

The Effect of Macroeconomic and Bank-Specific Variables to Risk-Taking of Islamic Bank in Indonesia*

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Abstract

This study aims to delineate the relationship between macroeconomic factors and bank-specific variables to risk-taking of Islamic bank. Adopting panel co-integration approach, this study posits macroeconomic and bank-specific factors as exogenous variables consisting to interest rate, exchange rate, inflation, bank size and equity to asset ratio. Risk-taking as endogenous variable has proxies non-performing loan or financing and bankruptcy risk. By using quarterly data from 2010-Q4 to 2017-Q4, this study finds the risk-taking behavior of all banks has long-term relationship with macroeconomic factors. In terms of bank specified characteristic, bank size becomes substantial factor for the bank's risk mitigation. When the samples are grouped based on Islamic bank's size, the big size of Islamic bank has no long-term co-integration to macroeconomic variables. As opposed to that, the middle and small size of Islamic bank have long-term relationship to macroeconomics factors and all macroeconomic variables affect the risk-taking of Islamic bank. It concludes that the medium and small size of Islamic banks are more vulnerable from external shock.

Keywords: Risk-taking, Macroeconomic variable, bank-specific variable

JEL Classification : E00, G33, G32

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Introduction

Since the regulation number 7 of 1992 about Indonesian banking system was released, Indonesia experienced the new era where the government opened its hands to the operation of Islamic bank in Indonesia. It was a history, when the Indonesian society erected Bank Muamalat Indonesia as the first Islamic bank in Indonesia (Rosylin & Bahlous, 2013). By having an impressive growth, Islamic bank attracts its counterparty which is conventional bank to open the same business model as performed by Islamic Bank. Then within one decade after, numerous conventional banks have been unfolding Islamic bank window to response the growing of the Islamic finance market. This step was also followed by the main player of banking industry in Indonesia such as Bank Mandiri that launched Bank Syariah Mandiri as its Islamic bank subsidiary in 1999. Currently, Indonesia has 13 Islamic banks and 21 Islamic banks business unit (OJK, 2017).

The achievement of Islamic banking development was tested with the financial turmoil in Indonesia during 1997-1998. This crisis was caused by several factors such as the weakening of Indonesian rupiah, unstable economic growth, uncontrolled inflation and other macroeconomic factors (Nursechafia & Abduh, 2014). This reason is also an evidence that macroeconomic factors have strong relationship to the financial condition. Nursechafia and Abduh (2014) conclude that the bank which perform as financial intermediary institution amid fully uncertainty condition faces difficulty to conduct business as usual. Nonetheless, this condition did not happen in Indonesia during crisis. Islamic banks remained untouchable from the effect of macroeconomic turbulence. It was caused by two arguments in which firstly Islamic bank had unique business model including its product variation and operation. Then secondly, Islamic bank was described as less cost-effective but productive as intermediary institution compared to its counterparty (Karim, *et al.*, 2016).

As opposed from Indonesian experience, different evidence comes from Turkey during financial distress in 2000-2001 when Ihlas Finans House, a special purpose Islamic bank for house financing, was declared bankrupt (Kanten & Ulker, 2013). At that moment, the macroeconomic indicator was shaking up the banking industry. Gross Domestic Product (GDP) moved downward, inflation rate increased dramatically and currency weakening were the factors that weakened the economic condition (Ali, 2007). This circumstance confirms that Islamic bank also has the same exposure to the macroeconomic indicator.

Several researchers have been conducted to understand the exposure of Islamic bank to macroeconomic variables. Considering the bank-specific

factor that focuses on Islamic bank size, Ibrahim & Rizvi (2017) opine that a big size of Islamic bank is more beneficial than the small size of Islamic bank in terms of financial stability. This thought stresses that a big bank will manage risk exposure in the right manner. It is also supported by Fakhrunnas, Dari, & Mifrahi (2018) who state that Islamic bank size will mitigate the risk from unstable macroeconomic situation. It is exhibited by the ability of Islamic bank to manage risk-taking behavior comprising of credit and bankruptcy risk.

This paper aims to review all related finding about the effect of macroeconomics factors and bank-specific variable to risk-taking of Islamic banks in Indonesia. Moreover, this research provides a new evidence and methodology to capture the long-terms effect of external shock and bank-specific factors to risk-taking of Islamic banks. This study consists of several parts which is begun by literature review after introduction part. Then, methodology, result and discussion will be delineated in the next part. Furthermore, it ends with conclusion to sum-up the research discussion and suggest for further research.

Literature Review

Islamic Bank in Indonesia

The regulation of Islamic bank in Indonesia develops following the development of banking industry. At the first time, the regulation stipulates in national act number 7 of 1992 about Indonesian banking system, Indonesia employs dual banking system comprising conventional and a bank with profit-sharing system. That regulation was amended by national act number 10 of 1998 where the name of "Islamic bank" was firstly introduced at the first time in the act. Then the new regulation was issued by the government in national act number 21 of 2008 about Islamic bank which specifically regulates Islamic bank in Indonesia.

In the latest regulation, Islamic banks have several functions such as supporting for national development, lending-funding activity, acting as Nadzir of waqf and collecting Islamic philanthropy funds for social purposes activity (act as Baitul Maal). Islamic bank is also stated to have prohibited activities which is against to sharia law. Therefore, Islamic bank has different characteristic from its counterparty in terms of its foundation and business operation (Zarrouk, Ben Jedidia, & Moualhi, 2016). Zarrouk, *et al.* (2016) delineates that Islamic bank has several uniqueness that *firstly* Islamic bank must comply to shariah rule that is derived from Islamic teaching. Hence, all

business activities are prohibited from interest (*riba*), huge uncertainty (*gharar*) and gambling (*maysir*). *Secondly*, all financial transactions must be real asset based. It means that Islamic bank tend to promote real market rather than financial market separately. *Thirdly*, Islamic bank will not allow any investment in impermissible elements such as pork, alcohol and related area. The permissible and impermissible elements will refer to Islamic principle. *Fourthly*, Islamic bank promotes profit and loss-sharing based.

In the current development of Islamic bank in Indonesia, based on financial service authority or *Otoritas Jasa Keuangan*(OJK) in quarter 1 2018, the number of Islamic bank in Indonesia is 13 banks with 21 Islamic business unit owned by the conventional bank (OJK, 2018). Compared to the conventional bank, the number of the banks are 115 banks in 2018. This number indicates the domination of conventional bank in Indonesia remains high. In terms of the asset, the conventional bank reach IDR 7,429,891 billion in quarter 1 2018 meanwhile Islamic bank is still under IDR 294,267 billion in total asset. The lower accumulative size of Islamic bank asset also appoints that the Islamic bank must struggle to compete in the banking industry.

Risk Exposure in Islamic Bank

In banking business, uncertainty has a potency to make a profit as well as loss. Because of uncertainty, the bank will face risk. The risk can make the bank suffer loss but without taking risk, the bank cannot earn a high return. In the conventional viewpoint, there are methods to mitigate the risk where it can be transferred to the other parties such as the insurance company. Another method to manage risk is by diversifying the investments (Nadeem & Khalil, 2014).

Islamic Finance believes that the bank is not allowed to engage in lending money; the bank has to be based on risk-sharing (Chazi & Syed, 2010). In addition to facing the same risks as those faced by conventional banks such as *murabahah* which uses deferred payment, Islamic banks follow *fiqh muammalat* which prohibits interest and restricts its operations to certain products (Abedifar, *et al.*, 2013). For managing the Islamic bank objective to reach *maslahah*, Islamic bank have to practise prudential supervision and information disclosure to the public. Khan and Ahmed (2001) explain considerable risks faced by an Islamic bank. The first is a credit risk. This risk happens when there has deferred payment in deliverability of cash or asset by the counterparty to the bank. This particular risk mainly occurs in *salam*, *istishna* and *murabahah*. In the context of *musharakah* and *mudarabah* which are mainly based on the PLS model, the risk is in the profit sharing

mechanism given by the mudharib. Sometimes, it has some asymmetric information where the Islamic banks do not have adequate information relating to how much profit was made by the mudharib. Regarding *murabahah* which is mainly based on debt, the risk can appear from the non-performing business activity experienced by trading partner. Because of that, the bank will not earn money returned by customers. Even though credit risk can affect Islamic bank significantly, that risk can be mitigated by stringent requirements implemented by the bank (Rosly & Zaini, 2008).

The second is withdrawal risk. Islamic banks have many clients who deposit their money in a *wa'diah* account or investment account. By having a source of funds from the public, an Islamic bank will manage that fund to finance products that are shariah compliant. However, Islamic bank has to anticipate when the customers withdraw their money from the bank. The withdrawal activity can be conducted by many reasons such as loss of confidence, weak economic conditions and so on.

The third is a fiduciary risk which can arise when Islamic bank cannot meet its fulfil their obligations in the transaction contract. For example, when the Islamic bank can give the investment return to the customers which is below the expected return provided in the prior agreement. Afterwards, if the bank has mismatch in managing the fund and cannot pay their obligation to the customers, customers will lose their confidence in the bank. This condition can be called the fiduciary risk encountered by Islamic banks with where the bank cannot give competitive return to the customers or account holders compared to other banks. Due to that reason, the account holders are likely to withdraw their money from the bank to move to another bank which is more profitable.

Fourth, market risk can be caused by an economic condition at a macro level that affects to the market condition. Market risk can also be called systematic risk that is typically a risk which is unavoidable. On the other hand, unsystematic risk is located inside the company and can be managed by the company independently. The fifth is liquidity risk which emerges when the bank does not have sufficient liquidity to operate. Liquidity risk is the most important risk that has to be managed well (Ben Selma Mokni, Echchabi, Azouzi, & Rachdi, 2014). Liquidity risk affects the bank performance because the bank cannot fulfil its liability. A failure to fulfil Islamic bank obligation may lead to face bankruptcy risk.

Previous Studies

Some studies about the influence of macroeconomic variables toward risk-taking of Islamic bank had been conducted by numerous researchers. Fakhrunnas et al. (2018) argue that macroeconomic variables have long-term relationship with risk-taking behavior in banking industry in Indonesia during 2010-2017. Fakhrunnas, *et al.* (2018) conclude prove Islamic bank more resilience to macroeconomic shocks. In addition, Adebola, *et al.*, (2011), Klein (2013), and Lin, Farhani, & Koo (2016) found that risk-taking in banking industry represented by credit risk has significant relationship to macroeconomic factors such as interest rate, exchange rate and inflation rate. Furthermore, Karim, *et al.* (2016) attempted to analyze the long run effect of bankruptcy risk to macroeconomic factors by adopting time-series data. Their research found that bankruptcy risk has long run relationship to macroeconomic variables including GDP in Indonesia.

A firm with higher ratio of equity capital, however, shows a negative and significant result for banks. A bank with higher equity on hand tends to have more prudent risk-taking behavior and thus, has lower loan-loss reserve (Saurina, *et al.*, 2007; Berger, *et al.*, 2009). This is true for Islamic banks where the banks hold more equity due to the practice of profit and loss sharing contracts and high risks can be offset by higher equity capital. Furthermore, the higher loan risks received by banks will be offset by higher equity capital engaged by banks. Banks holding more equity capital allow them to mitigate loan risks as they are backed by this equity capital as stated by Berger, Klapper & Turk-Ariss (2009).

Total asset can be used as a proxy of Islamic bank size. Banks with large asset have the possibility to provide large amounts of credit. The greater the asset or assets owned by a bank, the greater the volume of credit that can be extended by the bank. The greater the volume of credit provides an opportunity for the bank to reduce the level of spreads, which in turn will lower the level of lending rates (interest rate credit) so that banks will be more competitive in providing services to clients who need credit. The size of a company according to Ranjan & Dhal (2003) will affect its ability to bear risks that may arise due to a variety of situations faced by companies associated with its operations. It implies that the greater the level of bank size reflects the level of quality to better management in the analysis and evaluation of the credit agreement and allows greater diversification opportunities, so as to reduce the level of NPL.

In addition to that, several studies conducted by Louhichi & Boujelbene (2016) and Xiong, *et al.* (2010) also suggest a negative relationship between these two variables of bank size and risk-taking behavior. Such a relationship

is justified by the most natural argument that is diversification by size. Indeed, larger banks are expected to have lower risks because they have the capability of holding more diversifiable portfolios. They explain this result by the fact that larger banks are likely to be more skilled in risk management and have also better diversification opportunities. Thus, we expect to find that the bank size is negatively related to the level of risk.

In line with that, Ibrahim & Rizvi (2017) reveal that the larger a bank the greater should be its potential to diversify its asset risk. Bigger Islamic bank will promote financial stability to the bank performance and risk mitigation. Conducting research in 45 of Islamic banks in 13 countries, Ibrahim & Rizvi result that bigger Islamic bank will obtain more benefit from its size. Moreover, the larger the banking firm the more information that is likely to be collected by financial analysts and the lower the information risk from holding its stock. Finally, investors may believe that regulators are unwilling to let larger banks fail, in which the value of implicit failure guarantees rise with bank size. Each of these three effects suggests that size (measured here by total assets) and risk should be negatively related.

Nicolo (2000) and Trad, *et al.* (2017) relate negatively indicators of bank failure probabilities to bank size. In the case of fixed bankruptcy costs, the key reason behind the reversal of the risk shifting effect is the dependence of the risk-shifting choices on bank size. Such dependence arises from fixed bankruptcy costs whenever the average size of banks is decreasing in N . As bank size increases, banks' bankruptcy costs are rising at the margin, inducing banks to take on less risk, *ceteris paribus*. Thus, the benefits of risk shifting will eventually be offset by bankruptcy costs, once the number of banks in a market passes some critical threshold.

Methodology

Data and Variables

To fully capture the research's aim, 10 Islamic banks in Indonesia are observed in this study by using balanced panel quarterly data from 2010Q1, as the year when Islamic banks started to be mostly established (OJK, 2018), to 2018Q1. From that period the observation consists of 300 quarterly-observation. The data is collected from the Islamic bank quarterly report attached in Indonesian Central Bank's website. Furthermore, macroeconomics data was retrieved from the central bureau of statistic. The reason behind choosing Indonesia as the focus of study due to its

recognition as the most numerous Islamic bank account in the world (Ernst & Young, 2016).

Based on the previous studies, this research employs several variables to assess the effect of macroeconomic variable and bank-specific factor to risk-taking of Islamic banks in Indonesia.

The proxy of risk-taking consist of Non Performing Financing (NPF) and Z-Score. NPF is measured by the ratio of non-performing financing to total financing in Islamic bank while Z-Score is defined by the mean return on assets plus the capital ratio divided by the standard deviation of asset return. Risk-taking will be posited as dependent variable in the research model. Afterwards, the number of Bank Indonesia rate in the end of each quarter (BI_Rate) will represent interest rate in Indonesia, the number of inflation rate in the end of each quarter (INF), the log of GDP number in quarterly base (Ln_GDP) and the log of number of exchange rate in the end of each quarter (Ln_ER) are treated as independent variables. The equity to asset ratio of the bank based on quarterly data (ETA) and the log of the bank based on quarterly data (Ln_Size) are also exogenous variables in which the data analysis will group the result based on big, medium and small size of Islamic banks. The dissemination of the data analysis will elaborate the size effect as the bank-specific variable to the risk-taking of Islamic bank.

Research Method and Empirical Model

By adopting panel data, time series and cross-section data will be combined together it is able to assess some quantity of the phenomenon in certain time (Brooks, 2008). This research adopts general model as a follow;

$$\begin{aligned} \text{Risk - taking}_{it} = & \beta_0 + \beta_1 \text{BI_Rate}_{it} + \beta_2 \text{Inf}_{it} + \beta_3 \text{Ln_GDP}_{it} + \\ & \beta_4 \text{ER}_{it} + \beta_5 \text{ETA}_{it} \\ & + \beta_6 \text{Ln_Size}_{it} + \varepsilon_{it} \end{aligned} \quad (1)$$

Where,

Risk-Taking _{it}	= Non Performing Financing (NPF) and bankruptcy risk (Z Score) for bank <i>i</i> in year <i>t</i>
BI_Rate _{it}	= BI rate for bank <i>i</i> in year <i>t</i>
Inf _{it}	= Inflation rate for bank <i>i</i> in year <i>t</i>
Ln_GDP _{it}	= Gross domestic product for bank <i>i</i> in year <i>t</i>
Ln_ER _{it}	= Economic growth for bank <i>i</i> in year <i>t</i>
ETA _{it}	= Equity to asset ratio for bank <i>i</i> in year <i>t</i>
Ln_Size _{it}	= Size for Islamic bank <i>i</i> in year <i>t</i>
ε _{it}	= Error-term

In the beginning, unit root test will be conducted to measure whether the variables have stationarity at level or in the first level. Unit root test can be held by performing Im, Pesaran and Shin W-stat (IPS), ADF-fisher and PP-Fisher whereby the non-stationary for all unit roots test is the null hypothesis (Zulhibri, Naiya, & Ghazal, 2015). If the result of unit roots test is stationary in the first level, panel co-integration test can be applied to understand the long-terms effect of exogenous variables to endogenous variables.

Pedroni panel co-integration method can be adopted that allows individual effects across different cross-section performing the types of heterogeneous panel test (Pedroni, 2004). Pedroni tests consist of panel rho-statistic, panel PP-statistic and panel ADF-statistic. Moreover, Pedroni test has the second type which the result of the test can be compared to the group mean of the panel test. The general formula for Pedroni tests are as follow;

Panel rho-statistic:

$$Z_{\rho} = \left(\sum_{i=1}^N \sum_{t=1}^T \hat{L}_{11i}^{-2} \hat{e}_{it-1}^2 \right)^{-1} \sum_{i=1}^N \sum_{t=1}^T \hat{L}_{11i} (\hat{e}_{it-1} \Delta \hat{e}_{it} - \hat{\lambda}_i) \quad (2)$$

Panel PP-statistic:

$$Z_{PP} = \left(\hat{\sigma}^2 \sum_{i=1}^N \sum_{t=1}^T \hat{L}_{11i}^{-2} \hat{e}_{it-1}^2 \right)^{-1/2} \sum_{i=1}^N \sum_{t=1}^T \hat{L}_{11i} (\hat{e}_{it-1} \Delta \hat{e}_{it} - \hat{\lambda}_i) \quad (3)$$

Panel ADF-statistic:

$$Z_t = \left(\hat{S}^{*2} \sum_{i=1}^N \sum_{t=1}^T \hat{L}_{11i}^{-2} \hat{e}_{it-1}^{*2} \right)^{-1/2} \sum_{i=1}^N \sum_{t=1}^T \hat{L}_{11i} (\hat{e}_{it-1}^* \Delta \hat{e}_{it}^*) \quad (4)$$

Group rho-statistic:

$$\hat{Z}_{\rho} = \sum_{i=1}^N \left(\sum_{t=1}^T \hat{e}_{it-1}^2 \right)^{-1} \sum_{i=1}^N (\hat{e}_{it-1} \Delta \hat{e}_{it} - \hat{\lambda}_i) \quad (5)$$

Group PP-statistic:

$$\hat{Z}_t = \sum_{i=1}^N \left(\hat{\sigma}^2 \sum_{t=1}^T \hat{e}_{it-1}^2 \right)^{-1/2} \sum_{i=1}^N (\hat{e}_{it-1} \Delta \hat{e}_{it} - \hat{\lambda}_i) \quad (6)$$

Group ADF-statistic:

$$\hat{Z}_{PP} = \sum_{i=1}^N \left(\sum_{t=1}^T \hat{S}_i^{-2} \hat{e}_{it-1}^{*2} \right)^{-1/2} \sum_{i=1}^N (\hat{e}_{it-1}^* \Delta \hat{e}_{it}^*) \quad (7)$$

After panel co-integration analysis, Fully Modified Ordinary Least Square (FMOLS) and Dynamic Ordinary Least Square (DOLS) are applied to measure the relationship of each variable. Panel data with the considerable

heterogeneity across individual members can be accommodated by adopting those test (Pedroni, 2000).

Result and Analysis

To examine the long-term relationship between exogenous variables and risk-taking of Islamic bank in Indonesia, at the beginning, unit root test will be applied. From the unit root test result, each variable in the model has stationarity in the first level. This result is exhibited by Tabel.1 which is not only when applying individual intercept but also individual intercept and trend. This stationarity utilizes Im, Pesaran and Shin (IPM), Augmented Dickey-Fuller (ADF) dan Philips-Perron (PP). Moreover, when the characteristic of the sample that refers to bank size separation are applied, from the Table 2 to Table 4, all variables in each size group are stationary in the first level.

Even though the general conclusion that all variable has long-term relationship, some unit root measurement method has different result. For instance, this result happens in Islamic bank that has big asset whereby NPF is not stationary at the first level based on IPM test in individual intercept and trend. LN_GDP also faces the same result which is not stationary at the first level based on PP test. In the small size Islamic bank, Z-Score is not stationary at the first level based on IPM test. Basically, non-stationary at the first level reflects the statistical score in which the result is not significant. Thus the H_0 of unit root test hypothesis is not able to be rejected which means the long-run relationship does not exist for above-mentioned variables. Surely, this non stationary results do not change the general conclusion due to in other test methods in individual intercept as well as individual intercept and trend the results remain stationary in the first level.

Table 1. Panel Unit Root of Islamic Banks

Variable	Individual Intercept						Individual Intercept and Trend					
	At Level			1 st Difference			At Level			1 st Difference		
	IPM	ADF	PP	IPM	ADF	PP	IPM	ADF	PP	IPM	ADF	PP
NPF	-1.91	39.24***	40.20***	-17.57***	227.90***	211.74***	-0.86	33.96	35.57	-16.58***	206.00***	701.98***
Z-Score	-3.49***	47.07***	47.30***	-20.65***	253.23***	260.78***	-2.94***	41.85***	42.53***	-20.00***	339.80***	577.314***
BI_Rate	4.47	1.69	3.48	-8.44***	102.533***	102.53***	5.31	0.88	1.67	-6.71***	75.21***	74,76***
LN_GDP	7.93	0.19	0.08	-8.88***	108.54***	50.314***	-2.54***	32.63**	46.59***	-7.03***	78.87***	27.65*
Ln_ER	2.04	5.57	5.33	-12.67***	162.71***	164.35***	2.43	4.58	5.65	-11.15***	129.28***	146.33***
Inf	-2.65**	33.48**	35.72**	-20.01***	264.18***	264.18***	-0.89	19.97	22.67	-18.40***	224.58***	224.58***
ETA	-15.09***	199.50***	266.27***	-19.82***	257.97***	319.75***	-14.17***	170.22***	368.24***	-18.05***	227.02***	1146.45***
Ln_Size	-1.44*	29.88*	81.30*	-13.32***	171.08***	172.98***	1.57	11.45	16.63	-14.76***	179.94***	639.33***

Notes: The optimal lag length is based on Schwarz information criteria which are automatically selected. The null hypothesis for all tests is non-stationary in which *, ** and *** denote as significant at 1% level, significant at 5% level and significant at 10% level

Table 2. Panel Unit Root Tests for Big Asset Size of Islamic Banks

Variable	Individual Intercept						Individual Intercept and Trend					
	At Level			1 st Difference			At Level			1 st Difference		
	IPM	ADF	PP	IPM	ADF	PP	IPM	ADF	PP	IPM	ADF	PP
NPF	0.08	5.53	13.09	-1.92**	17.90**	49.52***	1.10	2.45	7.54	-0.82	12.96*	45.29***
Z-Score	0.47	3.98	4.91	-4.21***	39.63***	63.74***	-0.28	9.34	24.72***	-1.99**	29.42***	296.36***
BI_Rate	0.42	7.07	24.70***	-3.62***	30.26***	30.17***	1.56	1.04	0.68	-2.22**	25.03***	40.98***
LN_GDP	3.81	0.19	0.01	-10.14***	86.13***	11.11	-0.965	13.22*	7.39	-9.76***	103.07***	2.89
Ln_ER	0.02	5.90	7.58	-4.52***	40.94***	41.35***	-0.55	11.01	34.68***	-2.42***	31.98***	36.29***
Inf	-1.58*	12.86*	14.99*	-12.15***	89.42***	87.42***	-0.15	7.29	7.08	-6.78***	69.99***	68.80***
ETA	-6.39***	55.91***	86.22***	-7.75***	66.79***	103.93***	-3.45***	43.48***	87.68***	-4.24***	51.96***	262.64***
Ln_Size	1.29	12.38	17.41**	-5.39***	50.54***	48.47***	0.33	7.78	10.01	-3.78***	55.10***	52.60***

Notes: The optimal lag length is based on Schwarz information criteria which are automatically selected. The null hypothesis for all tests is non-stationary in which *, ** and *** denote as significant at 1% level, significant at 5% level and significant at 10% level

Table 3. Panel Unit Root Tests for Medium Asset Size of Islamic Banks

Variable	Individual Intercept						Individual Intercept and Trend					
	At Level			1 st Difference			At Level			1 st Difference		
	IPM	ADF	PP	IPM	ADF	PP	IPM	ADF	PP	IPM	ADF	PP
NPF	-1.58*	26.28**	27.79**	-11.49***	125.73***	343.92***	-1.10*	26.13**	30.43***	-	99.92***	119.67***
Z-Score	-1.98**	26.818**	26.92**	-11.21***	133.59***	142.23***	-1.48*	33.34***	45.79***	-	99.63***	109.40***
BI_Rate	2.36	3.80	7.20	-4.38***	49.83***	49.68***	1.68	2.95	3.29	-3.88***	34.66***	34.67***
LN_GDP	3.30	4.03	4.67	-5.13***	58.88***	50.63***	-1.18	25.69**	34.30***	-4.65***	40.75***	35.51***
Ln_ER	1.04	9.09	12.05	-7.44***	85.35***	94.01***	0.16	14.70	16.64	-7.28***	63.16***	80.81***
Inf	-1.68***	21.27*	20.87*	-11.37***	129.46***	130.72***	-0.52	16.70	16.96	-	99.46***	100.54***
ETA	-8.29***	98.41***	98.41**	-10.71***	129.43***	381.48***	-	75.21***	163.12***	-	103.00***	293.67***
Ln_Size	-1.85**	27.88**	74.92***	-6.46***	68.86***	71.73***	4.16***	5.44	7.74	11.67***	61.07***	309.02***

Notes: The optimal lag length is based on Schwarz information criteria which are automatically selected. The null hypothesis for all tests is non-stationary in which *, ** and *** denote as significant at 1% level, significant at 5% level and significant at 10% level

Table 4. Panel Unit Root Tests for Small Asset Size of Islamic Banks

Variable	Individual Intercept						Individual Intercept and Trend					
	At Level			1 st Difference			At Level			1 st Difference		
	IPM	ADF	PP	IPM	ADF	PP	IPM	ADF	PP	IPM	ADF	PP
NPF	-5.94***	33.10***	32.24***	-10.58***	59.27***	58.88***	-3.44***	21.52***	21.48***	-5.30***	50.65***	53.81***
Z-Score	-1.36**	13.25*	13.59*	-5.77***	58.28***	61.70***	0.47	6.94	6.93	-2.80***	46.59***	49.34***
BI_Rate	2.04	1.09	1.51	-2.80***	26.90***	27.93***	1.31	2.05	3.88	-0.93	18.92**	21.23***
LN_GDP	1.92	2.06	2.17	-4.53***	44.09***	45.47***	1.12	21.74***	28.14***	-1.87**	34.28***	274.05***
Ln_ER	1.99	1.25	1.12	-4.42***	42.38***	47.65***	-0.29	8.64	19.88**	-1.41*	29.25***	30.67***
Inf	-0.78	10.81	12.21	-4.54***	47.31***	47.39***	0.414	5.78	6.06	-2.31***	39.39***	41.13***
ETA	-4.15***	37.25***	49.78***	-5.68***	52.80***	74.99***	-2.26**	32.82**	77.13***	-2.36***	38.89***	277.89***
Ln_Size	0.62	4.89	7.89	-5.48***	47.43***	59.17***	-0.60	11.90	20.41***	-2.53***	37,47***	47.77***

Notes: The optimal lag length is based on Schwarz information criteria which are automatically selected. The null hypothesis for all tests is non-stationary in which *, ** and *** denote as significant at 1% level, significant at 5% level and significant at 10% level

Table 5. Co-integration Tests for All Models

Pedroni Tests	All Size		Big Asset Size		Medium Asset Size		Small Asset Size	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
<i>Within Dimension</i>								
Panel v-statistic	-2.28	-0.99	-0.17	-0.82	0.33	-0.07	-0.22	-0.77
Panel rho-statistic	0.40	1.38	0.99	-0.21	1.73	0.96	1.95	1.19
Panel PP-statistic	-7.35***	-1.81**	0.19	-2.26**	-1.4*	-1.96**	-1.87**	-3.36***
Panel ADF-statistic	-7.02**	-2.18**	-0.64	0.38	-1.79**	-1.94**	-1.42*	-1.58*
<i>Between Dimension</i>								
Group rho-statistic	2.99	1.45	1.79	0.271	3.04	1.86	2.11	1.66
Group PP-statistic	-4.94***	-1.78**	0.83	-2.29*	-2.47***	-2.42***	-2.49***	-6.30***
Group ADF-statistic	-4.45***	-2.65***	-0.10	0.75	-2.51***	-2.45***	-3.19***	-2.14***

Notes: All tests utilize Pedroni tests which have null hypothesis as no co-integration in which *, ** and *** denote as significant at 1% level, significant at 5% level and significant at 10% level

In order to examine long-term relationship, co-integration test become a suggested method to analyze the research model (Pedroni, 2004). This research accepts the suggestion to perceive the relationship between independent and dependent variables in each model. Model one represent the use of NPF as dependent variable and model two utilizes bankruptcy risk as dependent variable. According to Table 5, when the level of size is not separated, co-integration exist in all models. This finding is showed by four out of seven tests which represent the level of significance. It means the hypothesis of co-integration method as proposed by Pedroni is accepted which states the existence of long-terms relationship among the variables. This finding is supported by Karim, *et al.* (2016) stating that long run relationship is exist between risk-taking and macroeconomic variable.

When the size is grouped, the finding of this study exhibits the characteristic of Islamic bank in terms of size effect in each level. In the big size group, model one has no significance relationship in each type of test while model two has only two significance relationship in Panel PP-statistic test and Group PP-statistic test but it does not adequate to justify the existence of long-term relationship. This finding concludes that Islamic bank in the big size group has no long-term relationship to macroeconomic variables. The finding may indicate that the larger bank is more resilience to the external shock. The advantage of Islamic bank which has big asset may experience higher economic of scale in business activity and it may give better opportunity to diversify its portfolio in financing and investing activity Louhichi & Boujelbene (2016), Xiong, *et al.*, & Chen (2010) and Ibrahim & Rizvi (2017)).

As opposed to the big size group of Islamic bank, in the medium and small size group have different result. For all models in those asset group, four out of seven co-integration test display significance level of co-integration test

including in Panel PP-statistic, Panel ADF-statistic, Group PP-statistic and Group ADF-statistic. The statistical findings conclude that Islamic bank in the medium and low size group has long-term relationship to macroeconomic variable. It indicates Islamic bank faces an exposure to external shocks that may danger Islamic bank's performance to generate expected return and mitigate the risk. This bank-specific effect delineates that a bank with lower size is worse to manage risk management especially in tackling credit risk problem (Ranjan & Dhal, 2003). Nicolo (2000) appends that the bank having lower size will encounter higher bankruptcy cost which explain the smaller size of the bank will have higher exposure to bankruptcy risk.

The use of Fully Modified Ordinary Least Square (FMOLS) and Dynamic Ordinary Least Square (DOLS) is to enlighten the effect of a variable to another variable. Based on Table 6., it appoints the explanation of FMOLS and DOLS result for all Islamic banks. From that table, bankruptcy risk in the model two has negative and significance relationship to BI_Rate. It indicates that if the z-score of Islamic bank is higher, Islamic bank will have less exposure to interest rate risk. This evidence may be caused by internal resilience of Islamic bank due to a good governance in risk management including its mitigation (Fakhrunnas et al., 2018). In terms of exchange rate risk, NPF has positive and significance relationship while Z-Score has negative and significance relationship. That relationship explains that Islamic bank in Indonesia may have international transaction due to it has an exposure to exchange rate. This condition can be understood whereby Islamic bank in Indonesia possesses several financial products that have relation to foreign currency such as hajj saving account and time deposit account in foreign currency.

Table 6. FMOLS and DOLS Result for All Islamic Banks

Variables	FMOLS		DOLS	
	Model 1	Model 2	Model 1	Model 2
BI_Rate	0.19 (0.85)	-0.97 (0.33)	0.39 (0.70)	-1.70* (0.09)
Ln_GDP	-0.97 (0.33)	0.01 (0.99)	-0.85 (0.39)	-1.38 (0.17)
Ln_ER	2.87*** (0.004)	-3.08*** (0.00)	3.35*** (0.00)	1.33 (0.19)
Inf	-1.22 (0.22)	0.75 (0.46)	-1.43 (0.15)	-0.57 (0.57)
ETA	1.73*** (0.08)	1.63* (0.10)	0.67 (0.50)	0.20 (0.84)
Ln_Size	-1.85* (0.07)	3.23 (0.00)***	-2.19** (0.029)	0.94 (0.35)
Adjusted R-squared	0.171	0.75	0.18	0.78
No. of Observation	300	300	300	300

Notes: All tests utilize panel dynamic analysis tests which have null hypothesis as non-significant in which *, ** and*** denote as significant at 1% level, significant at 5% level and significant at 10% level

Table 7. FMOLS and DOLS Result for Small-Big Islamic Banks

Variables	Big Asset Size				Medium Asset Size				Low Asset Size			
	FMOLS		DOLS		FMOLS		DOLS		FMOLS		DOLS	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
BI_Rate	3.20*** (0.00)	-1.66* (0.10)	2.26** (0.03)	-0.21 (0.83)	-27.00*** (0.00)	-4.57*** (0.00)	-0.65 (0.52)	-0.79 (0.45)	0.49 (0.62)	-1.82* (0.07)	0.69 (0.48)	-1.57 (0.12)
Ln_GDP	1.13 (0.26)	-1.13 (0.26)	0.34 (0.73)	0.86 (-0.17)	75.05*** (0.00)	-5.81*** (0.00)	-1.61 (0.13)	-0.12 (0.90)	-4.12*** (0.00)	2.42** (0.02)	-3.55*** (0.00)	1.98*** (0.05)
Ln_ER	3.89*** (0.00)	-61.68*** (0.00)	3.92*** (0.00)	-7.08 (0.00)***	308.93*** (0.00)	9.31*** (0.00)	1.74* (0.09)	-0.01 (0.99)	6.62*** (0.00)	-3.79*** (0.00)	5.96*** (0.00)	-3.45*** (0.00)
Inf	-1.36 (0.18)	-1.55 (0.13)	-1.23 (0.22)	1.67* (0.10)	0.03 (0.98)	-1.51 (0.13)	1.76* (0.09)	-1.05 (0.32)	-3.87*** (0.00)	3.86*** (0.00)	-3.96 (0.00)	3.16*** (0.00)
ETA	-1.16 (0.25)	-2.41*** (0.01)	-0.09 (0.93)	-0.43 (0.67)	-9.18*** (0.00)	7.33** (0.00)	0.58 (0.57)	2.1* (0.07)	-1.96** (0.05)	1.66* (0.10)	-1.61 (0.11)	1.57 (0.12)
Ln_Size	-1.73* (0.09)	12.08*** (0.00)	-1.19 (0.93)	0.66 (0.51)	-40.27*** (0.00)	35.31** (0.00)	0.23 (0.82)	2.49** (0.03)	-3.99*** (0.00)	1.25 (0.22)	-3.46*** (0.00)	1.75* (0.08)
R-squared	0.64	0.61	0.66	0.87	0.14	0.76	0.93	0.92	0.61	0.89	0.61	0.89
Adjusted R-squared	0.59	0.55	0.62	0.85	-0.03	0.72	0.55	0.41	0.56	0.87	0.56	0.87
No. of Observation	75	75	75	75	150	150	150	150	75	75	75	75

Notes: All tests utilize panel dynamic analysis tests which have null hypothesis as non-significant in which *, ** and*** denote as significant at 1% level, significant at 5% level and significant at 10% level

Furthermore, ETA also has significant relationship to risk taking of Islamic bank as well as the size of the bank. Specifically, NPF has negative relationship to the size of Islamic bank and positive to Z-Score which represents bankruptcy risk. The bigger size of Islamic bank will encounter less credit risk (Trad et al., 2017). In the perspective of a relationship between variable, this result may imply the aggressiveness of Islamic bank to finance the customer which is compensated by the circumspection of risk management. Moreover, Islamic bank with higher asset is able to diversify financing activity. This diversification can be applied due to bigger Islamic bank has a choice to create financing portfolio with manageable risk. However, this advantages may not be held in small size Islamic bank due to its limited source of fund (Ibrahim & Rizvi, 2017).

In the Table 7, it describes the result of FMOLS and DOLS in separated size of Islamic banks. In the big size of Islamic bank, it had been analyzed that there is no long-term relationship. However, short-term relationship may happen among the variables. In the short-term, NPF is negatively influenced by size and size has positively significant relationship to bankruptcy risk. This condition explains that the higher size of Islamic bank, the more resilience in risk mitigation in the short-term circumstance. Moreover, macroeconomic variables such as BI_Rate, exchange rate have negative relationship to bankruptcy risk. ETA as proxy of capital structure has also negatively significant relationship to the same dependent variable in which the higher of the ratio of equity to total asset, the higher exposure to bankruptcy risk. It elucidates that in the big size of Islamic banks, bankruptcy risk is well managed from the external shocks. Ibrahim & Rizvi (2017) predict that it may be due to the ability or Islamic bank to diversify its financing and investing activity to tackle bankruptcy risk in the short-term.

Actually, in the big size of Islamic bank which has high ratio of ETA will drive the bank to be more prudent in risk-taking behavior (Berger, *et al.*, 2009). Nonetheless, in the big size of Islamic bank having higher equity to total asset, the bank may be too prudent in giving financing which may result not optimum of resource allocation to deficit unit of customer. It makes Islamic bank may not able to generate optimum return from deficit unit. As a result, Islamic bank may not able to fulfill its obligation to provide expected return to the surplus side. Then, BI_Rate and exchange rate are positive and significant to NPF which mean that if the rate of BI_Rate and exchange rate high, the credit risk faced by Islamic bank will high as well. This evidence reveals that Islamic bank in the big size group may finance the customer in international transaction by using

foreign currency and it still applies interest rate as a benchmark to determine profit generated from that financing activity (Fakhrunnas,*et al.*, 2018)

In the medium and low size of Islamic bank, bank size affects significantly to risk-taking of Islamic bank in the long-term. It is exhibited by statistical result which explains that bank size has negative and significant relationship to NPL then positive and significant relationship to bankruptcy risk. It emphasizes the previous finding in this research that the bigger size of Islamic bank, the better risk mitigation performed by the bank (Ranjan & Dhal, 2003; Nicolo, 2000; Trad, Trabelsi, & Goux, 2017)Equity to total asset has significant and negative relationship to NPL but significant and positive relationship to z-score. It defines a condition whereby the higher of equity to total asset possessed by Islamic bank, the better risk mitigation performed by Islamic bank. in the medium and low size of Islamic bank, owning the higher ratio of equity to total asset may lessen the bank to fulfill its financial obligation. As a result, the bank can utilize the source of funds to finance profitable business activity and generate more return in desirable risk.

In addition, all macroeconomic variables including BI_Rate, GDP, exchange rate and inflation affect risk-taking of Islamic bank. This finding demonstrates that the medium and low size of Islamic bank are susceptible to macroeconomic turmoil. For instance is a change in BI_Rate will negatively influence bankruptcy risk. When the interest rate is low, the bankruptcy risk will be less. Adebola,*etal.* (2011) predict that the relationship to the interest rate in the low and medium Islamic bank deduce that those group of Islamic bank has strong relationship to interest rate in operating the business. Islamic bank tends to adopt interest rate model in determining cost of borrowing from the surplus unit and deciding profit sharing rate when financing deficit unit.

Moreover, in the medium size of Islamic bank, inflation has positive and significant relationship to NPF. It may occur due to inflation will add cost of financing from the deficit unit (Fakhrunnas et al., 2018). Some financing product of Islamic bank such as *ijarah*, will consider inflation rate to determine the cost of renting. If the inflation is higher, the renting price may be considered to be risen. The impact of an increase of renting cost will cause the lessee as deficit unit pays more cost to the bank. As opposed to that situation, the small size of Islamic bank tends to possess negative and significant to NPF. When the inflation is high, the NPF will be low. This circumstance explain that the small size of Islamic bank may be more prudent to provide financing when inflation rate is high. Thus, it may insist NPF rate to the low level. This circumspection

may be taken by the Islamic bank management due to the consideration of the bank size which has not been able make diversification in financing activities (Nicolo, 2000; Trad, Trabelsi, & Goux, 2017; Ibrahim & Rizvi, 2017). Therefore, the small size of Islamic bank requires screening process to select the most eligible customer who will be financed when the rate of inflation remains high.

Conclusion & Recommendation

Conclusion

Risk-taking of Islamic bank in Indonesia are influenced by many factors including macroeconomic and bank-specific variables. From the above-mentioned analysis, risk-taking of Islamic bank in Indonesia generally exposes to macroeconomic variables like interest rate, Gross Domestic Product (GDP), exchange rate and inflation. When the bank-specific variable which is focused in the bank size is applied, the Islamic bank is grouped into big, medium and small size. In the big size of Islamic bank, there is no long-term relationship to macroeconomic variables to risk-taking of Islamic bank. This finding confirms that the bank has no exposure to macroeconomic turbulence in the long-term effect. Due to a well-managed risk mitigation process and diversification, the big size of Islamic bank is more resilience.

On the other hands, the medium and small size of Islamic bank has long-term relationship to risk-taking in operating the business process. In the FMOLS and DOLS finding, the bank is proven to be vulnerable to macroeconomics turmoil. Hence if there is any change in macroeconomic condition consisting of interest rate, GDP, exchange rate and inflation, the performance of Islamic bank will be influenced especially in credit and bankruptcy risk as proxies of risk-taking. The susceptibility of the small and medium size of Islamic bank can be inflicted by the ability of the bank to diversify the risk-taking which means the bank has no sufficient capability to manage financial risk.

Recommendation

According to the finding, several suggestions may be proposed to create Islamic bank more resilience in managing risk. *Firstly*, Islamic bank is more resilience if the bank has bigger asset. This evidence is a signal to the owner of Islamic bank, which can be private or state-owned bank, to enlarge the bank asset by inviting the promising investors to put the money as a capital for the bank. *Secondly*,

the authority such as central bank or government may encourage medium and small size of Islamic bank to merge. This suggestion can provide merged Islamic bank to benefit from larger economic of scale and better management in risk mitigation. *Thirdly*, the authority must give more attention to medium and small size of Islamic bank in terms of risk management activity. It has to be fully monitored due to the bank is vulnerable to external economic shocks.

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