



## The Determinants of Indonesian Islamic Rural Banks' Non-Performing Financing

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**Abstract:** Islamic bank encounters a high financing risk because of scheme contract using the profit-loss sharing system leading to an agency problem. The non-performing financing of Islamic rural banks as small Islamic banks in Indonesia is above the maximum threshold and is higher than that of conventional rural banks as their competitors. This paper investigates the impact of bank characteristic variables and macroeconomic variables on the non-performing financing of Islamic rural banks. Our study employs aggregate Islamic rural banks data, spanning from January 2009 to December 2018. Non-linear autoregressive distributed lag model (NARDL) is applied to address this issue. Capital adequacy ratio obviously increases impaired financing and income diversification clearly reduces non-performing financing. More interestingly, domestic output and inflation have an asymmetric effect on non-performing financing. Economic downturns increase non-performing financing but economic upturns have no impact on non-performing financing. Meanwhile, inflation deteriorates non-performing financing but deflation does not reduce non-performing financing.

**Keywords:** *Non-Performing Financing, Islamic Rural Bank, and Non-Linear Autoregressive Model.*

Article History

Received 25 September 2020; Revised 28 March 2021; Accepted 29 March 2021; Available Online 13 August 2021

### Introduction

Indonesian Islamic banks are classified into two types of Islamic banks consisting of large and small Islamic banks. The former is Islamic commercial banks (ICB) and the latter is Islamic rural banks (IRB) known as BPRS (*Bank Pembiayaan Rakyat Syariah*). The former operates at national level and the latter focus on regional level. Islamic bank bans interest rates as well as any speculative transactions (Hassan & Aliyu, 2018). By contrast, Islamic bank provides profit-and-loss sharing (PLS) and non-profit-and-loss sharing (non-PLS). However, PLS contracts comprising *mudharaba* and *musyaraka* lead to asymmetric information, adverse selection, and moral hazard and accordingly generate more financing risk (Azmat et al., 2015). Several previous studies documented that Islamic banks experience high non-performing financing than their counterparts conventional banks (Kabir et al., 2015).

Islamic rural banks are one of the important financial intermediaries in the Indonesian economy in rural areas. Islamic rural banks focus on micro, small, and medium enterprises (MSME) which account for the largest number of firms in Indonesia. To date, the number of small and medium firms is approximately 36 thousand firms but large firms are roughly 1000 firms. The number of IRB throughout Indonesia is 165. The role of this IRB will be able to maintain the sustainability of the MSME sector in Indonesia. In conducting business activities in MSME, IRB must have good financial performance and have credible institutions. In maintaining this credibility, IRB should have a good risk profile. This is because consumers of IRB see aspects of financial risk as an indicator of financial performance in serving financially MSME. In addition, IRBs compete with conventional rural banks (CRB) as their competitor in regional areas.

An important problem faced by IRB is high non-performing financing (NPF). The Financial Services Authority as the IRB policymakers determines a maximum NPF by 5%. Figure 1 illustrates the trend of

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 <https://doi.org/10.14421/grieb.2021.091-03>



NPF. IRBs' NPF is higher than NPL (non-performing loan) of CRB which represents an impaired loan. The average NPF of IRB was 8.76% per month during 2011-2018 while the average NPL of CRB was 5.94%. Based on the NPF conditions, IRB is very vulnerable to bankruptcy compared to CRB due to high impaired financing. Much previous research has examined the large Islamic commercial banks' financing risk (Trad et al., 2017; Hassan et al., 2019). Indeed, some previous studies have investigated NPF for Indonesian commercial banks such as Widarjono (2020b), Rahmah and Armina (2020), and Widarjono and Rudatin (2021), and for Indonesian the Islamic rural bank such as Hosen and Muhari (2019), Muhammad et al. (2020), and Widarjono et al. (2020).

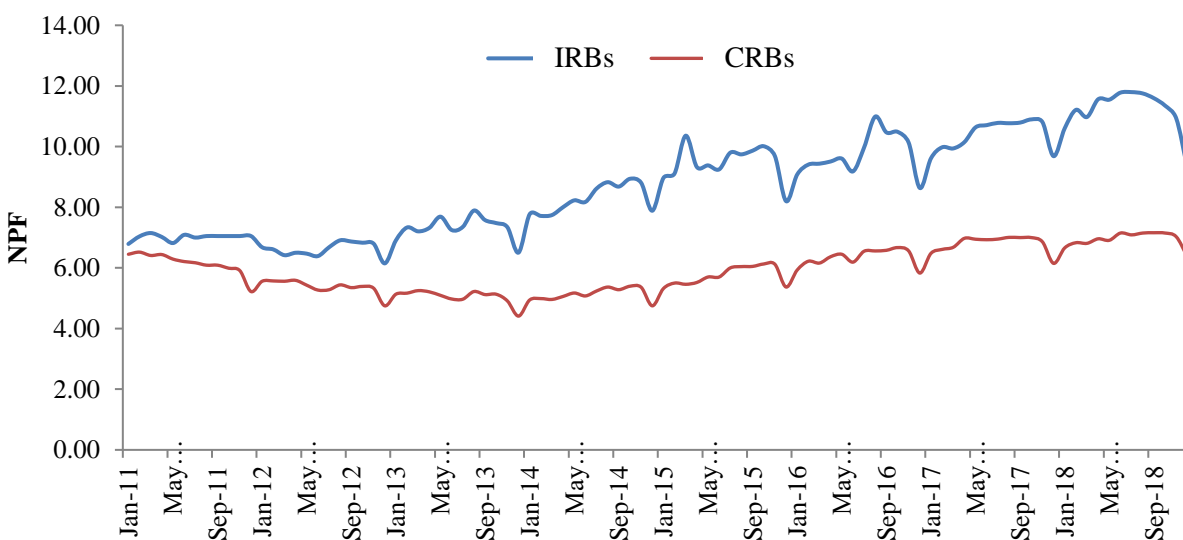


Figure 1. NPF 2011: M1 to 2018: M12  
Source: Indonesian Financial Service Authority (OJK).

Our study examines the impact of internal and external factors on the financing risk of IRB in Indonesia. The internal factors are bank characteristics such as asset, capital adequacy ratio (CAR) and the external factors are macroeconomic variables such as inflation and gross domestic product (GDP). Many empirical studies show that macroeconomic variables have a different effect as they are upturn and downturn for which economic downturn has a worse impact than economic upturn (Tang & Bethencourt, 2017; Kim et al., 2020; Widarjono, 2020a). For that reason, we include an asymmetric effect of macroeconomic variables on the non-performing financing of IRB. This paper differs from the existing empirical studies. First, some previous studies on Islamic commercial banks' financing risk that include macroeconomic variables assume the symmetric relationship between financing risk and macroeconomic variables. This study applies an asymmetric model of the relationship between macroeconomic variables and Islamic rural banks' financing risk. Second, some existing studies employ panel data to examine NPF but our study applies time series data using the non-linear autoregressive distributed lag model to capture the asymmetric effect of macroeconomic variables on IRBs' NPF.

## Literature Review

The issue of Islamic banks' high NPF has been addressed in many research. Abedifar et al. (2013), Kabir et al. (2015), and Trad et al. (2017) are among those who examine Islamic banks' NPF. Abedifar et al. (2013) investigated the Islamic bank's financing risk using 553 Islamic banks between 1999 and 2009 from 24 countries. The findings clearly indicate that Islamic bank's size affects negatively to NPF because diversification and scale economies benefits reduce operating costs. Trad et al. (2017) investigated Islamic bank's financing risk for 78 Islamic banks over the period 2004–2013 from 12 countries. Islamic bank's NPF is negatively influenced by the size and capital adequacy, implying that a high financing rate is

associated with fewer assets. The external factor such as inflation positively influences NPF, indicating that worse economic condition generates a high financing risk and vice versa. Some previous studies also documented that inflation is linked to higher NPF but GDP is linked to lower NPF (Adebola, 2011; Kabir et al., 2015)

Beck et al., (2013) analyzed financing risk from 510 banks across 22 countries, consisting of 428 conventional banks and 88 Islamic banks over the period 1995–2009. Their findings clearly exhibit that internal factors of Islamic banks such as asset quality and non-loan earning assets have a positive effect on NPF. The greater liquidity, higher capitalization, and higher inefficiency also lower NPF of Islamic banks in the Gulf Cooperation Council (GCC) (Chamberlain et al., 2020). Moreover, PLS contracts such *mudharabah* and *musharakah* financing clearly lead to high financing risk due to asymmetric information, adverse selection, and moral hazard, sequentially, PLS contracts generates the higher NPF of Islamic banks in Southeast Asia, South Asia, and the Middle East (Warninda et al., 2019; Belkhaoui et al., 2020).

Several studies also investigated the financing risk of Indonesian commercial banks for which bank internal variables and macroeconomic variables obviously influence NPF. Firmansyah (2015) documented that the Islamic bank's liquidity positively affects NPF while CAR and operating efficiency negatively affect NPF. Some empirical studies also confirm that CAR is positively linked to NPF and inefficient operating produces higher NPF (Rahmah & Armina, 2020; Widarjono & Rudatin, 2021). Moreover, macroeconomic variables such as GDP and inflation clearly contribute to the financing risk of Islamic commercial banks for which GDP lowers NPF and Inflation increases NPF (Setiawan & Bagaskara, 2016; Widarjono, 2020b).

Most of the existing empirical studies of financing risk are related to large Islamic commercial banks. Some studies also investigate small Islamic bank's financing risk. A study by Hosen and Muhari (2019) found that bank-specific variables such as asset, financing, and inefficiency positively affect NPF while macroeconomic variable GDP lower NPF and inflation produce higher NPF. Muhammad et al. (2020) found that total asset and CAR have a negative effect on NPF. Widarjono et al. (2020) found that high PLS contracts produce high NPF. However, the small Islamic banks encounter low NPF than large Islamic banks. More interestingly, the PLS contract leads to high NPF for those Islamic banks located outside Java. Evidence also documents that operating efficiency and income diversification link to low NPF. A more efficient Islamic bank and more income diversification lower financing risk, particularly for those located in Java Island.

## Methods

Our study follows the existing empirical studies in examining Indonesian IRB's non-performing financing, encompassing Islamic bank-specific and macroeconomic variables (Ghenimi et al., 2017; Mahdi & Abbas, 2018; Hassan et al., 2019; Rahmah & Armina, 2020; Widarjono & Rudatin, 2021). The determinant of Indonesian Islamic rural bank's non-performing financing can be formed in the regression Equation 1 as.

$$NPF_t = \beta_0 + \beta_1 Lasset_t + \beta_2 Gfin_t + \beta_3 CAR_t + \beta_4 OER_t + \beta_5 NOR_t + \beta_6 IPI_t + \beta_7 INF_t + e_t \quad (1)$$

Where NPF is non-performing financing, asset is total asset, Gfin is growth of financing, CAR is capital adequacy ratio, OER is operational efficiency ratio, IPI is industrial production index and INF is inflation. Asset is expressed in natural logarithm.

Both Islamic rural bank-specific and macroeconomic variables affect IRB's NPF. The Islamic bank-specific variables consist of asset (Lasset), growth of financing (Gfin), capital adequacy ratio (CAR), operational efficiency ratio (OER), which is operating cost over operating income, and a ratio of non-operating revenue over total revenue (NOR). The macroeconomic variables consist of domestic output (GDP) and Inflation (INF). Monthly data on GDP is not available. We use the industrial production index (IPI) as a proxy of GDP. Inflation (INF) is monthly inflation that is based on the consumer price index (%).

The model in Equation 1 assumes that the relationship between the dependent and independent variables is symmetric. Many empirical studies show that the relationship between variables has an asymmetric

effect. Among them are between macroeconomic variables and stock prices (Raza et al., 2016; Bahmani-Oskooee & Saha, 2018; Widarjono et al., 2021). As the asymmetric relationship between variables exists, the symmetric model may produce a biased and inefficient estimator (Shin et al., 2014). Accordingly, in the present study, we consider macroeconomic variables to be an asymmetric effect on non-performing financing as follows:

$$NPF_t = \beta_0 + \beta_1 \text{Lasset}_t + \beta_2 \text{Gfin}_t + \beta_3 \text{CAR}_t + \beta_4 \text{OER}_t + \beta_5 \text{NOR}_t + \beta_6 \text{IPI}_t^+ + \beta_7 \text{IPI}_t^- + \beta_8 \text{INF}_t^+ + \beta_9 \text{INF}_t^- + e_t \quad (2)$$

Where NPF, Lasset, Gfin, CAR, OER, NOR, IPI, and INF have been previously defined.  $\text{IPI}_t^+$ ,  $\text{Inf}_t^+$ ,  $\text{IPI}_t^-$ , and  $\text{Inf}_t^-$  are positive and negative changes in both output as well as inflation.

The asset indicating Islamic bank's size may cause a positive or a negative link to financing risk. Income diversification and economies of scale can be captured only for large Islamic banks so it links to low financing risk (Abedifar et al., 2013; Trad et al., 2017). By contrast, large Islamic banks may result in low monitoring financing which leads them to provide improperly and may produce higher financing risk (Mirzaei et al., 2013). The growth of financing (Gfin) indicates the ability of Islamic banks in financing its fund to the debtor. High financing leads Islamic banks to create a higher possibility of bad financing. The Gfin is expected to have a positive effect on financing risk. CAR demonstrates the capability of the Islamic bank to maintain its capital. CAR may lead to a positive or negative impact on financing risk. Higher CAR indicates that an Islamic bank can expand its business to produce more profit but also more financing default (Hamid, 2017). Due to the PLS contract generating high financing risk, Islamic banks prudentially maintain a capital buffer so that higher CAR reduces bad financing (Trinugroho et al., 2018). Operating cost over operating income (OER) measuring the efficiency of the Islamic bank produces more financing risk because higher OER demonstrates low efficiency and increases financing risk. Non-operating cost over total revenue (NOR) represents Islamic bank's diversification income. High diversification financing product represents low risk so it links to low financing risk (Kabir et al., 2015).

Domestic production shows a macroeconomic condition. On one hand, high growth of domestic production or economic upturn ( $\text{IPI}_t^+$ ) leads to a higher profit for any business and reduces impaired financing. The economic upturn is expected to have a negative effect on NPF. On the other hand, the economic downturn ( $\text{IPI}_t^-$ ) leads to a lower profit for any business and therefore increases bad financing. Inflation and deflation show a change in the business cycle. Inflation ( $\text{INF}_t^+$ ) reduces the purchasing power of the consumer. Therefore, we expect that higher inflation is linked to higher NPF. Deflation ( $\text{INF}_t^-$ ) increases the purchasing power of the consumer and is linked to lower impaired financing. The variable description and hypothesis of independent variables are shown in Table 1.

We applied non-linear autoregressive distributed lag (NARDL) models to investigate the symmetric impact of bank characteristics and the asymmetric impact of macroeconomic variables on non-performing financing of IRB (Shin et al., 2014). The Equation 2 can be rewritten in the NARDL model as follows.

$$\begin{aligned} \Delta NPF_t = & \theta_0 + \theta_1 NPF_{t-1} + \theta_2 \text{Lasset}_{t-1} + \theta_3 \text{Gfin}_{t-1} + \theta_4 \text{CAR}_{t-1} + \theta_5 \text{OER}_{t-1} + \theta_6 \text{NOR}_{t-1} + \\ & \theta_7 \text{IPI}_{t-1}^+ + \theta_8 \text{IPI}_{t-1}^- + \theta_9 \text{INF}_{t-1}^+ + \theta_{10} \text{INF}_{t-1}^- + \sum_{i=1}^n \varphi_{1i} \Delta NPF_{t-1} + \sum_{i=1}^n \varphi_{2i} \Delta \text{Lasset}_{t-1} + \\ & \sum_{i=1}^n \varphi_{3i} \Delta \text{Gfin}_{t-1} + \sum_{i=1}^n \varphi_{4i} \Delta \text{CAR}_{t-1} + \sum_{i=1}^n \varphi_{5i} \Delta \text{OER}_{t-1} + \sum_{i=1}^n \varphi_{6i} \Delta \text{NOR}_{t-1} + \\ & \sum_{i=1}^n \varphi_{7i} \Delta \text{IPI}_{t-1}^+ + \sum_{i=1}^n \varphi_{8i} \Delta \text{IPI}_{t-1}^- + \sum_{i=1}^n \varphi_{9i} \Delta \text{INF}_{t-1}^+ + \sum_{i=1}^n \varphi_{10i} \Delta \text{INF}_{t-1}^- + e_t \end{aligned} \quad (3)$$

Variable  $\text{IPI}_t^+$ ,  $\text{INF}_t^+$ ,  $\text{IPI}_t^-$ , and  $\text{INF}_t^-$  are calculated as follows (Shin et al., 2014).

$$\text{IPI}_t^+ = \sum_{t=1}^m \Delta \text{IPI}_{t-1}^+ = \sum_{t=1}^m \max(\text{IPI}_t, 0) \quad \text{IPI}_t^- = \sum_{t=1}^m \text{IPI}_{t-1}^- = \sum_{t=1}^m \min(\text{IPI}_t, 0) \quad (4)$$

$$\text{INF}_t^+ = \sum_{t=1}^m \Delta \text{INF}_{t-1}^+ = \sum_{t=1}^m \max(\text{INF}_t, 0) \quad \text{INF}_t^- = \sum_{t=1}^m \text{INF}_{t-1}^- = \sum_{t=1}^m \min(\text{INF}_t, 0) \quad (5)$$

All variables are defined above. Equation 3 can capture both the symmetric effect of bank characteristics and the asymmetric effect of macroeconomic variables on IRB's financing risk in the long-run condition.

On one hand, the long-run symmetric effects of bank characteristics on Islamic bank risk are calculated by  $\delta_1 = \frac{-\theta_2}{\theta_1}$ ;  $\delta_2 = \frac{-\theta_3}{\theta_1}$ ;  $\delta_3 = \frac{-\theta_4}{\theta_1}$ ;  $\delta_4 = \frac{-\theta_5}{\theta_1}$ ;  $\delta_5 = \frac{-\theta_6}{\theta_1}$ . On the other hand, the long-run asymmetric effects of the positive and negative macroeconomic variables are calculated by  $\delta_6 = \frac{-\theta_7}{\theta_1}$ ;  $\delta_7 = \frac{-\theta_8}{\theta_1}$ ;  $\delta_8 = \frac{-\theta_9}{\theta_1}$ ;  $\delta_9 = \frac{-\theta_{10}}{\theta_1}$  respectively.

Table 1. Variable Description and Hypothesis

Variable	Description	Hypothesis
Dependent Variable		
<i>NPF</i>	Non-performing financing (%) which measures bad financing.	
Independent Variable: Islamic Bank Characteristics		
<i>Lasset</i>	Total asset (in natural logarithm) which measures the size of Islamic rural banking.	(+/-)
<i>Gfin</i>	Financing (IDR billion) which measures the ability of Islamic rural banks to financing .	(+)
<i>CAR</i>	Equity over total assets (%) which measures capital adequacy.	(+)
<i>OER</i>	The operating cost over operational income (%) which measures the cost inefficiency of bank.	(+)
<i>NOR</i>	The ratio of non-operating and total revenue (%) which measures diversification of income.	(-)
Macroeconomic Variables		
<i>IPI<sub>t</sub><sup>+</sup></i>	An increase in industrial production index which measures economic upturn.	(-)
<i>IPI<sub>t</sub><sup>-</sup></i>	A decrease in industrial production index which measures economic downturn.	(+)
<i>INF<sub>t</sub><sup>+</sup></i>	Inflation (%) which measures a rise in the aggregate level of consumer price.	(+)
<i>INF<sub>t</sub><sup>-</sup></i>	Deflation (%) which measures a reduction in the aggregate level of consumer price.	(-)

We follow [Shin et al. \(2014\)](#) to estimate NARDL in [Equation 3](#). The general-to-specific approach is employed by sequentially trimming insignificant lag to come to the final specification of [Equation 3](#). The test of cointegration which examines the long-run relationship between variables in the equation is applied using two methods. The first method is the t-test ( $t_{BDM}$ ) following [Banerjee et al. \(1998\)](#). The null hypothesis of no cointegration is  $\theta_1 = 0$ . The second approach is the bound testing approach from [Pesaran, et al. \(2001\)](#). The bound testing approach follows  $F_{PSS}$  statistic test. The null hypotheses of no cointegration are  $\theta_1 = \theta_2 = \theta_3 = \theta_4 = \theta_5 = \theta_6 = \theta_7 = \theta_8 = \theta_9 = \theta_{10} = 0$ . After the cointegration is found, then the next procedure is to check the asymmetric effect of macroeconomic variables on NPF. The null hypothesis of no long-run asymmetric effect of macroeconomic variables on NPF is  $\delta_6 = \delta_7$ ;  $\delta_8 = \delta_9$ . The asymmetric tests follow the Wald F-statistic test. If the asymmetric effect is the presence, then an increase (a decrease) in macroeconomic variables has a different magnitude on IRB risk in the long-run.

The Monthly time series data covering from January 2009 to December 2018 are employed. The Islamic rural bank characteristics are the average of all Islamic rural banks. This study uses data starting in 2009 as the Indonesian government enacted the Islamic Banking Law No. 21 in 2008. The Islamic bank has grown and expanded rapidly both the numbers and assets since 2009. Data of Islamic bank characteristics including the asset, growth of financing, capital adequacy ratio, operational efficiency ratio, and the ratio of non-operating and total revenue are collected from the Indonesian Financial Services Authority. We

collect all macroeconomic variables consisting of the industrial production index and inflation from the Indonesian Central Bureau of Statistics.

## Results and Discussion

The descriptive statistics for all variables are exhibited in Table 2. The NPF, on average, is 8.54% with a standard deviation of 1.58, indicating that financing risk is relatively stable. However, the impaired financing is higher than the maximum threshold of 5%. Islamic rural banks may encounter higher financing risk because they channel their funds for small and medium-size firms to which they may face higher business risk than large firms. Financing growth is in line with asset growth with an average growth rate of 1.68%. CAR, on average, is 24.29% with a standard deviation of 4.16, which is above the minimum threshold of 12%. High CAR demonstrates that Islamic rural banks run prudentially due to high financing risk. Islamic rural banks, hence, must supply extra capital buffer to refrain from any likely losses in worse economic conditions (Louhichi & Boujelbene, 2017). The operating efficiency level IRB is 82.52% which is obviously below the maximum threshold of 94%. Moreover, income diversification is definitely low with an average NOR of 12.23%. Because of approval from the Sharia Supervisory Board for any financing product, Islamic rural banks are not flexible in providing financing so that the limited financing products lead to low-income diversification, (Waemustafa & Sukri, 2016). On average, monthly domestic output growth and inflation were 0.42% and 0.39% respectively.

Table 2. Descriptive Statistics for Variables

Variables	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness
<i>NPF</i> (%)	8.5343	8.1755	11.7966	6.1500	1.5765	0.4760
<i>Gasset</i> (%)	1.6816	1.7048	4.7228	-0.7357	1.0939	0.2285
<i>Gfin</i> (%)	1.6818	1.6267	5.0637	-0.8703	1.2603	0.2018
<i>CAR</i> (%)	24.2862	23.0525	43.8600	18.8127	4.1632	1.4987
<i>OER</i> (%)	82.5217	83.7485	92.3500	64.6900	5.9185	-0.5956
<i>NOR</i> (%)	12.2298	11.9830	17.9533	8.9299	2.4665	0.5325
<i>IPI</i> (%)	0.4203	0.2900	3.4600	-0.5600	0.5518	2.2266
<i>INF</i> (%)	0.3885	0.2700	3.2900	-0.4500	0.5134	2.1820

Table 3. Unit Root Tests

Variables	Level		First Difference	
	ADF	PP	ADF	PP
<i>NPF</i>	-2.5466	-3.2526*	-2.7591	-13.9978***
<i>Lasset</i>	-0.6910	-0.6813	-11.9537***	-11.9181***
<i>Gfin</i>	-1.5377	-1.2727	-7.9138***	-7.6727***
<i>CAR</i>	-4.1702***	-6.1027	-15.7226***	-31.9036***
<i>OER</i>	-3.9883**	-3.9137**	-13.7782***	-14.6388***
<i>NOR</i>	-2.9636	-2.7949	-13.4553***	-14.3381***
<i>IPI</i>	-9.0698***	-9.0804***	-13.2906***	-54.9567***
<i>INF</i>	-9.7937	-7.1355	-10.3858***	-21.5915***

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

Table 4. NARDL Estimation

Variables	Model 1		Model 2		Variables	Model 3	
	Coeff.	S.E.	Coeff.	S.E.		Coeff.	S.E.
<i>Constant</i>	-12.488***	4.363	-16.414***	4.854	<i>Constant</i>	5.921	14.944
<i>NPF</i> <sub>t-1</sub>	-0.338***	0.065	-0.407***	0.069	<i>NPF</i> <sub>t-1</sub>	-0.549***	0.083
<i>Lasset</i> <sub>t-1</sub>	1.173***	0.275	1.611***	0.361	<i>Lasset</i> <sub>t-1</sub>	0.063	0.998
<i>Gfin</i> <sub>t-1</sub>	-2.490	3.215	-0.375	3.356	<i>Gfin</i> <sub>t-1</sub>	-2.261	3.330
<i>CAR</i> <sub>t-1</sub>	0.062**	0.028	0.066**	0.026	<i>CAR</i> <sub>t-1</sub>	0.087**	0.041
<i>OER</i> <sub>t-1</sub>	-0.033*	0.017	-0.047***	0.016	<i>OER</i> <sub>t-1</sub>	-0.048***	0.017
<i>NOR</i> <sub>t-1</sub>	-0.109***	0.034	-0.133***	0.032	<i>NOR</i> <sub>t-1</sub>	-0.139***	0.039
<i>IPI</i> <sub>t-1</sub>			-0.007	0.010	<i>IPI</i> <sub>t-1</sub> <sup>+</sup>	-0.012	0.011
<i>INF</i> <sub>t-1</sub>			-0.083	0.092	<i>IPI</i> <sub>t-1</sub> <sup>-</sup>	-0.034**	0.014
$\Delta$ <i>NPF</i> <sub>t-1</sub>	-0.191**	0.080	-0.184***	0.076	<i>INF</i> <sub>t-1</sub> <sup>+</sup>	0.155**	0.080
$\Delta$ <i>NPF</i> <sub>t-5</sub>	-0.147*	0.076	-0.212***	0.076	<i>INF</i> <sub>t-1</sub> <sup>-</sup>	0.114	0.077
$\Delta$ <i>Lasset</i> <sub>t</sub>	-10.226***	3.771	-9.193**	3.506	$\Delta$ <i>NPF</i> <sub>t-5</sub>	-0.214***	0.075
$\Delta$ <i>Lasset</i> <sub>t-5</sub>			-8.719**	3.718	$\Delta$ <i>Lasset</i> <sub>t</sub>	-14.855***	3.652
$\Delta$ <i>Gfin</i> <sub>t-4</sub>	15.801***	2.975	6.048**	2.796	$\Delta$ <i>Lasset</i> <sub>t-5</sub>	-8.302**	3.801
$\Delta$ <i>Gfin</i> <sub>t-5</sub>	7.259**	2.914	15.675***	2.822	$\Delta$ <i>Gfin</i> <sub>t-5</sub>	9.549***	2.361
$\Delta$ <i>Gfin</i> <sub>t-6</sub>	14.693***	2.935	10.367***	2.845	$\Delta$ <i>CAR</i> <sub>t-1</sub>	-0.066*	0.037
$\Delta$ <i>CAR</i> <sub>t</sub>	0.059**	0.023	0.055**	0.022	$\Delta$ <i>CAR</i> <sub>t-2</sub>	-0.119***	0.033
$\Delta$ <i>CAR</i> <sub>t-2</sub>	-0.051***	0.019	-0.080***	0.019	$\Delta$ <i>CAR</i> <sub>t-3</sub>	-0.151***	0.032
$\Delta$ <i>CAR</i> <sub>t-3</sub>	-0.064***	0.020	-0.124***	0.024	$\Delta$ <i>CAR</i> <sub>t-4</sub>	-0.087***	0.029
$\Delta$ <i>CAR</i> <sub>t-4</sub>			-0.062**	0.024	$\Delta$ <i>CAR</i> <sub>t-5</sub>	-0.068***	0.020
$\Delta$ <i>CAR</i> <sub>t-5</sub>			-0.045**	0.019	$\Delta$ <i>OER</i> <sub>t-3</sub>	-0.034***	0.013
$\Delta$ <i>OER</i> <sub>t-3</sub>			-0.035**	0.013	$\Delta$ <i>NOR</i> <sub>t</sub>	-0.161***	0.039
$\Delta$ <i>NOR</i> <sub>t</sub>	-0.150***	0.039	-0.174***	0.036	$\Delta$ <i>IPI</i> <sub>t-5</sub> <sup>+</sup>	-0.040***	0.013
$\Delta$ <i>INF</i> <sub>t</sub>			-0.252***	0.075	$\Delta$ <i>IPI</i> <sub>t</sub> <sup>-</sup>	-0.050***	0.015
$\Delta$ <i>INF</i> <sub>t-2</sub>			-0.207***	0.067	$\Delta$ <i>INF</i> <sub>t</sub> <sup>+</sup>	-0.323***	0.111
					$\Delta$ <i>INF</i> <sub>t-2</sub> <sup>-</sup>	-0.334***	0.088
R <sup>2</sup>	0.606		0.695			0.691	
J-B	7.056	(0.029)	0.629	(0.730)		1.037	(0.596)
LM1	0.338	(0.561)	0.012	(0.918)		0.374	(0.541)
LM2	3.589	(0.166)	0.643	(0.725)		2.831	(0.243)
ARCH1	0.003	(0.957)	0.074	(0.785)		0.685	(0.408)
ARCH2	1.057	(0.590)	0.125	(0.939)		0.932	(0.628)
CUSUM	stable		stable			stable	
Asymmetric							
W <sub>LR</sub> for IPI						7.983	(0.006)
W <sub>LR</sub> for INF						0.614	(0.435)

Note: \*, \*\*, \*\*\* are statistically significant at  $\alpha=10\%$ ,  $5\%$ , and  $1\%$  respectively; Parentheses indicate probability; J-B is the Jarque-Bera test for normality; LM is the Lagrange multiplier test for autocorrelation and ARCH is autoregressive conditional heteroskedasticity test for heteroskedasticity; W<sub>LR</sub> is the Wald test statistics for long-run asymmetric test.

**Table 3** exhibits the unit root test using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) including constant and trend. NPF, CAR, OER, and IPI are stationary at the level data. Lasset, Gfin, NOR and INF are not stationary at level data but those variables are stationary at the first difference. In conclusion, some variables are integrated on I(0), the other variables are integrated on I(1) and none of them are integrated on I(2). These results prove that NARDL is an appropriate model for estimating IRB's NPF in Indonesia.

As a distributed lag model, the estimation of the NARDL model is very sensitive to the lag. We apply maximum lag up to 6. There are three models which consist of Model 1, 2, and 3. A basic model that does not include macroeconomic variables is represented by Model 1. Model 2 is a model that includes macroeconomic variables with symmetric effect. Model 3 is an augmented Model 1 which includes the asymmetric effect of macroeconomic variables. **Table 4** presents the NARDL estimation for all models. The top panel of **Table 4** shows NARDL estimation and the diagnostic tests of OLS assumptions are exhibited in the bottom panel of **Table 4**. The diagnostic statistic tests include normality of residuals using Jerque-Berra (JB) test, heteroskedasticity test up to order 2 employing autoregressive conditional heteroskedasticity (ARCH), and autocorrelation test up to order 2 using Lagrange multiplier (LM) test. All models pass diagnostic tests of normality, no autocorrelation, and homoskedasticity, except for Model 1 which violates the test of normality. The findings prove that our NARDL model fits the OLS assumption so it leads to unbiased and efficient estimators.

The next procedure is to perform a cointegration test to capture the long-run relationship between IRB's NPF and all independent variables. The cointegration test results are shown in **Table 5**. All computed t-values and F-values are greater than the upper critical bound at  $\alpha = 1\%$ . The cointegration tests prove that the long-run relationship between the dependent variable and independent variables for all models exists. With these findings, we can estimate the long-run coefficient of all independent variables.

Table 5. The Bound Test for Cointegration

	Test Statistics		Critical Value				
	t	F	$\alpha$	t		F	
				Lower	upper	Lower	upper
Model 1	-5.220	5.583	1%	-3.43	-4.99	3.15	4.43
Model 2	-5.913	5.804	5%	-2.86	-4.38	2.45	3.61
Model 3	-6.625	7.288	10%	-2.57	-4.04	2.12	3.23

Note: The critical values of statistics are from [Pesaran et al. \(2001\)](#).

**Table 6** shows the long-run coefficient of all models. Model 1 which only applies IRB bank characteristic variables, indicates that all independent variables except Gfin are statistically significant at  $\alpha = 5\%$  or lower level. Assets and CAR have a positive effect on NPF. Assets have a positive effect because high assets cause Islamic banks to have the ability to expand financing thereby increasing the probability of NPF. A high CAR causes Islamic banks to have adequate capital so that it can enlarge its business but increase the probability of non-performing financing at the same time. The Islamic bank efficiency (OER) has a negative effect on NPF and it is contrary to the hypothesis. NOR, which indicates income diversification, negatively affects NPF. The more diversification income has less probability of impaired financing.

Model 2 is a model that includes macroeconomic variables that symmetrically affect NPF. The results of the study rejected the null hypothesis for all bank characteristic variables at  $\alpha = 5\%$  or lower level. Assets, financing growth, and CAR have a positive effect on NPF. An increase in these three variables increases the possibility of bad financing. Less efficiency and more income diversification negatively affect NPF. However, all macroeconomic variables do not influence the impaired financing of IRB. Model 2 may result in an inappropriate model because it considers the symmetric effect of the macroeconomic variables on



NPF. [Shin et al. \(2014\)](#) argue that an inappropriate model may come from the treatment of variables by assuming the symmetric effect instead of the asymmetric effect.

Model 3 incorporates Islamic bank characteristic variables and asymmetric macroeconomic variables. The asset and growth of financing variables have no impact on NPF. CAR is positive and statistically significant at  $\alpha = 5\%$ . Higher CAR is higher NPF. The level of efficiency and diversification income are negative and statistically significant at  $\alpha = 1\%$ . Less efficiency and more diversified income mean less probability of bad financing. An increase in output is not statistically significant, while a decrease in output is statistically significant at  $\alpha = 5\%$ . We reject the null hypothesis of no inflation effect at  $\alpha = 5\%$  but we fail to reject the no deflation impact on NPF. It implies that the better the economic condition is the lower the impaired financing will be.

Table 6. Long Run Coefficient Estimates of NPF

Variables	Model 1	Model 2	Variables	Model 3
$Lasset_t$	3.4671*** (0.5768)	3.9559*** (0.9148)	$Lasset_t$	0.1158 (1.8257)
$Gfin_t$	-7.3574 (9.6799)	0.9215** (8.2277)	$Gfin_t$	-4.1211 (5.9988)
$CAR_t$	0.1836** (0.0864)	0.1631*** (0.0666)	$CAR_t$	0.1588** (0.0739)
$OER_t$	-0.0977** (0.0437)	-0.1165*** (0.0347)	$OER_t$	-0.0874*** (0.0311)
$NOR_t$	-0.3219*** (0.0706)	-0.3255*** (0.0588)	$NOR_t$	-0.2531*** (0.0719)
$IPI_t$		-0.0162 (0.0255)	$IPI_t^+$	-0.0221 (0.0203)
			$IPI_t^-$	-0.0615** (0.0243)
$INF_t$		-0.2043 (0.2211)	$INF_t^+$	0.2830** (0.1536)
			$INF_t^-$	-0.2077 (0.1515)

Note: \*, \*\*, \*\*\* are statistically significant at  $\alpha=10\%$ ,  $5\%$ , and  $1\%$  respectively. The standard errors are shown in parentheses.

Our findings show that Islamic bank-specific variables and macroeconomic variables affect the NPF of IRB. All the models show that CAR has a positive effect on NPF. These findings prove similar results of previous studies both in conventional banks ([Ghosh, 2015](#)) and in Islamic banks ([Trad et al., 2017](#)). Capital provides a buffer to absorb losses coming from risks. Islamic banks with high CAR have a high capability in financing so that it leads to a higher probability of bad financing. OER which represents the efficiency level negatively influences NPF for all the models. This finding is against some studies such as [Louzis et al. \(2012\)](#) for conventional banks and [Rahim and Zakaria \(2013\)](#) for Islamic banks. All the models clearly demonstrate that income diversification (NOR) reduces non-performing financing. Our findings support the existing studies both for Islamic banks ([Abedifar et al., 2013](#); [Kabir et al., 2015](#)) as well as conventional banks ([Louzis et al., 2012](#)). Income diversification leads Islamic banks to have more information from different financing products so that it acquaints with financing products and reduces its impaired financing which supports the existing studies such as [Widarjono et al. \(2020\)](#).

A decrease in domestic output negatively affects NPF, but an increase in domestic output has no impact on NPF. These findings are in line with previous research findings with the symmetric effect such as Kabir et al. (2015), Rahim and Zakaria (2013), Kabir and Worthington (2017), and Mirza et al. (2015). The existing empirical studies documented that the impact of the economic downturn is worse than the economic upturn (Tang & Bethencourt, 2017; Widarjono, 2020a). The worse economic condition persistently increases the financing risk of Islamic banks. Accordingly, the economic downturns obviously raise the NPF but economic upturns do not lower NPF. These results imply that the probability of IRB's bankruptcy is higher during economic downturns. In the asymmetric effect of inflation, inflation increases NPF while deflation has no impact on NPF, indicating that inflation worsens IRB's NPF more than deflation. Some empirical studies that use the symmetric effect of inflation on NPF also find a positive impact of inflation on bad financing (Kabir & Worthington, 2017). More interestingly, the impact of inflation is higher than economic downturns on impaired financing. Based on the two macroeconomic variables, IRB's bankruptcy due to NPF is very sensitive to the deteriorating macroeconomic conditions during economic downturn and inflation.

### Conclusion and Policy Implication

This study investigates the impact of both Islamic bank-specific and macroeconomic variables on Indonesian Islamic rural bank's non-performing financing. There are three models applied to avoid biased results. This research emphasizes the aspects of macroeconomic variables on NPF. In addition to the symmetric effect of internal Islamic bank variables, this study includes the asymmetric effect of domestic output and inflation on NPF. Our findings indicate that assets, financing, CAR, and OER influence the NPF. All the models find that CAR affects positively and that level of efficiency and income diversification negatively affect NPF. Domestic output has an asymmetric effect on the NPF. The economic downturns increase the risk of bad financing, but economic upturns do not reduce impaired financing. Inflation increases bad financing and deflation has no impact on bad financing. Therefore, the Islamic rural bank as a financial intermediary for small and medium firms is vulnerable to collapse as macroeconomic conditions get worse.

Indonesian Islamic rural banks encounter a high default due to high non-performing financing. Our findings suggest some policy implications for Islamic rural banks and the Indonesian Financial Service Authority as a policymaker to mitigate financial defaults because of high non-performing financing. First, high CAR links to high non-performing financing. Based on data, the CAR of IRBs is relatively high with an average of 25%. Therefore, the IRBs have to establish the optimal level of CAR that can maintain the financial stability of the IRBs because high CAR increases the risk of financing default. Second, IRBs have to provide more product diversification to reduce bad financing since the ratio of non-operating and total revenue is low (12.23%). Third, IRBs preserve more loan loss provisions during inflation and economic downturns to avoid bankruptcy due to high impaired financing.

Our study examines the aggregate data of Islamic rural bank's non-performing financing. Yet, the aggregate non-performing financing does not show financing risk for each Islamic rural bank. Hence, for future study, it should employ panel regression to investigating non-performing financing of individual Islamic rural banks.

### References

- Abedifar, P., Molyneux, P., & Tarazi, A. (2013). Risk in Islamic banking. *Review of Finance*, 17(6), 2035–2096. <https://doi.org/10.1093/rof/rfs041>
- Adebola, S. S. (2011). An ARDL approach to the determinants of non-performing loans in Islamic banking system in Malaysia. *Kuwait Chapter of Arabian Journal of Business and Management Review*, 1(2), 20–30.
- Azmat, S., Skully, M., & Brown, K. (2015). Can Islamic banking ever become Islamic? *Pacific Basin Finance Journal*, 34, 253–272. <https://doi.org/10.1016/j.pacfin.2015.03.001>
- Bahmani-Oskooee, M., & Saha, S. (2018). On the relation between exchange rates and stock prices: A non-

- linear ARDL approach and asymmetry analysis. *Journal of Economics and Finance*, 42(1), 112–137. <https://doi.org/10.1007/s12197-017-9388-8>
- Banerjee, A., Dolado, J. J., & Mestre, R. (1998). Error-correction mechanism tests for cointegration in a single-equation framework. *Journal of Time Series Analysis*, 19(3), 267–283. <https://doi.org/10.1111/1467-9892.00091>
- Beck, T., Demirgüç-Kunt, A., & Merrouche, O. (2013). Islamic vs. conventional banking: Business model, efficiency and stability. *Journal of Banking and Finance*, 37(2), 433–447. <https://doi.org/10.1016/j.jbankfin.2012.09.016>
- Belkhaoui, S., Alsagr, N., & van Hemmen, S. F. (2020). Financing modes, risk, efficiency and profitability in Islamic banks: Modeling for the GCC countries. *Cogent Economics and Finance*, 8(1). <https://doi.org/10.1080/23322039.2020.1750258>
- Chamberlain, T., Hidayat, S., & Khokhar, A. R. (2020). Credit risk in Islamic banking: Evidence from the GCC. *Journal of Islamic Accounting and Business Research*, 11(5), 1055–1081. <https://doi.org/10.1108/JIABR-09-2017-0133>
- Firmansyah, I. (2015). Determinant of non performing loan: The case of Islamic bank in Indonesia. *Buletin Ekonomi Moneter Dan Perbankan*, 17(2), 241–258. <https://doi.org/10.21098/bemp.v17i2.51>
- Ghenimi, A., Chaibi, H., & Omri, M. A. B. (2017). The effects of liquidity risk and credit risk on bank stability: Evidence from the MENA region. *Borsa Istanbul Review*, 17(4), 238–248. <https://doi.org/10.1016/j.bir.2017.05.002>
- Ghosh, A. (2015). Banking-industry specific and regional economic determinants of non-performing loans: Evidence from US states. *Journal of Financial Stability*, 20, 93–104. <https://doi.org/10.1016/j.jfs.2015.08.004>
- Hamid, F. S. (2017). The effect of market structure on banks' profitability and stability: Evidence from ASEAN-5 countries. *International Economic Journal*, 31(4), 578–598. <https://doi.org/10.1080/10168737.2017.1408668>
- Hassan, M. K., & Aliyu, S. (2018). A contemporary survey of Islamic banking literature. *Journal of Financial Stability*, 34, 12–43. <https://doi.org/10.1016/j.jfs.2017.11.006>
- Hassan, M. K., Khan, A., & Paltrinieri, A. (2019). Liquidity risk, credit risk and stability in Islamic and conventional banks. *Research in International Business and Finance*, 48, 17–31. <https://doi.org/10.1016/j.ribaf.2018.10.006>
- Hosen, M. N., & Muhari, S. (2019). Non-performing financing of Islamic rural bank industry in Indonesia. *Banks and Bank Systems*, 14(1), 20–28. [https://doi.org/10.21511/bbs.14\(1\).2019.03](https://doi.org/10.21511/bbs.14(1).2019.03)
- Kabir, M. N., & Worthington, A. C. (2017). The 'competition–stability/fragility' nexus: A comparative analysis of Islamic and conventional banks. *International Review of Financial Analysis*, 50, 111–128. <https://doi.org/10.1016/j.irfa.2017.02.006>
- Kabir, M. N., Worthington, A., & Gupta, R. (2015). Comparative credit risk in Islamic and conventional bank. *Pacific Basin Finance Journal*, 34, 327–353. <https://doi.org/10.1016/j.pacfin.2015.06.001>
- Kim, J., Yoon, J. C., & Jei, S. Y. (2020). An empirical analysis of Okun's laws in ASEAN using time-varying parameter model. *Physica A: Statistical Mechanics and Its Applications*, 540, 123068. <https://doi.org/10.1016/j.physa.2019.123068>
- Louhichi, A., & Boujelbene, Y. (2017). Bank capital, lending and financing behaviour of dual banking systems. *Journal of Multinational Financial Management*, 41, 61–79. <https://doi.org/10.1016/j.mulfin.2017.05.009>
- Louzis, D. P., Vouldis, A. T., & Metaxas, V. L. (2012). Macroeconomic and bank-specific determinants of non-performing loans in Greece: A comparative study of mortgage, business and consumer loan portfolios. *Journal of Banking and Finance*, 36(4), 1012–1027. <https://doi.org/10.1016/j.jbankfin.2011.10.012>
- Mahdi, B. S. I., & Abbes, M. B. (2018). Relationship between capital, risk and liquidity: A comparative study between Islamic and conventional banks in MENA region. *Research in International Business and Finance*, 45, 588–596. <https://doi.org/10.1016/j.ribaf.2017.07.113>

- Mirza, N., Rahat, B., & Reddy, K. (2015). Business dynamics, efficiency, asset quality and stability: The case of financial intermediaries in Pakistan. *Economic Modelling*, 46, 358–363. <https://doi.org/10.1016/j.econmod.2015.02.006>
- Mirzaei, A., Moore, T., & Liu, G. (2013). Does market structure matter on banks' profitability and stability? Emerging vs. advanced economies. *Journal of Banking and Finance*, 37(8), 2920–2937. <https://doi.org/10.1016/j.jbankfin.2013.04.031>
- Muhammad, R., Suluki, A., & Nugraheni, P. (2020). Internal factors and non-performing financing in Indonesian Islamic rural banks. *Cogent Business and Management*, 7(1), 1–12. <https://doi.org/10.1080/23311975.2020.1823583>
- Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, 16(3), 289–326. <https://doi.org/10.1002/jae.616>
- Rahim, S. R. M., & Zakaria, R. H. (2013). Comparison on stability between Islamic and conventional banks in Malaysia. *Journal of Islamic Economics, Banking and Finance*, 9(3), 131–149. <https://doi.org/10.12816/0001618>
- Rahmah, A. Z., & Armina, S. H. (2020). Macro and micro determinants of the non-performing finance: The case of Indonesian Islamic bank. *Jurnal Ekonomi & Keuangan Islam*, 6(1), 34–41. <https://doi.org/10.20885/jeki.vol6.iss1.art4>
- Raza, N., Shahzad, S. J. H., Tiwari, A. K., & Shahbaz, M. (2016). Asymmetric impact of gold, oil prices and their volatilities on stock prices of emerging markets. *Resources Policy*, 49, 290–301. <https://doi.org/10.1016/j.resourpol.2016.06.011>
- Setiawan, C., & Bagaskara, B. (2016). Non-performing financing (NPF) and cost efficiency of Islamic banks in Indonesia period 2012Q1 to 2015Q2. *Journal of Emerging Issue in Economics, Finance and Banking*, 5(1), 1816–1831.
- Shin, Y., Yu, B., & Greenwood-nimmo, M. (2014). Modeling asymmetric cointegration and dynamic multipliers in a Nonlinear ARDL framework. In R. Sickels, & W. Horrace (Eds.), *Festschrift in Honor of Peter Schmidt: Econometric Methods and Applications* (pp. 281–314). Springer, New York. <https://doi.org/10.1007/978-1-4899-8008-3>
- Tang, B., & Bethencourt, C. (2017). Asymmetric unemployment-output tradeoff in the Eurozone. *Journal of Policy Modeling*, 39(3), 461–481. <https://doi.org/10.1016/j.jpolmod.2017.01.003>
- Trad, N., Trabelsi, M. A., & Goux, J. F. (2017). Risk and profitability of Islamic banks: A religious deception or an alternative solution? *European Research on Management and Business Economics*, 23(1), 40–45. <https://doi.org/10.1016/j.iedeen.2016.09.001>
- Trinugroho, I., Risfandy, T., & Ariefianto, M. D. (2018). Competition, diversification, and bank margins: Evidence from Indonesian Islamic rural banks. *Borsa Istanbul Review*, 18(4), 349–358. <https://doi.org/10.1016/j.bir.2018.07.006>
- Waemustafa, W., & Sukri, S. (2016). Systematic and unsystematic risk determinants of liquidity risk between Islamic and conventional banks. *International Journal of Economics and Financial Issues*, 6(4), 1321–1327.
- Warninda, T. D., Ekaputra, I. A., & Rokhim, R. (2019). Do *mudharabah* and *musharakah* financing impact Islamic bank credit risk differently? *Research in International Business and Finance*, 49, 166–175. <https://doi.org/10.1016/j.ribaf.2019.03.002>
- Widarjono, A. (2020a). Asymmetric Okun's law in an emerging market: ASEAN-3 case. *Economics and Sociology*, 13(3), 203–217. <https://doi.org/10.14254/2071-789X.2020/13-3/12>
- Widarjono, A. (2020b). Stability of Islamic banks in Indonesia: Autoregressive distributed lag approach. *Jurnal Keuangan Dan Perbankan*, 24(1), 40–52. <https://doi.org/10.26905/jkdp.v24i1.3932>
- Widarjono, A., Anto, M. B. H., & Fakhrunnas, F. (2020). Financing risk in Indonesian Islamic rural banks: Do financing products matter? *The Journal of Asian Finance, Economics and Business*, 7(9), 305–314. <https://doi.org/10.13106/jafeb.2020.vol7.no9.305>
- Widarjono, A., & Rudatin, A. (2021). Financing diversification and Indonesian Islamic bank's non-performing financing. *Jurnal Ekonomi & Keuangan Islam*, 7(1), 45–58.
- Widarjono, A., Shidiqie, J. S. A., & El Hasanah, L. L. N. (2021). The sensitivity of the Indonesian Islamic

stock prices to macroeconomic variables: An asymmetric approach. *Journal of Asian Finance, Economics and Business*, 8(3), 181–190. <https://doi.org/10.13106/jafeb.2021.vol8.no3.0181>