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✉ Corresponding Author:

Agus Widarjono:

Tel. +62 274 881 546

E-mail: agus.widarjono@uui.ac.id



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Stability of Islamic banks in Indonesia: Autoregressive Distributed Lag Approach

Agus Widarjono

*Department of Economics, Faculty of Economics, Universitas Islam Indonesia
Jl. Ringroad Utara, Condong Catur, Yogyakarta, 55283, Indonesia*

Abstract

Islamic banks in Indonesia are very vulnerable to the instability of their business processes because of their small market share. Moreover, based on their financial performances, Islamic banks are worse than those of conventional banks due to lower profits (ROA) and higher Non-performing financing (NPF). Our study investigates the stability of Islamic banks. We measure the stability using Z-score and NPF. Instead of an individual bank, the study applies an aggregate data of Islamic banks encompassing Islamic commercial banks along with Islamic business units. Monthly time series data, covering January 2010 to December 2018 are selected. We apply the Autoregressive Distributed Lag (ARDL) model. The findings document that the Islamic bank's specific variables affecting stability are size, CAR, and efficiency. The larger size and CAR support the Islamic bank's stability. Lower efficiency increases the Islamic bank's instability. Meanwhile, Inflation and exchange rates affect the Islamic bank's stability. Economic downturns due to inflation and depreciation of rupiah increase the instability of Islamic banks.

Abstrak

Bank Islam di Indonesia sangat rentan terhadap ketidakstabilan proses bisnis mereka karena pangsa pasar yang kecil. Selain itu, berdasarkan kinerja keuangan mereka, bank syariah lebih buruk daripada bank konvensional karena laba lebih rendah (ROA) dan pembiayaan bermasalah (NPF) lebih tinggi. Penelitian ini menyelidiki stabilitas bank Islam. Stabilitas keuangan diukur dengan menggunakan Z-score dan NPF. Penelitian ini menggunakan data agregat bank syariah yang mencakup bank komersial syariah bersama dengan unit bisnis syariah. Data yang digunakan adalah bulanan dari Januari 2010 hingga Desember 2018. Penelitian ini mengaplikasikan model Autoregressive Distributed Lag (ARDL). Temuan penelitian ini mendokumentasikan bahwa variabel spesifik bank Islam yang memengaruhi stabilitas adalah besarnya asset, CAR, dan efisiensi. Aset dan CAR yang tinggi mendukung stabilitas bank syariah. Efisiensi yang lebih rendah meningkatkan ketidakstabilan bank syariah. Sementara itu, inflasi dan nilai tukar memengaruhi stabilitas bank Islam. Penurunan ekonomi akibat inflasi dan depresiasi rupiah meningkatkan ketidakstabilan bank Islam.

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1. Introduction

The existence of Islamic banks is inevitable for Indonesia as a Muslim-majority country as a form of bank application with a non-interest rate system. The practice of the Islamic Bank started in 1992. The Islamic bank proliferated when the government passed Law No. 23 in 2008 concerning Islamic banks. There were 29 Islamic banks consisting of 3 Islamic commercial banks with 401 offices and 26 Islamic business units with 196 offices in 2007. The number of Islamic banks was 34 Islamic banks encompassing 14 Islamic commercial banks with 1,905 offices and 20 Islamic business units with 376 offices in 2019. Moreover, total assets in Islamic banking also increased. The total assets of Islamic banks were IDR 26.538 trillion in 2007. Their assets increased to be IDR 466.799 trillion in 2019. Furthermore, one of the Islamic banks, namely Bank Syariah Mandiri, was ranked 25th of all Indonesian banks in 2019.

The stability of Islamic banks can be evaluated from their profitability along with impaired financing as known as Non-performing financing (NPF). The Indonesian financial services authority classifies healthy Islamic banks as the profitability assessed by return on assets (ROA) is over 1.5% and the maximum NPF is 5%. Figure 1 illustrates the movement of ROA and NPF from January 2013 to December 2018. The average ROA was 1.34% and the average of NPF was 4.02%. However, the financial performance of Islamic banks is worse than conventional banks as their competitors. ROA and NPL of the conventional banks were 2.61% and 2.56% respectively for the same period.

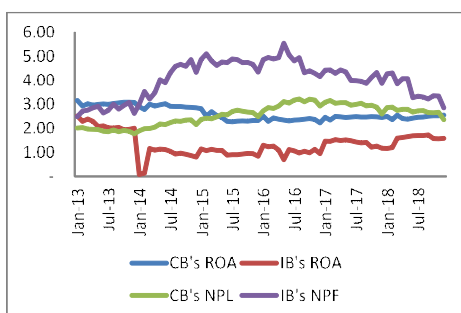


Figure 1. ROA and NPF: Islamic versus conventional bank

Based on their financial performances, the Islamic banks' stability is worse than those of conventional banks because of lower profits (ROA) and higher NPF. Many empirical kinds of the literature analyzed Islamic banks' stability. Both the Islamic bank's specific factors and macroeconomic conditions determine the Islamic bank's stability. The Islamic bank's specific variables that influence the stability are size and capital (Ghenimi, Chaibi, & Omri, 2017; Trad, Trabelsi, & Goux, 2017). While macroeconomic conditions that affect the stability are inflation, domestic output, and the exchange rate (Ghenimi et al., 2017; Trad et al., 2017; Srairi, 2019). Some empirical literature also examined the stability of small and large Islamic banks. A small Islamic bank is more secure than a large bank because of their lower credit risk (Abedifar, Molyneux, & Tarazi, 2013; Ěihák & Hesse 2010). By contrast, some empirical studies show that large Islamic bank is more secure than small Islamic bank because large Islamic bank has market power so large Islamic bank can reduce the risk of financing (Ibrahim & Rizvi, 2017).

Some previous studies also investigated the stability between Islamic banks and conventional banks. Some researchers point out that the Islamic banks' stability is better than the conventional bank. Some plausible reasons are from the limited investment of Islamic bank because they have to meet the Sharia principles (Hussein, 2010), having better risk management (Hassan, Khan, & Paltrinieri, 2019) and having low credit risk because of no speculative transaction in their financing (Miah & Uddin, 2017). On another hand, some empirical literature indicates that the Islamic banks' stability is worse than conventional banks because moral hazard and asymmetric information bear on the profit-and-loss sharing system (Kabir, Worthington, & Gupta, 2015; Lassoued, 2018).

Many empirical studies investigated Islamic banks in Indonesia. Most of the topics are related to profitability of Islamic bank (Hosen & Rahmawati

2016; Setyawati et al. 2017; Sriyana, 2015; Widarjono, 2018; Risfandy, 2018; Octavio & Soesetio, 2019), efficiency of Islamic banks (Hosen & Rahmawati 2016; Aisyah & Hosen, 2018; Majdina, Munandar, & Effendi, 2019) and credit risk of Islamic banks (Firmansyah, 2015; Husa & Trinarningsih, 2015; Nugraheni & Muhammad, 2019). Our present study examines Islamic banks' financial stability in Indonesia. To the best of our knowledge, only a few existing empirical kinds of literature address the stability of Indonesian Islamic banks. Some researchers apply NPF, which measures the credit risk, to examine the Islamic banks' stability. However, NPF represents an Islamic bank's asset quality instead of financial stability (Beck, Demirgüç-Kunt, & Merrouche, 2013). To contribute to the existing empirical studies in an Indonesian Islamic bank, our study applies two measures of financial stability consisting of Z-score and NPF. Another contribution relates to the estimation method. Most of the previous studies of Islamic banks in Indonesia used a panel regression method with an individual Islamic bank. This study examines aggregate Islamic banks by applying a dynamic model of Autoregressive Distributed Lag Model (ARDL).

2. Method, Data, and Analysis

The study applies an aggregate data of Islamic banks consisting of Islamic commercial bank along with Islamic business units. Monthly time series data, covering January 2010 to December 2018, are selected to analyze the Islamic banks' stability. This period was selected due to the fast development of Islamic banks after the Indonesian government passed the Islamic bank law in 2008. We follow the existing empirical literature such as Beck et al. (2013) and Hassan et al. (2019). The stability of Islamic banks can be modeled as follows:

$$\text{Stability} = f(\text{ASSET}, \text{CAR}, \text{GFIN}, \text{OER}, \text{GDP}, \text{INF}, \text{and EXC}) \quad (1)$$

The stability of Islamic banks depends on both the specific variables of Islamic banks and macroeconomic variables. Islamic bank's specific variable consists of assets, capital adequacy ratio (CAR), financing growth of Islamic bank (GFIN), the ratio of cost and income (OER). Meanwhile, macroeconomic variables encompass domestic output (GDP), inflation (INF), as well as exchange rate (EXC) of Indonesian rupiah (IDR) against the U.S dollar.

We measure stability using two methods, namely Z-score (Beck et al., 2013; Hassan et al., 2019) as well as Non-performing financing (NPF) (Abedifar et al., 2013; Kabir & Worthington, 2017). Z-score is estimated using a formula as $(\text{ROA} + \text{CAR}) / \text{STDV}(\text{ROA})$. $\text{STDV}(\text{ROA})$ stands for the standard deviation of ROA. NPF is the percentage of impaired financing to total financing. CAR is equity over total assets. Growth of financing (GFIN) is the growth of total financing consisting of mudharabah and musyarakah as profit-and-loss sharing contracts (PLS) and *murabahah*, *ijarah*, *salam*, *istishna*, and *qard* as non-PLS contract. The monthly industrial production index (IPI) is a proxy for GDP. Inflation is monthly inflation based on consumer prices. The exchange rate is the value of Indonesian Rupiah (IDR) against the U.S dollar.

Z-score represents the stability of Islamic banks because Z-score measures the variability of Islamic banks' profitability. The higher Z-score is the more stable the Islamic bank and vice versa. NPF is impaired financing and measures the insolvency level of Islamic banks. The lower the NPF is the lower the insolvency level of Islamic banks and vice versa. Total assets indicate the size of the bank. The larger assets lead to the ability of Islamic banks to expand their business and to increase profits and stability of Islamic banks. However, large banks are also often difficult to control over financing so that it leads to an increase in impaired financing, lower profits, and deteriorate financial instability. Therefore, as-

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sets are expected to be linked to lower or higher on bank stability. CAR represents the capability of banks to make provision funds used to cope with the possible risk of loss. The greater CAR reflects the better ability of banks in dealing with the possibility of loss. CAR is hypothesized to be linked to the higher stability of Islamic banks. Growth of financing (GFIN) shows the ability of Islamic banks to provide financing funds. The higher the financing is the greater the bank's ability to result in profits and vice versa. GFIN links to a positive impact on the stability of the Islamic bank. OER represents the efficiency of banks in operating their business. The lower OER means the more efficient the Islamic bank is in operating and encourages the Islamic banks' stability and vice versa. We expect that OER negatively influences the Islamic banks' stability.

IPI as a proxy of GDP reflects the total domestic output. The high domestic output shows an economic upturn and then improves the performance of Islamic banks. Therefore, we expect that IPI links to the higher stability of Islamic banks. Inflation indicates the price level at the consumer stage. A high inflation rate reduces the consumer's purchasing power. A decrease in consumer's purchasing power lowers the capability of Islamic banks to obtain high profit. We hypothesize inflation negatively effects on Islamic banks. The exchange rate shows the purchasing power of the rupiah against the US dollar. Indonesia is a country that heavily depends on raw

materials from imported goods for domestic production. The depreciation of the rupiah causes the prices of goods to be more expensive, causing the prices of goods to increase. Rising prices of goods lower profits of Islamic banks. The exchange rate negatively affects the Islamic banks' stability. Table 1 exhibits the definition of variables, hypotheses tests, and data sources. The Specific variables of Islamic banks such as ROA, NPF, CAR, and OER are the average data for all Islamic banks. The asset and expenditure are the total data of all banks.

The model in equation (1) can be written in the regression equation as follow:

$$Stability_t = \beta_0 + \beta_1 Log(ASSET)_t + \beta_2 CAR_t + \beta_3 GFIN_t + \beta_4 OER_t + \beta_5 IPI_t + \beta_6 INF_t + \beta_7 EXC_t + e_t \quad (2)$$

We apply the ARDL model. The ARDL leads to twofold benefits in estimating the stability of Islam bank because of capturing equilibrium both short-run and long-run condition. Equation (2) can be rewritten in term of ARDL model as follows:

$$\begin{aligned} \Delta Stability_t = & \varphi_0 + \varphi_1 Stability_{t-1} + \varphi_2 \log(ASSET)_{t-1} + \\ & \varphi_3 CAR_{t-1} + \varphi_4 GFIN_{t-1} + \varphi_5 OER_{t-1} + \varphi_6 IPI_{t-1} + \\ & \varphi_7 INF_{t-1} + \varphi_8 EXC_{t-1} + \sum_{i=1}^n \pi_{1i} \Delta Stability_{t-1} + \\ & \sum_{i=1}^n \pi_{2i} \Delta \log(ASSET)_{t-1} + \sum_{i=1}^n \pi_{3i} \Delta CAR_{t-1} + \\ & \sum_{i=1}^n \pi_{4i} \Delta GFIN_{t-1} + \sum_{i=1}^n \pi_{5i} \Delta OER_{t-1} + \\ & \sum_{i=1}^n \pi_{6i} \Delta IPI_{t-1} + \sum_{i=1}^n \pi_{7i} \Delta INF_{t-1} + \\ & \sum_{i=1}^n \pi_{8i} \Delta EXC_{t-1} + e_t \end{aligned} \quad (3)$$

Table 1. Variables description, hypothesis, and source of data

Variables	Description	Hypothesis	Source
Dependent variables			
Z-score	(ROA+CAR)/SD(ROA) (%)		OJK
NPF	Non Performing financing (%)		OJK
Independent variables			
Islamic bank specific			
ASSET	Total Asset (IDR trillion)	+/-	OJK
CAR	Equity over total assets (%)	+	OJK
GFIN	Growth of Financing (%)	+	OJK
OER	Ratio of operational expense to operational revenue (%)	+	OJK
Macroeconomic variables			
IPI	Industrial Production Index (%)	+	IFS
INF	Inflation rate (%)	+	BPS
EXC	IDR against US Dollar (US\$/IDR)	-	IFS

Note: OJK stands for Otoritas Jasa Keuangan (Financial Service Authority), BPS stands for Biro Pusat Statistik (Central Bureau of Statistics), and IFS stands for International Financial Statistics.

Several steps are conducted in estimating ARDL. The first step conducts the stationary test using the unit-roots test. ARDL can be applied if no stationary data at the second difference data exists. The unit-roots test encompasses the Augmented Dickey-Fuller (ADF) and Phillips Perron (PP) using both constant and constant and trend. The second step is the cointegration test to catch out on the long-run relationship between the dependent and independent variables using the Bound testing approach deleting is (Pesaran et al, 2001). The null hypothesis of no cointegration can be written as follows:

$$H_0: \varphi_1 = \varphi_2 = \varphi_3 = \varphi_4 = \varphi_5 = \varphi_6 = \varphi_7 = \varphi_8 = 0 \quad (4)$$

The cointegration with bound testing follows the F test. Pesaran et al (2001) provide the critical F value of the cointegration test. The critical F values consist of lower bound I (0) and upper bound I (1). Cointegration is present as F value is greater than I (1). By contrast, cointegration does not exist as F value is smaller than I(0). However, no decision exists as the computed F value between I(1) and I(0). In the third step, if cointegration exists, the estimation of the ARDL model must include the error-correction ARDL (ECM ARDL). This ECM ARDL model can capture the short-term conditions due to disequilibrium conditions in the short-run condition. Therefore, we have to include the error variable to correct the disequilibrium conditions in the short-

run condition. The final step is to estimate the long-run condition.

3. Results

Table 2 illustrates the statistical description of the variables being studied. The average Z-score was 36.20% and relatively stable, with a standard deviation of 4.39. The movement of Z-score can be seen in Figure 2. Z-score shows stable conditions and there is a tendency to increase starting in 2017. The Z-score clearly depicts the stability of Islamic banks. The average of NPF was 3.84, with a standard deviation of 0.82. NPF is below the maximum threshold of 5%. The average of the asset was IDR 245.027 trillion. CAR of Islamic banks is also relatively safe, with an average of 15.82%. This CAR is above the minimum threshold of 12%. This high CAR reflects that Islamic banks are a prudent bank in giving financing because the PLS contract often raises Hazard’s moral problems (Azmat et al., 2015). The financing growth of Islamic banks is low, with an average of 1.81%. This low financing growth shows that the development of Islamic banks is slow so that the market share of Islamic banks is approximately 5% of all banks. The efficiency rate of Islamic banks was 83.78%. This efficiency rate is below the maximum thresholds of 94%, but due to the relatively high standard deviation, it is very volatile.

Table 2. Descriptive Statistics

	Mean	Standard Deviation	Maximum	Minimum
Z-score	36.20	4.39	48.00	26.97
NPF	3.84	0.82	5.54	2.22
ASSET	245,027.00	111,368.30	477,327.00	67,436.00
CAR	15.82	2.07	21.39	11.07
GFIN	1.81	1.74	7.08	-1.80
OER	83.78	7.05	94.38	70.43
INF	0.41	0.53	3.29	-0.45
IPI	120.80	15.11	156.78	92.32
EXC	11,543.27	2,072.93	15,178.87	8,526.80

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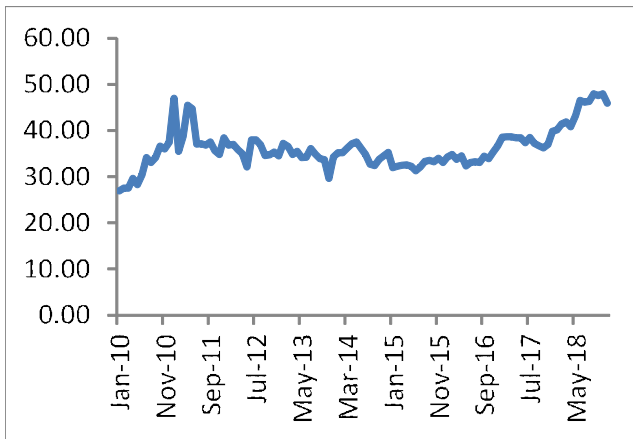


Figure 2. Z-score of Islamic Banks
2010:M1 - 2018:M12

Before estimating the ARDL model, we must check data stationery to ensure that the ARDL model is the appropriate model. Table 3 exhibits the results of the data stationary test with the ADF and PP method. Both tests apply constant and constant and trend. The results clearly show that the Z-score, LASSET, CAR, GFIN, OER, IPI, and INF are integrated at the level data $I(0)$. The NPF and LEXC variables are not integrated at $I(0)$, but they are integrated at the first difference data $I(1)$. The levels of stationary are different, but none of them is stationary at the second difference data. Hence, the ARDL model is a fit model to estimate the stability of Islamic banks.

The selected maximum lag length is 4 using the Akaike info criterion (AIC) to estimate the ARDL

model (Widarjono, 2018). Islamic bank stability is measured Z-score (model 1) and NPF (model 2). Estimation results of the stability of Islamic banks are exhibited in Table 4. Table 4 is grouped into two parts. The upper part portrays the ARDL estimation results. The bottom part shows the diagnostic test consisting of autocorrelation test with Lagrange Multiplier (LM) test both lag 1 (LM1) and lag 2 (LM2) and heteroscedasticity test using Autoregressive Conditional Heteroscedasticity (ARCH) test with lag 1 (ARCH1) and lag 2 (ARCH2).

The first and second models show ARDL (3,0,3,0,4,0,0,4) and ARDL (1,1,3,1,0,0,1,4). In the first model, out of 21 independent variables, 14 independent variables are significant at $\alpha = 10\%$ or less. Whereas in the second model, out of 18 independent variables, ten independent variables are significant at $\alpha = 10\%$ or less. Based on LM (1) and LM (2) and ARCH (1) and ARCH (2) tests, the first model passes no autocorrelation and heteroscedasticity problems. However, the second model passes the homoscedasticity test but does not pass the autocorrelation problem. This autocorrelation problem is solved by applying the HAC method (heteroscedasticity and autocorrelation consistent covariance matrix) of Newey and West to produce an efficient and consistent estimator. We apply the CUMSUM and CUMSUM squares test to check the stability parameter. The results of the stability parameters are shown in Figures 3 and 4. The results report that model 1 and model 2 are stable models.

Table 3. Unit root test Results: ADF and PP

	Level				First difference			
	Constant		Constant and Trend		Constant		Constant and Trend	
	ADF	PP	ADF	PP	ADF	PP	ADF	PP
Z-score	-1.43	-2.66*	-1.63	-3.05	-11.16***	-14.27***	-11.11***	-14.20***
NPF	-1.88	-2.14	-1.54	-2.17	-10.21***	-14.39***	-10.16***	-14.31***
LASSET	-3.02**	-3.39**	-2.69	-1.97	-3.75***	-11.40***	-4.47***	-12.26***
CAR	-1.72	-2.60*	-2.05	-3.35*	-11.24***	-12.35***	-11.18***	-12.29***
GFIN	-2.41	-9.04***	-3.37*	-10.49***	-5.69***	-46.19***	-5.70***	-45.87***
OER	-1.71	-2.35	-2.30	-3.85**	-16.72***	-19.21***	-16.64***	-19.11***
INF	-9.41***	-6.74***	-9.61***	-6.87***	-9.93***	-19.13***	-9.88***	-18.94***
IPI	-0.26	-1.10	-9.31***	-9.28***	-10.27***	-77.88***	-10.24***	-79.77***
LEXC	-0.41	-0.35	-2.18	-2.10	-7.75***	-7.75***	-7.72***	-7.72***

Note: ***, **, * are stationery at $\alpha=1\%$, 5% and 10% respectively. L=logarithm natural

Table 4. ARDL estimation results

Variable	Z-score		Variable	NPF	
	Coefficient	t-value		Coefficient	t-value
<i>C</i>	25.748	3.280	<i>C</i>	-5.356	-0.974
<i>ZScore</i> _{<i>t</i>-1}	0.552***	5.777	<i>NPF</i> _{<i>t</i>-1}	0.573***	7.970
<i>ZScore</i> _{<i>t</i>-2}	-0.113	-1.044	<i>LASSET</i> _{<i>t</i>}	-3.534**	-2.272
<i>ZScore</i> _{<i>t</i>-3}	0.263***	2.800	<i>LASSET</i> _{<i>t</i>-1}	2.746*	1.727
<i>LASSET</i> _{<i>t</i>}	0.755**	2.264	<i>CAR</i> _{<i>t</i>}	-0.085**	-2.626
<i>CAR</i> _{<i>t</i>}	2.145***	43.778	<i>CAR</i> _{<i>t</i>-1}	0.007	0.192
<i>CAR</i> _{<i>t</i>-1}	-1.256***	-5.971	<i>CAR</i> _{<i>t</i>-2}	-0.071*	-1.944
<i>CAR</i> _{<i>t</i>-2}	0.428*	1.813	<i>CAR</i> _{<i>t</i>-3}	0.144***	4.289
<i>CAR</i> _{<i>t</i>-3}	-0.627***	-3.186	<i>GFIN</i> _{<i>t</i>}	-0.027	-0.937
<i>GFIN</i> _{<i>t</i>}	0.058	1.625	<i>GFIN</i> _{<i>t</i> - 1}	-0.080***	-3.419
<i>OER</i> _{<i>t</i>}	-0.040**	-2.415	<i>OER</i> _{<i>t</i>}	0.020**	2.134
<i>OER</i> _{<i>t</i>-1}	0.018	1.093	<i>INF</i> _{<i>t</i>}	0.057	0.866
<i>OER</i> _{<i>t</i>-2}	0.032*	1.840	<i>INF</i> _{<i>t</i>-1}	0.114*	1.678
<i>OER</i> _{<i>t</i>-3}	-0.012	-0.694	<i>IPI</i> _{<i>t</i>}	0.005	0.685
<i>OER</i> _{<i>t</i>-4}	0.030*	1.937	<i>LEXC</i> _{<i>t</i>}	-1.058	-0.511
<i>INF</i> _{<i>t</i>}	0.034	0.291	<i>LEXC</i> _{<i>t</i>-1}	-0.435	-0.139
<i>INF</i> _{<i>t</i>-1}	0.214*	1.678	<i>LEXC</i> _{<i>t</i>-2}	0.892	0.285
<i>INF</i> _{<i>t</i>-2}	0.272**	2.035	<i>LEXC</i> _{<i>t</i>-3}	-5.272	-1.622
<i>INF</i> _{<i>t</i>-3}	0.020	0.170	<i>LEXC</i> _{<i>t</i>-4}	7.455***	3.470
<i>INF</i> _{<i>t</i>-4}	0.407***	3.546			
<i>IPI</i> _{<i>t</i>}	0.013	1.178			
<i>LEXC</i> _{<i>t</i>}	-4.235***	-3.641			
<i>R</i> ²	0.990		<i>R</i> ²	0.890	
Diagnostic					
LM 1	0.544	(0.461)	4.546	(0.033)	
LM 2	0.751	(0.687)	4.628	(0.099)	
ARCH 1	0.636	(0.425)	1.602	(0.206)	
ARCH 2	0.652	(0.722)	1.946	(0.378)	

Note: ***, **, * stand for significant at $\alpha=1\%$, 5% and 10% respectively. Probability is shown in parentheses.

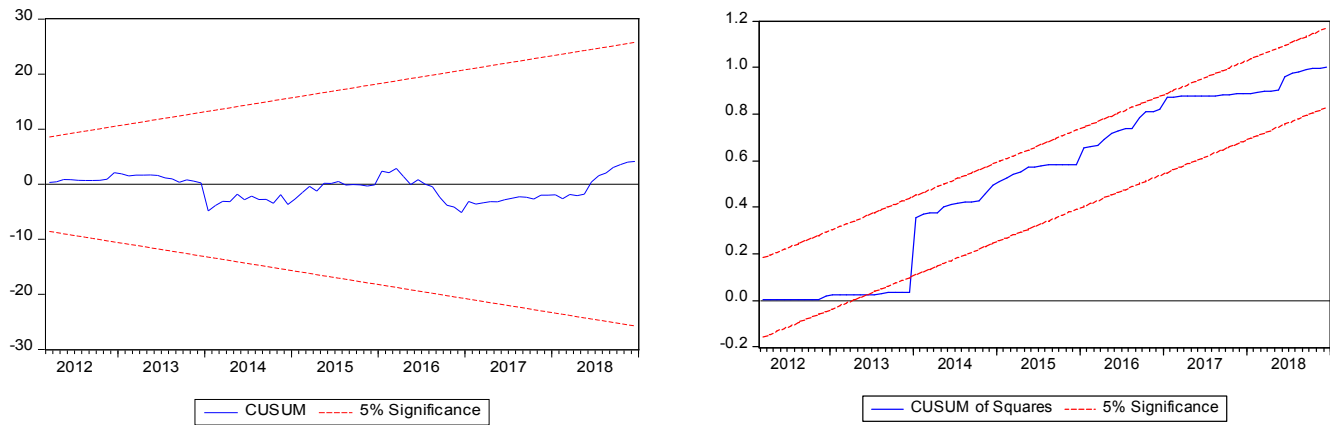


Figure 3. Stability test for Z-score

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The next evaluation is the cointegration test using the Bound testing approach. Table 5 presents the results of the cointegration test in both the first and second models. The left part indicates the calculated F value and the right part represent the critical F value at various levels of α based on the F distribution developed by Pesaran et al. (2001). Critical values consist of upper bound I (1) and lower bound I (0). In the first model, the calculated F value is 3.895. This calculated F value above from I (1) at $\alpha = 5\%$ so that there is cointegration among variables. In conclusion, there is a long-term relationship between the dependent variable (Z-score) and the independent variables consisting of LASSET, CAR, GFIN, OER, IPI, INF, and EXC. In model 2, the calculated F value is 6.003 and is greater than I (1) at $\alpha = 1\%$, so a long-term relationship is a presence between NPF and LASSET, CAR, GFIN, OER, IPI, INF and EXC variables.

Table 6 presents the short-run estimation results with the ECM ARDL. The first step is to test

the validity of the ECM ARDL model by evaluating the sign and significance of the correct error term variable. The variable is the error of the previous period. This variable must be a negative sign and statistically significant as a variable that corrects errors. In the first model, the variable is negative and significant at $\alpha = 1\%$ so that the ARDL ECM in model 1 is valid. In the short term, Z-score is affected by CAR, OER, and INF. CAR has a positive effect on Z-score. Efficiency (OER) and inflation have a negative effect on Z-score. Although the short-term condition indicates a disequilibrium condition, the effects of independent variable in the short-run are in accordance with the hypothesis as expected in the long run. In the second model, the variable is also negative and significant at $\alpha = 1\%$. In conclusion, in model 2, the ECM ARDL model is also valid. ASSET, GFIN, CAR, and LEXC affect NPF in the short-run. ASSET, GFIN, CAR, and LEXC negatively affect NPF. The impact of the LASSET is in line with the hypothesis while the GFIN, CAR, and LEXC variables are not in accordance with the hypothesis.

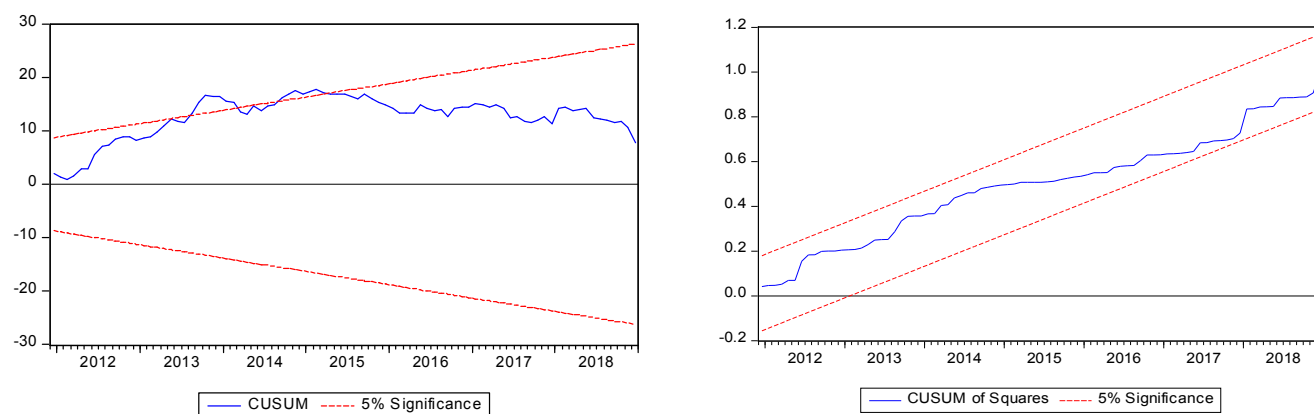


Figure 4. Stability test for NPF

Table 5. The bound test for cointegration

Computed F value		α	Critical F Value	
Z-score	NPF		I(0)	I(1)
3.895	6.003	10%	1.92	2.89
		5%	2.17	3.21
		1%	2.73	3.90

Now we turn to the long-run condition as the main analysis of the stability model of Islamic banks from the ARDL model. Table 7 exhibits the estimated results of long-run coefficients for both model 1 and model 2. In the first model, all Islamic bank's specific variables, namely assets, CAR, GFIN, and OER, affect Z-score at $\alpha = 10\%$ or less. Assets have a positive as expected. The higher the assets of Islamic banking, the more stable the Islamic banks are. This result is supported by the capital adequacy ratio (CAR) and financing growth (GFIN) variables which have a positive effect on Z-score. The high CAR and increased funding increase the stability of Islamic banks. The variable efficiency of Islamic bank op-

erations (OER) has a positive effect and does not fit the hypothesis. While for the macroeconomic variable, inflation and the exchange rate influence Z-score. Inflation has a positive effect and is not in accordance with the hypothesis. This means that the increase in prices actually causes the stability of Islamic banks is higher and deflation causes a decrease in the stability of Islamic banks. The exchange rate has a negative effect on the stability of Islamic banks and is in accordance with the hypothesis. The depreciation of the rupiah lowers bank profits and further suppresses the stability of Islamic banks. Conversely, if there is an appreciation of the rupiah, it leads Islamic banks to become more stable.

Table 6. The short-run estimated coefficient of Islamic banks stability

Variables	Z-score		Variable	NPF	
	Coefficient	t-value		Coefficient	t-value
$\Delta ZScore_{t-1}$	-0.150*	-1.769	$\Delta LASSET_t$	-3.534***	-3.585
$\Delta ZScore_{t-2}$	-0.263***	-3.138	ΔCAR_t	-0.085***	-2.888
ΔCAR_t	2.145***	47.447	ΔCAR_{t-1}	-0.073**	-2.514
ΔCAR_{t-1}	0.200	1.120	ΔCAR_{t-2}	-0.144***	-4.894
ΔCAR_{t-2}	0.627***	3.548	$\Delta GFIN_t$	-0.027*	-1.726
ΔOER_t	-0.040***	-2.709	ΔINF_t	0.057	1.087
ΔOER_{t-1}	-0.050***	-3.013	$DLEXC_t$	-1.058	-0.591
ΔOER_{t-2}	-0.018	-1.097	$DLEXC_{t-1}$	-3.075*	-1.675
ΔOER_{t-3}	-0.030**	-2.109	$DLEXC_{t-2}$	-2.183	-1.131
ΔINF_t	0.034	0.367	$DLEXC_{t-3}$	-7.455***	-3.801
ΔINF_{t-1}	-0.698***	-5.554	EC_{t-1}	-0.427***	-7.688
ΔINF_{t-2}	-0.427***	-4.114			
ΔINF_{t-3}	-0.407***	-4.224			
EC_{t-1}	-0.298***	-6.203			
R^2	0.971		R^2	0.521	
DW	2.070		DW	2.252	

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

Table 7. The long-run estimated coefficient of Islamic bank stability

Variable	Z-score		NPF	
	Coefficient	t-value	Coefficient	t-value
C	86.270***	2.910	-12.536	-0.875
LOG(ASSET)	2.531**	1.950	-1.842***	-4.728
CAR	2.309***	16.045	-0.012	-0.185
GFIN	0.194*	1.564	-0.250**	-1.813
OER	0.096*	1.297	0.047**	2.333
INF	3.172**	2.423	0.401*	1.611
IPI	0.042	1.196	0.011	0.639
LOG(EXC)	-14.190***	-2.791	3.702**	1.942

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

In the second model, the Islamic bank's specific variables such as ASSET, GFIN, and OER affect NPF at $\alpha = 10\%$ or less while CAR variables have no impact on NPF. Assets have a negative impact as expected. The higher the assets of Islamic banking are the possibility of decreasing non-performing financing. Financing growth (GFIN) negatively affects on NPF and is not in accordance with the hypothesis. The increase in financing does not increase non-performing financing but rather decreases bad financing. The efficiency of the Islamic bank (OER) has a positive as expected. The inefficiency of bank operations results in higher non-performing financing. Meanwhile, for macroeconomic variables, inflation and the exchange rate affect NPF but the domestic input (IPI) does not affect the NPF. Inflation has a positive effect and links to the hypothesis. The increase in prices leads to an increase in NPF and deflation causes a decline in NPF. The exchange rate positively affects the financing of an Islamic bank as expected. The depreciation of the rupiah increases NPF and appreciation of the rupiah decreases NPF.

4. Discussion

In model 1, the Islamic bank inefficiency negatively influences Z-score in the short-run but positively affects on Z-score in the long run. Higher spending has increased profitability in the long-run but lowered profitability in the short-run. As a new player in national banking, Islamic banks must spend high investment to build networks so that this high spending increases profits in the long-run (Widarjono, 2018). Inflation has a negative effect on Z-score in the long-run, but has a positive effect on Z-score in the short-run. Inflation reduces the purchasing power of consumers thereby reducing the profitability of Islamic banks in the short-run. However, consumer income also increased during the study period so that the decline in purchasing power in the short-run can be offset by the upward trend in long-term income that positively impacts the prof-

its of Islamic banks (Widarjono, 2018; Octavio & Soesetio, 2019). While in model 2, the exchange rate negatively affects NPF in the short-run but positively affects the NPF in the long-run. The impact of the exchange rate does not directly affect production costs. However, if depreciation continues, producers adjust prices due to the high cost of imported raw materials that increase NPF.

The results of this study support the existing empirical literature. In model 1, the Z-score value is influenced by both Islamic bank's specific variables as well as macroeconomic variables. The large asset leads to Islamic bank to expand its business and create economies of scale so as to increase profits (Rahim & Zakaria, 2013; Hassan et al., 2019). CAR has a positive effect on the Z-score because the greater the CAR links to the better the Islamic banks to manage financing risk (Eihák & Hesse 2010; Miah & Uddin, 2017). The growth of financing shows the ability of Islamic banks to provide financing. The greater the financing supported by economies of scale due to the large size of Islamic banks can increase profits and, at the same time, increase the value of Z-score. Depreciation causes the price of domestic goods to be expensive due to the high cost of imported raw materials so that it lowers the profit of Islamic banks and reduces the value of the Z-score.

Similar to model 1, NFP in model 2 is affected by Islamic banks' specific variables as well as macroeconomic. The large assets can improve the performance and efficiency of Islamic banks due to economies of scale. The large assets can reduce the level of Islamic bank non-performing financing (Abedifar et al., 2013). The inefficiency of Islamic banks increases the NPF value. This finding is in line with the previous study that took place at the Malaysian Islamic bank Malaysia (Rahim & Zakaria, 2013). High inflation shows economic downturn so that this worse economic condition increases the impaired financing. These results are supported by previous empirical studies in the Middle East and

North Africa countries Africa (Ghenimi et al., 2017). Likewise, the depreciation of the Rupiah against the U.S dollar increases the inflation rate due to the high import of raw materials for domestic production. Depression causes economic conditions to worsen and increases the risk of impaired financing of Islamic banks.

There are several important implications of these findings. First, the stability of Islamic banks is greatly influenced by the size of banking assets and CAR. The greater the asset is the more stable the bank. Therefore, increasing equity is needed to maintain the stability of Islamic banks. Second, the stability of Islamic banks can be improved if Islamic banks are able to increase their level of efficiency. Third, the stability of Islamic banks is also affected by inflation and depreciation. The implication is that the government must be able to stabilize domestic prices and exchange rates to strengthen the performance of Islamic banks.

Robustness check

This study uses the ARDL model because some data are not stationary at level data but none of them is stationary at the second difference data. To check robustness, we apply multiple regressions using the OLS method, assuming that the equilibrium among variables exists. Due to the autocorrelation problem, we run OLS methods with robustness standard errors using the HAC method. These findings are presented in Table 8. Results for

both model 1 and model 2 are similar to ARDL models.

5. Conclusion

This study investigates the stability of Islamic banks in Indonesia. The findings document that Asset, CAR, GFIN, and OER affect positively on Z-score. The most significant factor affecting Z-score is assets, followed by CAR. Based on CAR, Islamic banks are relatively high because of prudential banks in dealing with impaired financing. However, the assets of Islamic banks are relatively small and lead to the financial instability of Islamic banks. It is not Depression but Depreciation is a large negative impact on the stability of Islamic banks so that Islamic banks must be careful as the depreciation of the domestic currency is persistent in the long-run. Asset strongly influences the NPF of Islamic banks. The greater the assets of Islamic banks are better the ability of Islamic banks to manage the financing. However, NPF is also strongly influenced by the efficiency of Islamic banks. The more inefficient in its operations is the higher NPF. Bad financing is also strongly influenced by macroeconomic conditions. When macroeconomic conditions deteriorated due to high domestic prices and depreciation, NPF of Islamic banks also increase. Therefore, Islamic banks must be able to provide sufficient reserve funds in anticipation of the economic downturn due to higher impaired financing.

This present study investigates the stability of Islamic banks applying aggregate data of Islamic

Table 8. Robustness test

Variable	Z-score		NPF	
	Coefficient	t-value	Coefficient	t-value
C	40.415	2.734	-10.802	-0.995
LOG(ASSET)	0.241	0.611	-1.655***	-5.941
CAR	2.080***	31.964	-0.070*	-1.726
GFIN	0.082*	1.407	-0.019	-0.354
OER	-0.067**	-2.249	0.062**	2.499
IPI	0.033*	1.729	0.024**	2.455
INF	-0.169	-1.240	0.053	0.609
LOG(EXC)	-4.135**	-1.966	2.999**	1.836

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

banks as an Industry. However, aggregate data does not reflect the behavior of individual Islamic banks because of the average data of Islamic banks. Therefore, for future research, empirical study of the sta-

bility of Islamic banks considers individual data using panel data that combines cross-section and time-series data.

References

- Abedifar, P., Molyneux, P., & Tarazi, A. (2013). Risk in Islamic banking. *Review of Finance*, 17(6), 2035–2096. <https://doi.org/10.2139/ssrn.1663406>
- Aisyah, S., & Hosen, M. N. (2018). Total factor productivity and efficiency analysis on Islamic banks in Indonesia. *Jurnal Keuangan dan Perbankan*, 22(1), 137–147. <https://doi.org/10.26905/jkdp.v22i1.1333>
- 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>
- 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>
- Èihák, M., & Hesse, H. (2010). Islamic banks and financial stability: An empirical analysis. *Journal of Financial Services Research*, 38(2), 95–113. <https://doi.org/10.1007/s10693-010-0089-0>
- 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>
- 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., & Rahmawati, R. (2016). Efficiency and profitability on Indonesian Islamic banking industry. *Al-Iqtishad: Journal of Islamic Economics*, 8(1), 33–48. <https://doi.org/10.15408/aiq.v8i1.2507>
- Husa, P. P., & Trinarningsih, W. (2015). Credit risk in Indonesia: Islamic bank vs conventional bank. *Fokus Manjerial*, 13(2), 133–146.
- Hussein, K. (2010). Bank-level stability factors and consumer confidence-A comparative study of Islamic and conventional banks product mix. *Journal of Financial Services Marketing*, 15(3), 259–270. <https://doi.org/10.1057/fsm.2010.21>
- Ibrahim, M. H., & Rizvi, S. A. R. (2017). Do we need bigger Islamic banks? An assessment of bank stability. *Journal of Multinational Financial Management*, 40, 77–91. <https://doi.org/10.1016/j.mulfin.2017.05.002>
- 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>
- Lassoued, M. (2018). Comparative study on credit risk in Islamic banking institutions: The case of Malaysia. *Quarterly Review of Economics and Finance*, 70, 267–278. <https://doi.org/10.1016/j.qref.2018.05.009>
- Majdina, N., Munandar, J. M., & Effendi, J. (2019). The determinant factors of efficiency on Islamic banking and conventional banking in Indonesia. *Jurnal Keuangan dan Perbankan*, 23(3), 454–468. <https://doi.org/10.26905/jkdp.v23i3.3157>
- Miah, M. D., & Uddin, H. (2017). Efficiency and stability: A comparative study between islamic and conventional banks in GCC countries. *Future Business Journal*, 3(2), 172–185. <https://doi.org/10.1016/j.fbj.2017.11.001>
- Nugraheni, P., & Muhammad, R. (2019). Board of directors and credit risk: An empirical study of Indonesian Islamic banks. *Jurnal Keuangan dan Perbankan*, 23(4), 503–513. <https://doi.org/10.26905/jkdp.v23i4.3484>
- Octavio, D. Q., & Soesetio, Y. (2019). Intellectual capital and bank profitability: Evidence from conventional and Islamic bank in Indonesia. *Jurnal Keuangan dan Perbankan*, 23(2), 191–205. <https://doi.org/10.26905/jkdp.v23i2.3028>
- 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>
- Risfandy, T. (2018). Equity financing and Islamic banks' profitability: Evidence from the biggest muslim country. *Jurnal Keuangan dan Perbankan*, 22(3), 496–505. <https://doi.org/10.26905/jkdp.v22i3.2150>
- Setyawati, I., Suroso, S., Suryanto, T., & Nurjannah S. D. (2017). Does financial performance of Islamic banking is better? Panel data estimation. *European Studies Research Journal*, XX(2), 592–606. <https://doi.org/10.35808/ersj/661>
- Srairi, S. (2019). Transparency and bank risk-taking in GCC Islamic banking. *Borsa Istanbul Review*, 19(S1), S64-S74. <https://doi.org/10.1016/j.bir.2019.02.001>
- Sriyana, J. (2015). Islamic banks' profitability amid the competitive financing in Indonesia. *International Journal of Applied Business and Economic Research*, 13(4), 1695–1710.
- 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.iemeen.2016.09.001>
- Widarjono, A. (2018). Estimating profitability of Islamic banking in Indonesia. *Jurnal Keuangan dan Perbankan*, 22(3), 568–579. <https://doi.org/10.26905/jkdp.v22i3.2197>
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