The Effect of Macroeconomic Variables on the Resilience of Islamic Banking in Indonesia

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Abstract

Purpose of the study: This study aims to analyse the sources of shocks by selecting various macroeconomic indicators as leading factors and constructing a proxy for the resilience of Islamic banking.

Data and Methodology: The study utilises time series data on a quarterly basis from Q1 2010 to Q4 2017. The dependent variable is the resilience index of Islamic banking. This index is formed through three individual indexes of banking variables – Capital Adequacy Ratio (CAR), Return on Assets (ROA) and Third Party Funds (DPK). Meanwhile, the independent variables comprise selected macroeconomic variables, including Gross Domestic Product (GDP), Inflation rate and Nominal Exchange Rate.

Main Findings: The findings show that GDP and the inflation rate have a positive and significant impact on the resilience of Islamic banking. Meanwhile, the nominal exchange rate has a negative and significant impact on the resilience of Islamic banking. These findings confirm that shocks originating from selected macrovariables affect resilience by changing the balance sheet position, particularly in the case of capital and asset formation.

Novelty of this study: Economic shocks could weaken the resilience of Islamic banking in Indonesia due to its relatively small market share compared to conventional banking, despite the increasing growth of the Islamic banking sector overall. Therefore, it is important to maintain resilience by analysing the sources of shocks that can expose the vulnerability of Islamic banking.

Keywords: Resilience, Islamic Banking, Macroeconomic Variables, Shock, Vulnerability.

JEL Classification: E31, F41, G21

1. Introduction

Financial instability has the potential to lead to a financial crisis. To illustrate, financial instability triggered the Global Financial Crisis (GFC) in 2008 and the Asian Financial Crisis (AFC) in 1997, which had a devastating effect on the economy. During the GFC from 2007 to 2009, several global macroeconomic indicators showed reduced volatility. Global GDP growth in 2009 fell sharply to -1.7%, from 1.8% in 2008 and 4.3% in 2007. This drop in global GDP growth in 2009 was significant given its previously high level of growth in 2004 of around 4.5% – considered the highest growth of global GDP.

Meanwhile, the AFC saw a sharp fall in asset prices and currency values in several countries, including Indonesia. Bank Indonesia (BI) reported in 1998 that the level of poor debt in the
national bank had reached IDR 10.2 trillion in April 1997, an increase of 7.7% compared to the end of 1996. Meanwhile, during the financial turmoil, the banking sector faced a liquidity mismatch. This was followed by people starting to distrust the banks, which prompted a large-scale withdrawal of deposits. As a consequence, the inflation rate rose as the money supply was high in comparison to stocks of goods, which led to a gradual fall in the value of money. The distrust in banking performance led to a massive withdrawal of bank funds. The adequacy of both capital and liquidity continued to weaken, triggering the banking crisis.

The national economy slowed down during the GFC, which had earlier been seen in the macroeconomic indicators during the AFC. GDP growth fell to -13.1% in 1998 from 4.7% in 1997 and 7.8% in 2006. The inflation rate also rose to 75.3% in 1998, from 12.6% in 1997 and 8.7% in 1996 (World Bank). This meant there was a period of hyperinflation during the AFC.

Table 1: Growth in the Inflation Rate Based on the Consumer Price Index (CPI) and Gross Domestic Product (GDP) in Indonesia, 1995–2016

<table>
<thead>
<tr>
<th>Year</th>
<th>Inflation Rate based on CPI (%)</th>
<th>GDP Growth (%)</th>
<th>Year</th>
<th>Inflation Rate based on CPI (%)</th>
<th>GDP Growth (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>9.9</td>
<td>8.2</td>
<td>2006</td>
<td>14.1</td>
<td>5.5</td>
</tr>
<tr>
<td>1996</td>
<td>8.7</td>
<td>7.8</td>
<td>2007</td>
<td>11.3</td>
<td>6.3</td>
</tr>
<tr>
<td>1997</td>
<td>12.6</td>
<td>4.7</td>
<td>2008</td>
<td>18.1</td>
<td>6.0</td>
</tr>
<tr>
<td>1998</td>
<td>75.3</td>
<td>-13.1</td>
<td>2009</td>
<td>8.3</td>
<td>4.6</td>
</tr>
<tr>
<td>1999</td>
<td>14.2</td>
<td>0.8</td>
<td>2010</td>
<td>15.3</td>
<td>6.2</td>
</tr>
<tr>
<td>2000</td>
<td>20.4</td>
<td>4.9</td>
<td>2011</td>
<td>7.5</td>
<td>6.2</td>
</tr>
<tr>
<td>2001</td>
<td>14.0</td>
<td>3.6</td>
<td>2012</td>
<td>3.8</td>
<td>6.0</td>
</tr>
<tr>
<td>2002</td>
<td>5.9</td>
<td>4.5</td>
<td>2013</td>
<td>5.0</td>
<td>5.6</td>
</tr>
<tr>
<td>2003</td>
<td>5.5</td>
<td>4.8</td>
<td>2014</td>
<td>5.4</td>
<td>5.0</td>
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<td>2004</td>
<td>8.6</td>
<td>5.0</td>
<td>2015</td>
<td>4.0</td>
<td>4.9</td>
</tr>
<tr>
<td>2005</td>
<td>14.3</td>
<td>5.7</td>
<td>2016</td>
<td>2.5</td>
<td>5.0</td>
</tr>
</tbody>
</table>


The serious financial crises were exacerbated by the greater degree of connectedness among global economies. The volatility, uncertainty, complexity and ambiguity (VUCA) in the global economy became a growing concern globally and was a factor in triggering the crises (Bank Indonesia, 2017), Under VUCA, the economic disturbances become unpredictable and increased the vulnerability of Islamic banking in Indonesia as part and parcel of the global as well as the national economy. Thus, the vulnerability of Islamic banking that was exposed by the economic disturbances or economic shocks jeopardised the stability of the entire banking system and even the stability of the financial system in the VUCA era. Therefore, maintaining the resilience of the banking system can act as a buffer, mitigate the possibility of a crisis occurring and eventually promote financial system stability.

Bank Indonesia (2003) defines financial system stability (FSS) as its ability to allocate funds efficiently, absorb shocks and allow the real sector to function normally. Thus, Islamic banking, as one of the elements of a complex financial system, is monitored and remains resilient to various shocks.

Indonesia has a dual banking system in which Islamic and conventional banks operate side by side according to the amended Law No. 10 year 1998. This law is the fundamental law of the dual banking system in Indonesia.

In fact, during the AFC in 1998, some conventional banks were liquidated due to balance sheet mismatch. However, Islamic banks working to the Sharia system survived due to the focus of Islamic banking on domestic economic activities and their lack of exposure and tight connections to the global financial system. Nowadays, Islamic banking is undergoing immense
growth and is gradually coming to play a significant role in the global financial system. Thus, as one of the vehicles of economic growth, Islamic banking remains resilient to various economic disturbances, such as the global economy, domestic economy and exposure to internal risk.

According to Bank Indonesia, Islamic banking has two main risk exposures: financing and liquidity risk. Financing risk is defined as any of the various types of risk associated with financing, including financial transactions that cover non-performing loans. In term of financing risk, in October 2017 the growth of non-performing financing (NPF) had fallen to 4.91%, from 5.61% in August 2009 after the GFC; however, this level of growth was higher than the 2.82% in 2005 (Otoritas Jasa Keuangan, 2017). Connected to financing risk, there is alert with regard to the resilience of Islamic banking if the NPF ratio approaches the roughly maximum 5% tolerance limit stipulated by BI (BI Regulation No. 15, 2013).

Liquidity risk refers to the risk that a bank may be unable to meet its short-term financial demands. This occurs when an individual investor, business or financial institution is unable to meet its short-term debt obligation, resulting in a balance sheet mismatch. In terms of liquidity risk, the growth of short-term liquidity mismatch fell to 28.72% in October 2017 from 43.83% in September 2017. However, this still exceeded the rates of 18.22% in 2014 and 20.04% in 2015 (Otoritas Jasa Keuangan, 2017). Islamic banks may be exposed to liquidity risk due to an increase in short-term liquidity mismatch. Duasa et al. (2016) stated that Islamic banking may be exposed to liquidity risk due to a decrease in the amount of liquid assets.

Therefore, the risk exposures for Islamic banks are essentially reflected through several factors, including profitability, efficiency and loan quality. The profitability of Islamic banking as indicated by Return on Assets (ROA) fell from 1.67% at the end of 2010 to 0.63% at the end of 2017. Inefficiency in Islamic banking is also characterised by the high ratio of operating costs to operating income (BOPO). The average BOPO of Islamic banks was 94.16% versus 78.39% for conventional banks from 2010 to 2017. The NPF of Islamic banking rose to 4.91% from 4.80% in December 2016, which was higher than the 2.92% non performing loan (NPL) of conventional banks for October 2017. The NPF of Islamic banking thus almost reached the BI tolerance limit of around 5% (Otoritas Jasa Keuangan, 2017).

Hence, the risk exposure of Islamic banking is basically due to its internal vulnerability and dynamic environment (exogenous shocks). This combination of vulnerability and exogenous shocks can trigger an imbalance in the various indicators in Islamic banking and weaken its resilience. Blancher et al. (2013) explained how the interaction between shock and vulnerability creates the various probabilities as shown in Figure 2. There are four possibilities: (i) there is no potential for systemic risk when there is no vulnerability problem in Islamic banking and no external shock to increase vulnerability; (ii) there is an increasing probability of systemic risk when Islamic banking has a vulnerability problem but there is no shock; (iii) there is an increasing probability of systemic risk when Islamic banking has no vulnerability problem but there is an external shock, and lastly, (iv) systemic risk arises when Islamic banking has a vulnerability problem and this is exposed by an external shock.
Figure 1. The interaction between shock and vulnerability

Source: Blancher et al. (2013)

Given the importance of its environment in terms of transmitting external shocks, this study employs several macroeconomic variables that are correlated to the resilience of Islamic banking. In addition, internal banking variables are composed to determine how the selected macroeconomic variables influence the resilience of Islamic banking. Makram et al. (2015) suggested some potential determinants for measuring banking performance by splitting them into internal variables (specific to banks), macro-financial (related to the banking industry) and external (macroeconomic variables). The selected macroeconomic variables comprise gross domestic product (GDP), the inflation rate and the exchange rate. While the internal Islamic banking variables included are return on assets (ROA), capital adequacy ratio (CAR) and third party funds (DPK).

Figure 2 illustrates the transmission of shocks through the banking system. Technically, the transmission of shocks will trigger risk exposure in the banking sector if banks are vulnerable. This vulnerability then spreads across the financial system and leads to systemic risk. However, the degree of systemic risk depends on the degree of resilience of the banking system. It is important to have a resilience check, as shown in Figure 2. This check on resilience helps to ensure that the banking system is able to manage risks, as reflected by its continued operation, while at the same time absorbing shocks from the external banking system. Given that Islamic banking forms part and parcel of the banking system, it remains vulnerable to external shocks and therefore needs to anticipate these external shocks.
Therefore, this study aims to analyse the factors affecting the resilience of Islamic banking in Indonesia by referring to the macroeconomic variables of GDP, the exchange rate and the inflation rate. The resilience of Islamic banking is derived by constructing a composite index. The study is structured as follows: Part 1 contains the introduction, Part 2 is a literature review, Part 3 presents the data and methodology, Part 4 contains the results and discussion and Chapter 5 provides the study’s conclusion, suggestions, limitations and possibilities for future research.

2. Literature Review

2.1. Previous Studies

Risgi (2017) conducted a study entitled “Analysis of The Impact of Bank Specific Determinants and Macroeconomic Indicators on Profitability in Islamic Bank Period 2012-2015” using the multiple linear regression method. The study found that Financing Growth has a positive and significant influence on Return on Assets in Islamic Banks. The inflation rate was found to have a positive but insignificant influence on Return on Assets in Islamic Banks, while Exchange rate had a negative and significant influence on Return on Assets in Islamic banks.

Sumandi (2017) conducted research analysing an early warning system for the robustness of Islamic banking in Indonesia using the non-parametric with signalling approach. The results of the study showed that Islamic banks had poor resilience during the period 2004–2005 but that they also registered a stable performance during the 2008 financial crisis. The poor resilience of Islamic banks in 2004 was due to their vulnerability. The results also indicated that 3 leading indicators out of 5 indicators could be used to measure the vulnerability of Islamic banks. These were Interest rate, Inflation and the financing to deposits ratio (FDR). The selection criteria were based on the noise to signal ratio (NSR), the proportion of crises correctly called, the proportion of false alarms to total alarms, the proportion of crises with an alarm issued and the proportion of probability of crisis given no alarm.

Research by Febrina and Naomi (2009) looked at the impact on bank profitability of inflation, the central bank rate and the exchange rate. The method used in their research was multiple
regression. They found no significant relationship between the BI rate and bank profitability due to a negative relationship between the exchange rate, inflation and bank profitability.

Briguglio (2009) conducted research on measuring the resilience of the economy using the resilience index. The result showed that GDP per capita has a positive correlation with the resilience of the economy and is negatively correlated with vulnerability.

Lim et al (2015) researched factors affecting the performance of Islamic banks and conventional banks in Malaysia using descriptive methods with a simple regression analysis. Their results demonstrated the significant influence of capital adequacy, operational efficiency, economic growth and inflation on the profitability of conventional and Islamic banks.

Assegaf, Putri, Mitra, & Syarief, 2014 examined the impact of macroeconomic variables on the financial performance of Islamic banks in Indonesia. The independent variables in their research were macroeconomic variables (inflation, interest rate and money supply) and they employed multiple linear regression analysis as the research method. Their results showed, firstly, that the macroeconomic variables and ROA in the previous month simultaneously had an influence on the ROA of Islamic banks; however, partially, none of the macroeconomic variables, except for ROA in the previous month, influenced the ROA of Islamic banks. Secondly, macroeconomic variables and ROE in the previous month simultaneously influenced the ROE of Islamic banks; however, partially, only BI Rate had no significant effect on the ROE of Islamic banks. Thirdly, the macroeconomic variables and NPF in the previous month simultaneously influenced the NPF of Islamic banks; however, only BI Rate had no significant effect on the NPF of Islamic banks.

2.2. Research Framework

Islamic banking as a financial institution serves the real economy but is subjected to the pressure of external shocks and vulnerability. This means that Islamic banking requires intensive surveillance in order to maintain resilience. Moreover, the unpredicted macroeconomic environment presents challenges to Islamic banks in terms of their ability to deliver continued improvement while remaining resilient to the various shocks.

The Islamic bank internal variables that can be used to measure the level of resilience are Return on Assets (ROA), Capital Adequacy Ratio (CAR) and Third Party Funds (DPK). ROA indicates the profitability of Islamic banks, CAR relates to a bank’s capital, expressed as a percentage of a bank’s risk-weighted credit exposure, and DPK correlates to liquidity and the main source of funds.

The external shocks are transmitted exogenous risks and can trigger, or even worsen, vulnerability and subsequently reduce the resilience level of Islamic banking. These external shocks can be defined as GDP, Inflation rate and Nominal Exchange rate. Therefore, the resilience of an Islamic bank is influenced by the dynamic interaction between its vulnerability and its macroeconomic environment.
3. Data and Methodology

3.1. Research Objective and Data Type

The objective of this research is to analyse the impact of the selected macroeconomic variables on the resilience of Islamic banking in Indonesia. Secondary time series data on a quarterly basis were used in this research, relating to the period of quarter one 2010 to quarter four 2017. Quarterly data were used due to the limited publication of data, while the time period Q1 2010–Q4 2017 was chosen to reflect the new normal period of the global economy following the GFC, as indicated by the growth path of East Asian countries and the Chinese economy. This new normal was established following the materialisation of one complete business cycle (expansion, peak, recession, trough and recovery phases). The data were obtained from Statistik Perbankan Syariah (SPS), Otoritas Jasa Keuangan (OJK), monthly reports from Statistik Ekonomi Keuangan Indonesia (SEKI), BI, the World Bank and Badan Pusat Statistik (BPS).

This research employed a total of 7 variables. These comprised 4 variables as the independent variables (the selected macroeconomic variables) and the dependent variable of the resilience index as constructed using the 3 micro-banking indicators.

The dependent variable is the resilience index constructed from the 3 micro-banking indicators of Return on Assets (ROA), Capital Adequacy Ratio (CAR) and Third Party Funds (DPK). Meanwhile, the independent variables are the selected macroeconomic variables of gross domestic product (GDP), Exchange Rate (ER) and Inflation Rate (INF).

The use of the independent variables in this research is based on the previous studies found in the literature. Makram et. al (2015) state that banking performance can be analysed by examining both internal determinants (specific to the banks) and external variables (macroeconomic and macro-financial).

3.2. Data and Method

The data were collected from several credible resources. Table 2 displays the variables employed and their sources.
### Table 2: Variables and Data Sources

<table>
<thead>
<tr>
<th>NO</th>
<th>Variable</th>
<th>Definition</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GDP (Gross Domestic Product)</td>
<td>Gross Domestic Product by Expenditure in Constant Prices: Total Gross Domestic Product for Indonesia, Index 2010=100, quarterly data, seasonally adjusted</td>
<td>Federal Reserve Bank of St. Louis <a href="https://fred.stlouisfed.org/tags/series?t=gdp%3Bindonesia%3Bquarterly">https://fred.stlouisfed.org/tags/series?t=gdp%3Bindonesia%3Bquarterly</a></td>
</tr>
</tbody>
</table>

### 3.3. Operational Definition of Variables

The operational definition of a variable relates to the way in which it is used to interpret the data. This research used a total of seven variables. The detail of the variables is as follows:

### 3.3.1. Dependent Variable

**3.3.1.1. The Resilience Index of Islamic Banking:** The dependent variable in this study is the resilience index of Islamic banking. An index is a composite variable and this composite index is constructed using the three internal Islamic banking indicators of CAR, ROA and DPK. These indicators were chosen to represent the resilience level of Islamic banking. ROA indicates the profitability of Islamic banks, CAR relates to a bank’s capital and DPK correlates to the bank’s liquidity and its main source of funds. Further details of the variables are as follows:

1. **Capital Adequacy Ratio (CAR):** CAR is a measurement of a bank’s capital. It is expressed as a percentage of a bank’s risk-weighted credit exposure.
2. **Return on Assets (ROA):** ROA is a financial ratio that shows the percentage of profit a company earns in relation to its overall resources.
3. Third Party Funds (DPK) is a measurement of the amount of funds obtained from depositors in the form of demand, saving and investment deposits.

3.3.2. Independent Variables: The independent variables are the selected macroeconomic variables. Each selected macroeconomic variable is transformed into a single index. The selected macroeconomic variables are as follows:

1. Gross Domestic Product (GDP) – this research uses GDP by expenditure at constant prices, seasonally adjusted, with 2010 as the base year (2010=100).
2. Inflation Rate (INF) – calculated using the consumer price index with 2007 as the base year (2007=100).
3. Exchange Rate (ER) – the nominal exchange rate on transaction-adjusted prices in Indonesian Rupiah (IDR) compared to USD.

3.4. Method

This study used Microsoft Excel as the auxiliary tool to construct the resilience index as the dependent variable and the single index of each selected macroeconomic variable as the independent variables. Ordinary Least Squares (OLS) Multiple Linear Regression was then used as the statistical approach to identify the influence of the independent variable (the selected macroeconomic variables) on the dependent variable (resilience index of Islamic banking). Technically, there are several processes, as follows:

3.4.1. Indexation: Indexation was conducted using the standardisation method to either develop or construct both the single index and the composite index. The resilience index, which is a Composed Index, is constructed from three indexes of internal variables, namely Return on Assets (ROA), Capital Adequacy Ratio (CAR) and Third Party Funds (DPK). This resilience index is set as the dependent variable, while the independent variables comprise the single index of each macroeconomic variable.

3.4.2. Constructing the Resilience Index as the Dependent Variable

3.4.2.1. Variable Selection: An index (resilience index) needs to be created that includes CAR, ROA and DPK as these are the internal indicators in Islamic banking capable of capturing the resilience.

3.4.2.2. Calculating the Composite Index: A composite index is an index that contains more than one single index of a selected item. To obtain the composite index, the single index is calculated. The following is the formula for the single index:

\[ S_{It} = \frac{x_{t}-\bar{x}}{\sigma} \]  

Where:

\[ S_{It} \] : Single index at period t
\[ x_{t} \] : Variable (Quarterly)
\[ \bar{x} \] : Average of variable during the research period
\[ \sigma \] : Standard deviation per variable during the research period.

The composite index can then be constructed by aggregating the entire Single index \( S_{It} \) into the composite index, as shown below:

\[ 0.33 \times S_{I_{ROA}} + 0.33 \times S_{I_{CAR}} + 0.33 \times S_{I_{DPK}} = \text{Resilience Index} \]  

........ (2)
In constructing the composite index, every single index is accorded the same weight (equal weight) because all of the selected variables are assumed to have the same influence and be of equal importance. According to the “Handbook on Constructing Composite Indicators” by the Organisation for Economic Co-operation and Development (2008), most composite indicators use equal weighting (EW), thus meaning all variables are given the same weight. This essentially implies that all of the variables in the composite index are worth the same.

3.4.2.3. Setting the Threshold: The threshold indicates that the fluctuation of each index is at a normal level or beyond the normal level. The formula for setting the threshold is given as follows:

\[ T = \bar{X} + M \times \sigma \times \chi \text{(Single Index)} \] \hspace{1cm} (3)
\[ T = \bar{IC} + M \times \sigma \times IC \text{(Composite Index)} \] \hspace{1cm} (4)

Where;
- \( T \) : Threshold
- \( \bar{X} \) : Average of Variable during the Research Period
- \( M \) : Multiplier (1.3, 1.7 and 2 are used, referring to Bank Indonesia)
- \( \sigma IC \) : Standard Deviation from Composite Index
- \( \sigma X \) : Standard Deviation from Variable X

After selecting and calculating the threshold, each index is then combined with the threshold in one graph in order to easily see the index position in terms of whether the index is at a normal level or beyond. Technically, the threshold 1.3 represents the alert threshold, 1.7 represents the wary threshold and 2 represents the crisis threshold. The smallest the value of index is, the index below the set threshold then it can be grouped as normal level. These three selected thresholds refer to the threshold used by Bank Indonesia.

3.4.3. Computing the Single Index of Each Macroeconomic Variable to Determine the Condition of Each Variable: The single indexes illustrate and can be used to determine the fluctuation of each selected variable over the time period by setting a threshold for each respective index. The fluctuation of macroeconomic variables has been one of the causes of imbalances in the financial system. The indexation is then constructed to determine the extent of the fluctuation of the selected macroeconomic variables during the observation period. The selected macroeconomic variables will be constructed into a single index.

3.4.4. Multiple Linear Regression Method: The aim of the multiple linear regression method is to identify the influence of independent variables (the selected macroeconomic variables) on the dependent variable (resilience index). Every value of an independent variable is associated with the value of the dependent variable. Multiple linear regression is thus a form of regression analysis that attempts to model the relationship between two or more explanatory variables and a response variable by fitting a linear equation to observed data. This study uses the following econometric model:

\[ R_{1t} = a + \beta_1 \text{SIGDP}_t + \beta_2 \text{SIER}_t + \beta_3 \text{SIINF}_t + e_t \] \hspace{1cm} (5)

Where:
- \( R_{1t} \) = Resilience Index of Islamic Banking at period \( t \)
- \( a \) = Constant \( a \)
- \( \beta_1 - \beta_3 \) = Regression Coefficient of Each Variable
- \( \text{SIGDP}_t \) = Single index of Gross Domestic Product at period \( t \)
SIERₜ = Single Index of Exchange Rate at period t  
SIINFₜ = Single Index of Inflation Rate at period t

According to Asteriou and Hall (2007), the following assumptions apply to a multiple regression model:
1. The dependent variable is a linear function of the explanatory variables.
2. All explanatory variables are non-random.
3. The variance of the error is constant (heteroscedasticity).
4. There is no autocorrelation in error.
5. There is no multicollinearity among independent variables.
6. Each error is normally distributed.
7. There are no exact linear relationships among the sample values of any two or more of the explanatory variables.

3.5. Regression Analysis

3.5.1. Coefficient of Determination (R-Squared): The coefficient of determination ($R^2$) is used to measure the extent to which the independent variables can explain the variation of the dependent variable. Adjusted $R^2$ is used for analysis purposes. The Adjusted $R^2$ value falls in the range $0 < \text{Adjusted } R^2 < 1$. An adjusted $R^2$ value that is small or close to 0 indicates only a very limited ability of the independent variable to explain the variation in the dependent variable. An adjusted $R^2$ value that is large or close to 1 indicates that the independent variable in question can provide more measurable information to predict the dependent variable (Asteriou & Hall, 2007).

3.5.2. Simultaneous Regression Model Testing (F-test): The F-test can evaluate the influence of more than one independent variable, or all independent variables, on the dependent variable. It differs from a t-test in that the latter evaluates only the influence of a partial independent variable on the dependent variable. The result obtained from an F-test can differ from those of a t-test; for example, in a t-test the price of crude oil has no impact on the vulnerability of Islamic banks, yet the crude oil price and global gross domestic product, when grouped together, produce different results (Widarjono, 2017).

The following hypotheses are tested using the F-test:

$H_0$: all of the independent variables simultaneously influence the dependent variable.

$H_a$: none of the independent variables simultaneously influence the dependent variable.

The F-test justification relates to the following criteria:

If P value < 0.05 then $H_0$ is rejected, and if P value > 0.05 then $H_0$ is accepted.

3.5.3. Partial Regression Coefficient Testing (t-test): The t-test statistic is a partial test used to test the extent to which each independent variable explains the dependent variable. At the 0.05 (5%) significance level, assuming the independent variable has a constant value, the hypothesis is as follows:

Not significant if the probability $\beta_i > 0.05$;
Significant if the probability $\beta_i < 0.05$.

$H_0$: an independent variable is not a significant explanatory variable for the dependent variable

$H_a$: an independent variable is a significant explanatory variable for the dependent variable
3.6. Classical Assumption

The classical assumption test is used to obtain the BLUE (Best Linear Unbiased Estimator). Classical assumption comprises the following:

3.6.1. Autocorrelation Test: Literally, autocorrelation means there is a correlation between the residuals of independent variables. It is very important to test for autocorrelation in multiple regression since if autocorrelation is present when a researcher applies OLS over an estimator, then the estimator is incompetent (Widarjono, 2017).

3.6.2. Multicollinearity Test: This test aims to determine whether a high correlation is found between the independent variables in the regression model. A good regression model is characterised by having no correlated independent variables. The presence or absence of multicollinearity in the regression model is detected by looking at the Variance Inflation Factor (VIF) by the equation \( VIF = \frac{1}{\text{tolerance}} \). A VIF of less than 10 indicates there is no multicollinearity (Widarjono, 2017).

Multicollinearity is useful to test whether or not there is correlation among the independent variables in the regression model. Multicollinearity can be detected by looking at the coefficient values of the independent variables in the matrix result. A good regression model has no multicollinearity between the independent variables and the dependent variable (Gujarati, 2007).

3.6.3. Heteroscedasticity Test: The heteroscedasticity test aims to establish whether there is any inequality variance from the residual of one independent variable against the residual of a regressed variable. Heteroscedasticity exists if the regression model has no constant variance, which leads to various problems. Included among these is that if the OLS estimator is biased, then the variance of the OLS coefficient would be wrong (Basuki & Yuliadi, 2014). This is detected by looking at the probability value; if it has a significance value of \( \alpha > 0.05 \), then the model does not contain heteroscedasticity.

4. Results and Discussion

4.1. Regression Result - Classical Assumption Test

4.1.1. Normality Test: The normality test is a supplementary test used to assess the normality of the data. It is conducted by looking at a histogram of the residual. The residual will be grouped as normal from the Jarque–Bera test. The null hypothesis (Ho) states that the residual has a normal distribution, while the alternative hypothesis (Ha) states that the residual does not have a normal distribution.

\[ \text{Ho is accepted if the probability of Jarque–Bera > 0.05.} \]

\[ \text{Ha is accepted if the probability of Jarque–Bera < 0.05.} \]
According to Figure 4, the value of Jarque–Bera is 1.1215522 with a probability level of 0.570766. This is higher than 0.05 or 5%, which means the null hypothesis is accepted. The null hypothesis (Ho) states that the residual has a normal distribution.

4.1.2. Heteroscedasticity Test: The heteroscedasticity test is used to test the variability of a variable across the range of residuals observed. A constant variance of the residuals is called homoscedasticity. There is heteroscedasticity if the variance is not constant. A good regression model displays homoscedasticity or has no heteroscedasticity (Gujarati, 2004). The results of the heteroscedasticity test are shown below:

Table 3: Heteroscedasticity Test Result

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<thead>
<tr>
<th>Heteroscedasticity Test: White</th>
<th>F Statistic</th>
<th>Obs*R Squared</th>
<th>Scaled Explained SS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.149082</td>
<td>10.23246</td>
<td>5.478359</td>
</tr>
<tr>
<td></td>
<td>Prob F (9.22)</td>
<td>Prob Chi Square (9)</td>
<td>Prob Chi Square (9)</td>
</tr>
<tr>
<td></td>
<td>0.3725</td>
<td>0.3320</td>
<td>0.7908</td>
</tr>
</tbody>
</table>

Source: Data Processed (EViews 9)

Table 3 shows that the value of Obs*R Squared is 10.23246 with a Prob. Chi Square of 0.3320, which is greater than alpha 5% (>0.05). Thus, the result indicates no heteroscedasticity.

4.1.3. Autocorrelation Test: It is very important to test for the presence of autocorrelation in multiple regressions when applying OLS in order to obtain a credible estimator. This study used the Breusch–Godfrey Serial Correlation LM Test by comparing the probability value Obs*R Squared with α = 5% (0.05). The results of the Breusch–Godfrey Serial Correlation LM Test for autocorrelation are shown as follows:

Table 4: Autocorrelation Test Result

<table>
<thead>
<tr>
<th>Breusch–Godfrey Serial Correlation LM Test</th>
<th>F Statistic</th>
<th>Obs*R Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.461305</td>
<td>3.233578</td>
</tr>
<tr>
<td></td>
<td>Prob. F (2.26)</td>
<td>Prob. Chi Square (2)</td>
</tr>
<tr>
<td></td>
<td>0.2504</td>
<td>0.1985</td>
</tr>
</tbody>
</table>

Source: Data Processed (EViews 9)

Based on Table 4, the value of Obs*R-squared is 3.233578 and its probability is 0.1985, which is greater than α=5% (0.05). It can thus be ascertained that there is no autocorrelation in the regression model.
4.1.4. Multicollinearity Test: This study uses variance inflation factors to test the multicollinearity by looking at the centred VIF. The centred VIF of each variable cannot be more than 10, or it should be less than 10. The results of multicollinearity test using VIFs are shown as follows:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient Variance</th>
<th>Uncentred VIF</th>
<th>Centre VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.002701</td>
<td>1.000000</td>
<td>NA</td>
</tr>
<tr>
<td>GDP</td>
<td>0.017090</td>
<td>6.130605</td>
<td>6.130605</td>
</tr>
<tr>
<td>ER</td>
<td>0.016416</td>
<td>5.889026</td>
<td>5.889026</td>
</tr>
<tr>
<td>INF</td>
<td>1.003286</td>
<td>1.178692</td>
<td>1.178692</td>
</tr>
</tbody>
</table>

Source: Data Processed (EViews 9)

According to Table 5, the result of the centred VIF of each variable is not more than 10; it can thus be concluded that there is no multicollinearity in the regression model.

4.1.5. Regression Estimation Result: The model of regression estimation is shown as follows:

\[ RI_t = a + \beta_1 \text{GDP}_t + \beta_2 \text{ER}_t + \beta_3 \text{INF}_t + e_t \]

Based on the regression calculation carried out using EViews 9, the correlation between the dependent variable and independent variables is shown as follows:

\[ RI_t = -5.66E-16 + 0.773634 \text{SIGDP}_t - 0.676592 \text{SIER}_t + 0.118573 \text{SIINF}_t + e_t \]

Table 6: Results of the Regression Estimation

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>T-Test</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent Variable: Resilience Index of Islamic Banking</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant a</td>
<td>-5.66E-16</td>
<td>-1.18E-14</td>
<td>1.000</td>
</tr>
<tr>
<td>SIGDP</td>
<td>0.773634</td>
<td>6.204313</td>
<td>0.000</td>
</tr>
<tr>
<td>SIER</td>
<td>-0.676592</td>
<td>-5.587133</td>
<td>0.000</td>
</tr>
<tr>
<td>SIINF</td>
<td>0.118573</td>
<td>2.166860</td>
<td>0.038</td>
</tr>
<tr>
<td>R-Squared</td>
<td></td>
<td>0.582200</td>
<td></td>
</tr>
<tr>
<td>F-Statistic</td>
<td></td>
<td>13.00591</td>
<td></td>
</tr>
<tr>
<td>Prob. F-Stat</td>
<td></td>
<td>0.000017</td>
<td></td>
</tr>
</tbody>
</table>

Source: Secondary Data Processed (EViews 9)

Based on Table 6, gross domestic product (GDP) and inflation rate (INF) are positively and significantly correlated with the resilience of Islamic banking. Meanwhile, exchange rate (ER) has a negative and significant correlation with the resilience of Islamic banking.

4.1.6. Statistic Test:

4.1.6.1. T-Test (Partial Regression Coefficient Testing)

4.1.6.1.1. Constant a: Based on Table 6, the coefficient of Constant a is 5.66E-16. This means that when all of the independent variables (selected macroeconomic variables) are considered to be constant, the resilience of Islamic banking is -5.66E-16.
4.1.6.1.2. **Gross Domestic Product (GDP):** The null hypothesis (Ho) states that GDP has a positive and significant effect on the resilience of Islamic banking. The alternative hypothesis (Ha) states that GDP does not have a positive and significant effect on the resilience of Islamic banking.

- Ho is accepted if the probability level of a variable < 0.05
- Ha is accepted if the probability level of a variable > 0.05.

Based on Table 6, the probability level of the variable GDP is less than 0.05 > 0.0000. So, it can be concluded that the null hypothesis (Ho) is accepted and the alternative hypothesis (Ha) is rejected. This result suggests that the variable gross domestic product (GDP) significantly affects the resilience of Islamic banking.

Table 6 also shows that the value of the coefficient ($\beta_1$) for GDP is 0.773634, which is positive. This indicates that gross domestic product (GDP) is positively and significantly correlated with the resilience of Islamic banking. An increase in GDP of 1 unit will increase the resilience of Islamic banking by 0.645504 units. It can be assumed that the other factors are fixed, or ceteris paribus.

4.1.6.1.3. **Exchange Rate (ER):** The null hypothesis (Ho) states that exchange rate (ER) has a negative and significant effect on the resilience of Islamic banking. The alternative hypothesis (Ha) states that exchange rate (ER) does not have a negative and significant effect on the resilience of Islamic banking.

- Ho is accepted if the probability level of a variable < 0.05
- Ha is accepted if the probability level of a variable > 0.05.

According to Table 6, the probability level of exchange rate (ER) is less than 0.05, at 0.0000. It can thus be concluded that the null hypothesis (Ho) is accepted and the alternative hypothesis (Ha) is rejected. Exchange rate (ER) significantly affects the resilience of Islamic banking.

Table 6 also shows that the value of the coefficient ($\beta_2$) for exchange rate (ER) is -0.676592, which is negative. This means that exchange rate (ER) is negatively and significantly correlated with the resilience of Islamic banking. An increase of 1 unit in the exchange rate (ER) (depreciation of IDR against USD) will reduce the resilience of Islamic banking by 0.676592 units. It can be assumed that the other factors are fixed, or ceteris paribus.

4.1.6.1.4. **Inflation Rate (INF):** The null hypothesis (Ho) states that inflation rate (INF) has a positive and significant effect on the resilience of Islamic banking. The alternative hypothesis (Ha) states that inflation rate (INF) does not have a negative and significant effect on the resilience of Islamic banking.

- Ho is accepted if the probability level of a variable < 0.05
- Ha is accepted if the probability level of a variable > 0.05.

According to Table 6, the probability level of inflation rate (INF) is less than 0.05 at 0.0389. So, it can be concluded that the null hypothesis (Ho) is accepted and the alternative hypothesis (Ha) is rejected. Inflation rate (ER) significantly affects the resilience of Islamic banking.

Table 6 also shows that the value of the coefficient ($\beta_3$) for inflation rate (INF) is 0.118573, which is positive. This means that inflation rate (INF) is positively and significantly correlated with the resilience of Islamic banking. A 1 per cent increase in the inflation rate (INF) will thus increase the resilience of Islamic banking by 0.118573 units. It can be assumed that the other factors are fixed, or ceteris paribus.
4.1.6.2. F-test (Simultaneous Regression Model Testing): The basic aim of the F-test statistic is to determine the influence of the independent variables on the dependent variable simultaneously.

The null hypothesis (Ho) states that all the independent variables simultaneously affect the resilience of Islamic banking.

The alternative hypothesis (Ha) states that none of the independent variables simultaneously affect the resilience of Islamic banking.

According to Table 6, the probability F-statistic is 0.000017, which is smaller than 0.05. This means that all the independent variables – gross domestic product (GDP), exchange rate (ER) and inflation rate (INF) – simultaneously affect the resilience of Islamic banking in Indonesia.

4.1.6.3. Coefficient of Determination (R²): Based on Table 6, the R-squared value is 0.582200. This means that all of the independent variables used explain around 58% of the dependent variables, with the remaining 42% explained by other factors that are not included in the regression model, such as political issues, the global financial system and global macroeconomic conditions.

4.2. Results and Discussion

The multiple linear regression aimed to determine the correlation and influence between the dependent variable, resilience of Islamic banking index, and the independent variables of gross domestic product (GDP), exchange rate (ER) and inflation rate (INF).

**Table 7: The Accumulation of Independent Variable Influence on the Dependent Variables**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant a</td>
<td>-5.66E-16</td>
<td>1.0000</td>
</tr>
<tr>
<td>GDP</td>
<td>0.773634</td>
<td>0.0000</td>
</tr>
<tr>
<td>ER</td>
<td>-0.676592</td>
<td>0.0000</td>
</tr>
<tr>
<td>INF</td>
<td>0.118573</td>
<td>0.0389</td>
</tr>
</tbody>
</table>

**Source:** Data Processed (EViews 9)

**4.2.1. The Influence of Gross Domestic Product on the Resilience of Islamic Banking:** The coefficient value of gross domestic product is 0.773634, which means an increase in the global gross domestic product of about 1 unit will generate an increase in the resilience index of Islamic banking of about 0.773634 units, with the assumption that all the other variables are constant, or ceteris paribus. The result is significant because the probability value is less than 5%.

The regression result shows that there is a positive and significant correlation between GDP and the resilience of Islamic banking. This result supports studies by Indriani (2016), Sahara (2013), and Setiawan (2009). Using GDP as the macroeconomic factor indicates economic growth. An increase in GDP can thus affect the intermediary function of Islamic banking, whether in the right-hand-side or the left-hand-side function. The left-hand side is the function of Islamic banking to collect funds from depositors. Meanwhile, the right-hand side is the function of Islamic banking to channel those funds to earn profit through financing and other services.

In the left-hand side, the ability of Islamic banking to attract funds and savings from the economy is affected by the increase in GDP. An increase in GDP will increase the flow of savings and investment from the economy to Islamic banking and subsequently increase the liquidity or Third Party Funds (DPK) of Islamic banking. Technically, there will be a gradual increase in the adequacy of capital of Islamic banking through the financing process, as shown by the percentage of the capital adequacy ratio (CAR). Thus, through increases in CAR and
DPK, Islamic banking will be more resilient in operating its intermediary function to serve the economy.

The right-hand-side function, where Islamic banking channels capital or liquidity to earn a profit through financing, is affected by an increase in GDP. An increase in GDP that is followed by an increase in Islamic banking capital and liquidity also increases the percentage of financing channelled by Islamic banking to earn a profit. GDP, meanwhile, has a positive correlation with saving; thus, the increase in saving in the banking sector through third party funds (DPK) provides extra support to the Islamic bank as the main source of funds. Islamic banking can channel funds from saving to the financing side, thus delivering profitability, as indicated by the increase in return on assets (ROA).

Increasing GDP leads to a gradual increase in the welfare of society. So, when Islamic banking channels funds to the real sector through products such as murabahah, musyarakah and other services, it indicates a reduction in the probability of Islamic banking being exposed to credit risk, as reflected in a reduction in non-performing financing (NPF).

**Table 8: Summary of the Influence of GDP on the Resilience of Islamic Banking**

<table>
<thead>
<tr>
<th>Macroeconomic Variable Change</th>
<th>Micro-banking variable transmission</th>
<th>The resilience of Islamic banking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase in gross domestic product (GDP)</td>
<td>1. Increases the third party funds (DPK) through an increase in saving. 2. Increases the capital adequacy ratio (CAR) of Islamic banking due to extra retained earnings, given a sound macroeconomic environment. 3. Increases return on assets (ROA) caused by increasing financing services. 4. Decreases non-performing financing (NPF) in Islamic banking due to the good condition of the national economy.</td>
<td>Increases the resilience level of Islamic banking in Indonesia.</td>
</tr>
</tbody>
</table>

**4.2.2. The Influence of Exchange Rate on the Resilience of Islamic Banking:** According to Table 7, the coefficient value of the exchange rate is -0.676592, which means that an increase of around 1 unit in the exchange rate (depreciation against US dollar) will lead to a fall in the resilience of Islamic banking of 0.568104 units, with the assumption that all other variables are constant, or ceteris paribus. The result is significant because the probability value is less than 5%.

The negative correlation between the exchange rate variable and the resilience index of Islamic banking in Indonesia implies that the exchange rate variable has a negative effect on the resilience of Islamic banking. The left-hand-side function, where Islamic banks collect funds from depositors, is affected by a depreciation in the rupiah (increase in the nominal exchange rate) given that depositors are exposed to international transactions or are sensitive to exchange rate fluctuations. A depreciation in the rupiah leads to a rise in the price of imported goods and services. Moreover, since imported goods often comprise the raw materials needed to produce final goods, there is a rise in the production cost which leads to a corresponding rise in the price of goods. An increase in the price of goods will reduce the purchasing power parity (PPP), assuming no change in consumption behaviour. As a result, depositors withdraw their funds to fulfil their consumption. The resulting depletion of funds then reduces the liquidity of banks and consequently diminishes banks’ resilience.

The right-hand-side function, where Islamic banking channels deposited funds to earn profit through financing, is affected by a depreciation in the Rupiah (increase in the nominal exchange rate). A depreciation of the rupiah, which leads to a fall in PPP and reduces the amount of DPK due to withdrawals by depositors, leads to a fall in the CAR. This reduction in CAR is due to the bank being channelled into credit in order to maintain earnings. Consequently, it will lead to a fall in the capital ratio of Islamic banking over the risk-based balance asset (ATMR) and generate liquidity risk and credit risk in Islamic banking. In the long run, Islamic banking will respond by reducing the amount of credit channelled...
through *Musyarakah* or *Mudharabah* (financing) to minimise the risk. Therefore, a depreciation in the Rupiah will reduce the resilience of Islamic banking in Indonesia. These results are in line with studies by Dwijayanti (2009), Swandayani and Kusumaningtyas (2012) and Rosanna (2007).

<table>
<thead>
<tr>
<th>Macroeconomic Variable Change</th>
<th>Micro-banking variable transmission</th>
<th>The resilience of Islamic Banking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase in the nominal exchange rate (depreciation of Rupiah against US Dollar)</td>
<td>1. Decreases third party funds (DPK) as a result of the low level of PPP of depositors and withdrawals to maintain their PPP. 2. Decreases return on assets (ROA) caused by the inadequacy of capital in Islamic banking due to lower financing scheme. 3. Decreases the capital adequacy ratio (CAR) due to lower retained earnings.</td>
<td>Reduces the resilience level of Islamic banking in Indonesia.</td>
</tr>
</tbody>
</table>

**4.2.3. The Influence of Inflation Rate on the Resilience of Islamic Banking:** According to Table 7, the coefficient value of the inflation rate is 0.118573, which means that a roughly 1 percent increase in inflation will increase the resilience of Islamic banking by about 0.118573 units, with the assumption that all other variables are constant. The coefficient value of the inflation rate is positive and significant, shown by a probability value of less than 0.05 or 5%.

The positive sign is good as long as the type of inflation is demand-pull inflation, which promotes a rise in goods and services productivity. Demand-pull inflation is also good for saving, wherein people’s increasing income means they have high demand, high consumption and saving. Demand-pull inflation occurs when job opportunities are high, thus creating high levels of income and expenditure, and, finally, it raises the economic capacity of issuing goods and services.

Specifically in Indonesia, one of the drivers of inflation is volatile foods. An increase in demand for volatile foods during several periods in the year increases the level of the consumer price index and produces an increase in the inflation rate. The high demand for volatile foods thus leads to an increase in both the consumer price index and inflation rate. This inflation in Indonesia is considered to be demand-pull inflation. Referring to the data used, the inflation rate is based on the consumer price index.

In the banking sector, demand-pull inflation benefits Islamic banking. The high demand in consumption indicates that the national economy is performing well, where consumption, investment and saving are positively correlated with national income. Since demand-pull inflation leads to positive growth in goods and services productivity, this in turn results in an increase in people’s income and third party funds (DPK) through saving in Islamic banking.

In addition, for the left-hand-side function, where Islamic banks collect funds, depositors are affected by the increase in the inflation rate. Demand-pull inflation will result in an increase in both saving and deposits. This can provide extra liquidity and capital for Islamic banking as the level of their third party funds (DPK) increases. As a result, Islamic banks can channel funds towards the real sector and investment.

In the right-hand-side function, where Islamic banking channels financing services to earn a profit, depositors are affected by the increase in the rate of inflation. This increase in the inflation rate caused by demand-pull inflation will in turn lead to a rise in the price assets of Islamic banks. Consequently, when an Islamic bank trades its assets, it will see an increase in its ROA (Ridhwan (2006)).
Table 10: Summary of the Influence of the Inflation Rate on the Resilience of Islamic Banking

<table>
<thead>
<tr>
<th>Macroeconomic Variable Change</th>
<th>Micro-banking variable transmission</th>
<th>The resilience of Islamic banking</th>
</tr>
</thead>
</table>
| Increase in the inflation rate (demand-pull inflation) | 1. Increases saving and third party funds (DPK) resulting from an increase in people’s income.  
2. Increases return on assets (ROA) caused by financing extension.  
3. Increases asset prices. | Increases the resilience level of Islamic banking in Indonesia. |

5. Conclusion, Suggestions, Limitations and Future Research

5.1. Conclusion

Based on the findings, the conclusions are as follows:

1. Gross domestic product has a positive and significant effect on the resilience of Islamic banking in Indonesia. An increase in GDP is followed by an increase in saving and investment on the third party funds (DPK). The profitability of Islamic banking is thus increased, indicated by an increase in return on assets (ROA) and the capital adequacy ratio (CAR). Finally, the increase in GDP can increase the resilience of Islamic banking.

2. The exchange rate has a negative and significant effect on the resilience of Islamic banking in Indonesia. A depreciation of the rupiah, or an increase in the nominal exchange rate, means the PPP of depositors falls in terms of them maintaining their consumption level. Consequently, people withdraw their funds, which reduces the level of third party funds (DPK). As a result, the percentage value of return on assets (ROA) falls, thus gradually decreasing the resilience of Islamic banking.

3. The inflation rate has a positive and significant effect on the resilience of Islamic banking in Indonesia. Inflation in Indonesia is caused by demand-pull inflation triggered by the increasing price of volatile foods and an increase in the consumer price index. This type of inflation is related to an increase in people’s income, which produces an increase in the third party funds (DPK) of Islamic banking. This increase can be channelled into the banks’ financing services. As prices continue to increase, the demand for the financing sector increases. This in turn will increase both the ROA and resilience of Islamic banking in Indonesia.

5.2. Suggestions

1. Bank Indonesia should monitor the growth of inflation in order to maintain people’s income.

2. Bank Indonesia should maintain exchange rate stability in order to minimise risk as caused by international transactions.

3. Bank Indonesia and the government should promote economic growth as a means of stimulating the demand for placing funds into Islamic banks.

5.3. Limitations and Future Research

1. There is a need to add more than the selected macroeconomic variables that affect the resilience of Islamic banking.

2. There is a need to include some micro-banking variables in the resilience index as the dependent variable.

3. There is a need to add more time series data to the research covering crisis periods.
4. There is a need to advance the methodology in order to examine both the short- and long-run relationship among variables.

References


