	Critical F Value		
F-statistic	2.9831	α	I(0)	I(1)
k	6	10%	1.99	2.94
		5%	2.27	3.28
		2.5%	2.55	3.61
		1%	2.88	3.99

Source: (Data processing)

Now we turn in a long-run condition and the coefficients of the long-run condition are exhibited in Table 6. The Islamic bank's internal variables consisting of HHIF, ASSET, and CIR, influence Islamic banks' NPF at $\alpha = 10\%$ or lower. Meanwhile, CAR does not affect non-performing financing. Financing diversification is positive and significant as expected, implying higher concentrated financing leads to more financing risk and generates higher bad financing. As predicted, asset has a negative impact on non-performing financing, meaning that a big size of asset could reduce non-performing financing. As expected, the operating efficiency (CIR) positively affects NPF. Higher operating inefficiency causes worse management risk and results in higher non-performing financing. The macroeconomic variables such as inflation and the exchange rate also contribute to NPF. Inflation has a negative effect on NPF but is contrary to our hypothesis. An increase in the inflation rate reduces NPF. As expected, the exchange rate positively links to NPF. The depreciation raises NPF and appreciation reduces NPF.

Table 6. Short-run estimation: ECM model

Variable	Coefficient	Std. Error	t-Statistic
ΔNPF_{t-1}	-0.1993**	0.0894	-2.2293
ΔNPF_{t-2}	-0.0242	0.0880	-0.2752
ΔNPF_{t-3}	0.0875	0.0878	0.9966
ΔNPF_{t-4}	0.0306	0.0864	0.3543
ΔNPF_{t-5}	-0.1556**	0.0776	-2.0068
$\Delta HHIF_t$	-0.0653	0.0852	-0.7664
$\Delta HHIF_{t-1}$	0.2093**	0.0895	2.3374
$\Delta HHIF_{t-2}$	-0.1511	0.0932	-1.6209
$\Delta HHIF_{t-3}$	-0.0997	0.0967	-1.0309
$\Delta HHIF_{t-4}$	0.0690	0.0977	0.7065
$\Delta HHIF_{t-5}$	-0.2059**	0.0934	-2.2039
ΔCAR_t	-0.0974***	0.0288	-3.3855
ΔCAR_{t-1}	-0.0746**	0.0322	-2.3148
ΔCAR_{t-2}	-0.1183***	0.0315	-3.7608
ΔCAR_{t-3}	0.0085	0.0311	0.2732
ΔCAR_{t-4}	0.0950***	0.0305	3.1115
ΔCAR_{t-5}	0.0463	0.0306	1.5153
ΔInf_t	0.0468	0.0606	0.7722
ΔInf_{t-1}	0.3832***	0.0758	5.0586
ΔInf_{t-2}	0.3622***	0.0711	5.0959
ΔInf_{t-3}	0.2519***	0.0630	3.9990
ΔInf_{t-4}	0.1362**	0.0595	2.2890
EC_{t-1}	-0.2749***	0.0541	-5.0855
R-squared	0.5879		

Note: ***, **, * stands for statistically significant at $\alpha=1\%$, 5% and 10%, respectively.

Source: (Data processing)

Table 7. Long Run Estimation

Variable	Coefficient	Std. Error	t-Statistic
C	-23.8216*	13.3328	-1.7867
HHIF	0.4030**	0.2148	1.8763
LASSET	-3.0628***	1.1886	-2.5768
CAR	0.0588	0.1480	0.3974
CIR	0.0494*	0.0308	1.6055
INF	-1.1336*	0.6859	-1.6526
LEXC	4.7659**	2.5540	1.8660

Note: ***, **, * are statistically significant at $\alpha=1\%$, 5% and 10% respectively

Source: (Data processing)

The main variable of concern in our study is the effect of Islamic banks' financing diversification on non-performing financing. Two theoretical frameworks proposed different points of view about diversification. One theory states that financing or credit diversification maximizes the bank's financial performance by lowering a variety of financing risks (Diamond, 1984; Boyd & Prescott, 1986). Conversely, another theory clearly proposes that bank's lending diversification to several sectors is more suitable than credit diversification (Denis et al., 1997; Rajan et al., 2000).

The diversification of financing as measured by the HHI shows that the greater the HHIF is the more concentrated financing and conversely the smaller the HHIF is the less concentrated financing. The results show that this variable has a positive effect on NPF, which means that the more concentrated financing increases the risk of non-performing financing. Financing diversification, therefore, is a strategy to reduce the financing failure because of the concentration of funding provision in Indonesian Islamic banks. The empirical research results prove that *mudharaba* and *musyarakah* contracts have no different impacts on financing risk in Islamic banks (Warninda et al., 2019). This finding is in line with the previous studies in conventional banks such as Mulwa (2018) for African conventional banks and Prastiwi & Anik (2020) for Indonesian conventional banks and Indonesian Islamic rural banks such as Widarjono et al. (2020).

Some control variables of bank-specific variables also contribute to Islamic banks' NPF. The asset that represents bank size shows that the large assets can reduce the non-performing financing because it can charge the lower price and diversify financing as a result of economic scale (Abedifar, et al., 2013). The Islamic banks' operating efficiency distinctly reduces the bad financing due to better management of financing risk. Our results support the existing empirical study for the Malaysian Islamic bank (Rahim & Zakaria, 2013) and for Islamic banks in the Gulf Cooperation Council (GCC) region (Chamberlain et al., 2020; Belkhaoui et al., 2020).

Inflation reduces the purchasing power of consumers, thus high inflation rate deteriorates economic condition and increase bad financing but our result is not in line with the hypotheses. This fact occurs because the average inflation rate is quite low during the research period of 3.9% while the average economic growth is 5.2% so that people's income increases above the inflation rate (Widarjono, 2018). The macroeconomic variables of exchange rate obviously show that depreciation of domestic currency increases bad financing of Islamic bank because depreciation swells the price import of raw materials and then raise the cost of domestic production. Our findings support the previous study such as Lin et al. (2016) and Widarjono (2020).

Robustness Check

Based on unit root tests both ADF and PP method, our data show different stationary levels. Accordingly, instead of the ECM model, the ARDL model is applicable to examine the short-run and long-run conditions of Islamic banks' financing risk. Our study employs the OLS method to check robustness, given the existence of equilibrium conditions among variables being studied. Because of autocorrelation, we re-estimate the model using the HAC method instead of OLS to generate robustness estimators. Table 8 presents our results which are exactly the same as the ARDL method but the coefficient of income diversification is positive but not significant.

Table 8. OLS estimation: Robustness test

Variable	Coefficient	Std. Error	t-Statistic
C	-19.3723***	9.1634	-2.1141
HHIF	0.0212	0.0701	0.3024
LOG(ASSET)	-1.3808***	0.3552	-3.8874
CAR	-0.0574	0.0475	-1.2101
OER	0.0653***	0.0230	2.8383
INF	0.0310	0.0873	0.3552
LOG(EXC)	3.7193***	1.4361	2.5898
R-squared	0.6499		

Note: ***, **, * are statistically significant at $\alpha=1\%$, 5% and 10% respectively

Source: (Data processing)

Conclusion

This empirical study examines the effect of financing diversification of the Islamic banks with some control variables, including Islamic bank-specific variables and macroeconomic variables on financing risk. Our findings denote that higher financing concentration raises the Islamic bank's non-performing financing. Moreover, some Islamic bank-specific variables such as banks size, operating efficiency contribute to the Islamic bank's NPF. Due to the economics of scale, a large size of Islamic bank could reduce non-performing financing. Inefficiency in operating also increases non-performing financing. The external factor which significantly contributes to higher financing risk is the depreciation of the domestic currency.

The results of this study have several important implications for Islamic banks and policymakers. First, diversification of financing can reduce the level of financing risk. Currently, the level of concentration of financing is 40%, which indicates that financing is still concentrated on *murabaha* and *musyarakah*. Thus Islamic banks must diversify their financing by also focusing on financing *mudharaba*, *ijarah*, *isthisna*, and *salam*. The previous study showed that the *mudharaba* contract would not generate more risk than the Musharaka contract. Furthermore, *musyarakah* financing shows a non-linear impact (U-shape) on financing risk and generally, financing risk gets the maximum rate as the *musyarakah* is roughly 39% of the total financing for some countries (Warninda et al., 2019).

Second, among bank-specific variables, bank size has the biggest influence on reducing non-performing financing. Our results fail to support the theory of too big to fail in the financial intermediary. This finding implies that Islamic banks can optimize their performance as the bank's economies of scale are large enough. Therefore, increasing assets is the key to the success of Islamic banks in competing with conventional banks. In addition, increasing assets can increase economies of scale so that it can reduce the high operating costs of Islamic banks. The results show that a high level of efficiency can reduce the NPF. Finally, the most factors that contribute to the high NPF are the external factors stemming from the instability of the exchange rate. Therefore, the stability of the exchange rate is the key to support the performance of Islamic banks.

Author Contributions

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