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ANALYSIS OF MACROECONOMIC AND BANK-LEVEL DETERMINANTS OF LIQUIDITY OF ISLAMIC BANKS IN MALAYSIA

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Abstract*: Islamic banks play a significant role in the economy of Malaysia. For the Islamic bank to operate successfully it must have a healthy relationship with stakeholders and manage its supply and demand for liquidity. This study seeks to investigate the macroeconomic and bank-level determinants of liquidity in Islamic banks in Malaysia. For this purpose, liquidity is used as dependent variable while capital adequacy, bank performance, bank size, economic growth, price level and cost of capital are independent variables. The result indicates that in the short run capital adequacy and bank size has no significant while performance affects liquidity and in the long run cost of capital and price level are found to have negative and significant effect on liquidity in Islamic banks in Malaysia*

Keywords*: Liquidity, Performance, Bank size, ARDL, Capital Adequacy, Cost of capital.*

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1.0 INTRODUCTION

Historically, studies on determinants of liquidity have largely focused on bank variables, especially profitability of banks, and financial crisis. Nevertheless, given recent happenings and the pronounced impact of the macroeconomic environment, researchers and practitioners are now interested in the broad determinants of liquidity of banks, especially Islamic banks. However, there is still paucity of empirical literature in this area, specifically in Malaysia, and the available literatures are faced with inconclusiveness. For instance, some found positive impacts of the determinants of liquidity, some negative impacts while others found no significant relationship. These findings lead to the gap in research which this study seeks to fill. The broad objective of this study is to investigate the determinants of liquidity (captured as the ratio of liquid assets to the sum of deposits and short term funding, LQD) of Islamic

banks in Malaysia, using fourteen banks as a case study. The study also investigates the causal relationship between bank-level variables and liquidity as well as between macroeconomic variables and liquidity.

2.0 LITERATURE REVIEW

Adrian & Shin (2008) states that during financial crisis liquidity change affects the bank reserve. Aikaeli (2006) found that credit risk, adequate level of funding, preference of cash, volatility of deposits is critical for surplus liquidity. Bank viability strong depends on the level of liquidity (Basel Committee, 2009).

The study of Vodova (2011) proposes that bank-specific and macroeconomic variables are determinants of bank liquidity. Valla & SaerEscorbia (2006) investigated liquidity measures of banks in France and found that profitability, credit growth, GDP, monetary policy and interest rate have negative effect on liquidity. Rauch et.al (2010) studied the determinants of bank liquidity and found that bank size, profitability and interest rate of monetary policy are negatively associated with liquidity, while the value of delayed liquidity is positively associated with bank liquidity.

Furthermore Saxegard (2006) investigated the pattern of excess liquidity in sub-Saharan Africa utilizing Structured Vector Auto Regression (SVAR) and the results indicates that excess liquidity alters the transmission of monetary policy such that monetary authority could not control the demand for currency.

Berger and Bouwman (2009) showed two assumptions related to the motivation of the bank's capital to create liquidity: Capital increase improves the ability of the bank to create liquidity. Diamond & Ragan (2001) Hypothesis of financial fragility increase in capital reduces liquidity creation. Hovarth et .al (2012) examined Czech banks between 2000 – 2010 and observed negative relationship between creation of liquidity and bank capital, Basel III reduced liquidity creation but creation of high liquidity can reduce bank solvency. Choon et. al (2013) studied the determinants of 15 commercial banks in Malaysia between the periods (2003 – 2012). The study used specific factors (size of bank, capital adequacy, profitability and credit) and macroeconomic factors (GDP, Interbank rate, Financial crisis). They used panel data (fixed effect model with data). The result indicates that all factors included are significant except interbank rate the positive factors are non-performing loans, profitability, GDP while bank size, capital adequacy and financial crisis negative effects on liquidity.

Kamau et. al (2013) found that 42.2% of variation in the liquidity of 27 commercial banks in Kenya is explained by several factors such as profitability, obligation, policy management, credit rating, monetary policy while 57.8% is explained by other factors. Lei and Song (2013) studied performance of bank and the creation of liquidity are negatively related in large banks in china, while they are positively related in small banks a decrease in the flow money in proportion to deposits of the banking sector lead to decrease of the ratio of loans to deposit.

3.0 RESEARCH HYPOTHESES

H_{01}: Bank-level variables have no significant impacts on liquidity of Islamic banks in Malaysia.
H_{02}: Macroeconomic variables have no significant impacts on liquidity of Islamic banks in Malaysia.
H_{03}: No causal relationship between bank-level variables and liquidity of Islamic banks in Malaysia.

H_{04}: No causal relationship between macroeconomic variables and liquidity of Islamic banks in Malaysia

4.0 METHODOLOGY

From the reviewed literature, it is evident that banks' liquidity can be affected by both bank-specific (micro or internal) factors and macro or external factors. A simple functional relationship to capture this can be given in Equation (1) below:

$Liquidity = f(BSV,\ MV)$……. (1)

The determinants are broadly categorized as bank-level determinants (BSV) and macroeconomic (MV) determinants. The bank-level determinants are bank capital (captured as equity, EQT), bank performance (captured as return on asset, ROA) and bank size (captured as natural log of total assets, LTA). The macroeconomic variables are economic growth (captured as growth rate of GDP, GDPG), price level (captured as Consumers' Price Index, CPI) and cost of capital (captured as real interest rate, RIR). Explicitly stating Equation (1) in econometric form gives;

$LQD_t = \alpha_0 + \alpha_1 EQT_t + \alpha_2 ROA_t + \alpha_3 LTA_t + \alpha_4 GDPG_t + \alpha_5 CPI_t + \alpha_6 RIR_t + \varepsilon_t$ ….....(2)

Where LQD, EQT, ROA, LTA, GDPG CPI and RIR are as defined in Table 3.1 and $\alpha_0, \alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5\ and\ \alpha_6$ are the parameters to be estimated while ε is the error term of the model and t is the time period which ranges from 1990 to 2014.

The study estimated the disaggregated forms (bank specific determinants and macroeconomic determinants separately) of Equation (2) as stated below:

Bank Specific Model: $LQD_t = \beta_0 + \beta_1 EQT_t + \beta_2 ROA_t + \beta_3 LTA_t + \varepsilon_t$…….(3)

Macroeconomic Model: $LQD_t = \gamma_0 + \gamma_1 GDPG_t + \gamma_2 CPI_t + \gamma_3 RIR_t + \varepsilon_t$……(4)

Table 4.1: Definition, Measurement & Expected Signs of Variables and Sources of Data

Variable	Definition	Measurement	Expected Sign	Source
Independent Variable				
Banks' Liquidity		Average of Annual Liquid Asset over Deposit and Short-term funding of the Selected Islamic Banks in Malaysia(LQD)	Not Applicable	Defunct BankScope
Dependent Variables (Bank- specific)				
Banks' Capital		Average of Equity of the Selected Islamic Banks in Malaysia (EQT)	+	Defunct BankScope
Banks' Performance		Average of Annual Return on Asset of the Selected Islamic Banks in Malaysia (ROA)	+	Defunct BankScope

Banks' Size		Average of Natural Log of Total Assets of the Selected Islamic Banks in Malaysia (LTA)	+/-	Defunct BankScope
Dependent Variables (Macroeconomic Variables)				
Economic Growth	Annual percentage growth rate of GDP at market prices based on constant local currency.	Annual Growth Rate of Gross Domestic Product in Malaysia (GDPG)	+	World Development Indicator (WDI) 2017 Database
Price Level	Consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services.	Annual Consumer Price Index (CPI)	+/-	World Development Indicator (WDI) 2017 Database
Cost of Capital	Real interest rate is the lending interest rate adjusted for inflation as measured by the GDP deflator.	Annual Real Interest Rate (RIR)	-	World Development Indicator (WDI) 2017 Database

Source: Author's Compilation (2018)

4.1 Estimation Techniques

In choosing an appropriate econometric technique of analysis to adopt, the result of the unit root tests and cointegration tests were considered. Based on the results, Equation (3) is investigated using the error correction model (ECM), while Equation (4) is estimated using the autoregressive distributed lag (ARDL) model. The estimated models of Equations (3) and (4) are given below in Equations (5) and (6) respectively.

$$\Delta LQD_t = \propto + \sum_{i=1}^{\rho} \beta_1 \Delta ROA_{t-i} + \sum_{i=1}^{\rho} \beta_2 \Delta EQT_{t-i} + \sum_{i=1}^{\rho} \beta_3 \Delta LTA_{t-i} + \delta(LQD_{t-1} - \gamma_1 ROA_{t-1} - \gamma_2 EQT_{t-1} - \gamma_3 LTA_{t-1}) + \mu_t \quad \ldots\ldots (5)$$

$$\Delta LQD_t = \propto + \sum_{i=1}^{\rho} \beta_1 \Delta LQD_{t-i} + \sum_{i=0}^{\rho} \beta_1 \Delta ROA_{t-i} + \sum_{i=0}^{\rho} \beta_2 \Delta EQT_{t-i} + \sum_{i=0}^{\rho} \beta_3 \Delta LTA_{t-i} + \gamma_1 LQD_{t-1} - \gamma_2 ROA_{t-1} - \gamma_3 EQT_{t-1} - \gamma_4 LTA_{t-1} + \mu_t \quad \ldots\ldots (6)$$

4.2 Sample and Data

The sample of the study is selected fourteen (14) Islamic banks in Malaysia. The selected banks are Affin Islamic Bank, Al-Rajhi Bank, Alliance Islamic Bank, Asian Finance Bank, Bank Islam Malaysia, Bank Muamulat Malaysia, CIMB Islamic Bank, HSBC Amanah Malaysia, Hong Leong Islamic Bank, Kuwait Finance House, Maybank Islamic Berhad, OCBC Al-Amin Bank, Public Islamic Bank and RHB Islamic Bank. Annual secondary time series data were

collected on all the variables defined in Table 3.1 from the defunct BankScope database and the World Development Indicator (WDI) 2017 Database. Data on liquidity and bank-level data were collected from the defunct BankScope while data on macroeconomic variables were collected from World Development Indicator (WDI) 2017 Database.

5.0 DATA ANALYSIS, INTERPRETATION AND DISCUSSION

5.1 Trend, Descriptive, and Correlation Analyses

A brief examination of the graphs of the data in this study (See Figure 1 below) indicates that LQD trended upwards for the first seven years before it began a downward trend up to 2014. Bothe EQT and LTA assumed a rather upward movement, even though they fluctuated slightly over the period of analysis. ROA dropped sharply between 2004 and 2006 and rose sharply between 2006 and 2008 from when it then assumed a slightly upward movement. Both GDGG and RIR fluctuated greatly over the period but GDPG generally assumed a downward trend while RIR assumed a generally upward trend over the entire period. CPI trended upward throughout the period of analysis.

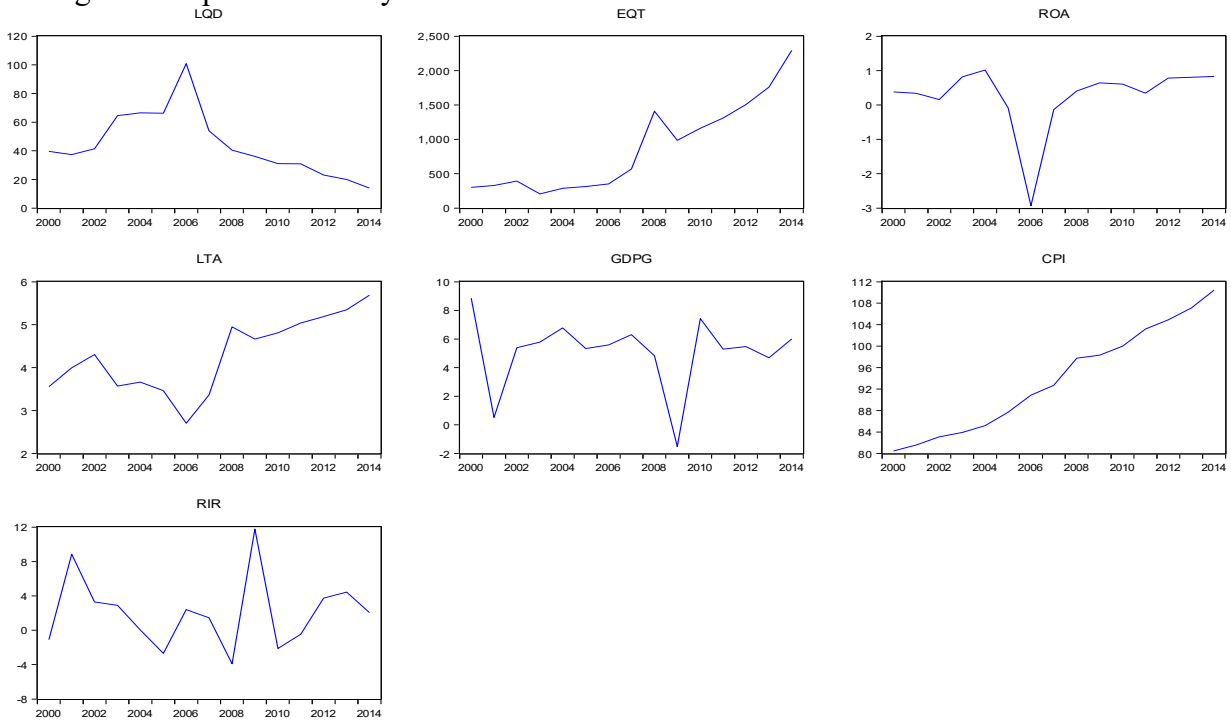

Figure 5.1: Graph of Series

Source: Author's Computation (2018)

Furthermore, descriptive statistics indicate that LQD, EQT, ROA and LTA, respectively, averaged about 44, 878.9, 0.26, and 4.29 while CPI, GDPG and RIR, respectively, averaged about 9%, 5.12%, and 2% over the period. Jarque-Bera test for normal distribution indicates that the null hypothesis of normal distribution can only be rejected at the 5% level for ROA and GDPG while the rest show evidence of normal distribution. Furthermore, the test of linear association using correlation analysis reveals that LQD has a strongly negative and significant

linear association with all the three bank level determinants (EQT, ROA and LTA). Similarly, LQD has a moderately negative and significant association with CPI. The correlation between LQD and each of GDPG and RIR are not statistically significant at the 5%.

Table 5.0 Descriptive Analyses

	LQD	EQT	ROA	LTA	CPI	GDPG	RIR
Mean	44.39024	878.9052	0.264689	4.28774	93.8118	5.117743	2.048918
Median	39.65	568.9023	0.406	4.304878	92.70468	5.473454	2.068397
Maximum	100.8256	2295.554	1.015	5.690714	110.4649	8.858868	11.78227
Minimum	13.915	204.7	-2.93	2.702542	80.46135	-1.51353	-3.90326
Std. Dev.	22.60585	660.0669	0.946794	0.882164	10.00382	2.544191	4.205333
Skewness	0.969622	0.690251	-2.7483	-0.08172	0.164238	-1.42295	0.809318
Kurtosis	3.599998	2.288351	9.991196	1.847329	1.657501	4.778794	3.269748
Jarque-Bera	2.575417	1.507643	49.43082	0.847101	1.193875	7.039508	1.682965
Probability	0.275902	0.470565	0	0.654718	0.550495	0.029607	0.431071

Source: Author's Computation (2018)

5.2: Unit Root Analyses

In order to obtain information about the integration properties of series and possible cointegration among variables, it is important to determine the unit root properties of the series in this study. This will also help in choosing an appropriate econometric technique of analysis to adopt. If the series are level-stationary, simplified assumptions can be made about the relationship between the dependent and independent variables. However, if not handled properly, difference-stationary series may lead to bogus results. To determine the unit root properties of the data in this analysis, the augmented Dickey-Fuller (ADF) as well as the Phillip-Perron (PP) are deployed. Results of both tests indicate that only GDPG and RIR are stationary at levels while all the others (LQD, EQT, LTA, ROA and CPI) series are non-stationary and integrated of order one, and become stationary only after differencing once. The implication of these results is that the relationship between the dependent variable and the bank level determinants can be investigated using the error correction model (ECM), provided cointegration is established among the variables while autoregressive distributed lag (ARDL) model will be appropriate in examining the relationships between the dependent and economy-wide determinants in this study.

Table 4.2: Results of Unit Root Tests

UNIT ROOT TEST TABLE (PP)								
Variable		ALQD	AEQT	AROA	LATA	GDPG	CPI	RIR
Level								
With Constant & Trend	t-Statistic	-1.7225	-1.3048	-2.4537	-1.5973	-5.3624	-3.2838	-5.1256
	Prob.	***0.6862***	***0.8422***	***0.3413***	***0.7409***	***0.0042***	***0.1094***	***0.0060***
		n0	n0	n0	n0	***	n0	***
At First Difference								
With Constant & Trend	t-Statistic	-4.4328	-7.844	-6.7316	-5.2846	-16.796	-4.2363	-15.9331
	Prob.	***0.0199***	***0.0002***	***0.0001***	***0.0056***	***0.0001***	***0.0269***	***0.0001***
		**	***	***	***	***	**	***
UNIT ROOT TEST TABLE (ADF)								
At Level								
With Constant & Trend	t-Statistic	-1.9221	-1.8527	-2.5941	-1.8029	-5.1508	-2.5051	-5.0176
	Prob.	***0.5906***	***0.6250***	***0.2871***	***0.6487***	***0.0058***	***0.3208***	***0.0071***
		n0	n0	n0	n0	***	n0	***
	At First Difference							
With Constant & Trend	t-Statistic	-4.2921	-4.5898	-3.8724	-3.4184	-6.8349	-4.2192	-5.2829
	Prob.	***0.0247***	***0.0157***	***0.0469***	***0.0924***	***0.0006***	***0.0276***	***0.0067***
		**	**	**	*	***	**	***
Notes: (*) Significant at the 10%; (**) Significant at the 5%; (***) Significant at the 1%. and (no) Not Significant								
*MacKinnon (1996) one-sided p-values.								

Source: Author's Computation (2018).

5.3 Error Correction Model (Bank Level Determinants)

Both the trace and eigenvalue tests in the Johansen counteraction test indicates four counteracting equations in the model. Having established counteraction among the bank level variables, the error correction model is estimated to examine the relationship between liquidity and bank level determinants. Results (See Table 4.3 below) indicate that the estimated long-run coefficients are not statistically significant at the 5% level. Furthermore, as the error correction term which measures the speed of adjustment process of liquidity (LQD) to long run equilibrium given changes in bank level determinants (EQT, ROA, and LTA) is negative and significant at the 5% level of significance ($ECT = -0.37;\ p < 0.05$). This implies that the deviation of liquidity from the path to long run equilibrium given shocks to bank level determinants will die away gradually over time. Specifically, about 37% of deviations of liquidity from long run path caused by shocks due to bank level determinants will be corrected for annually, implying that convergence to long run equilibrium path can be expected to take about three years, provided there are no new shocks introduced during this period.

In the short run, only ROA shows evidence of a negative and statistically significant effect on bank liquidity (β = - 10.30; $p < 0.05$) while EQT and LTA show no evidence of statistically significant effect on liquidity. Specifically, a unit (in percentages) increase (decrease) in ROA is expected to reduce (increase) liquidity by about 10.3% annually. The significance of the ROA short run coefficient is an indication that there exists a causal relationship running from ROA to LQD. In addition, Granger causality test reveals that none of the dependent variables has a causal effect on LQD but LQD is found to Granger-cause ROA and CPI at the 5% level. Diagnostic tests also indicate that the model is adequate. Both Breusch-Godfrey serial correlation LM and Breusch-Pagan-Godfrey heteroscedasticity tests show that the model is free from serial correlation and heteroscedasticity. Cusum test also shows that the model is stable at the 5% level of significance. Similarly, the residual diagnostic check using the Jarque-Bera test shows that the residual of the regression is normally distributed.

Table 5.3: Results of Error Correction Model (Bank Level Determinants)

Dependent Variable: D(LQD)			
Variable	**Coefficient**	**t-Statistic**	**Prob.**
D(EQT)	0.00555	0.455841	0.6582
D(ROA)	-10.30271	-4.196116	0.0018
D(LTA)	-12.8637	-1.688185	0.1223
ECT	-0.373174	-2.267387	0.0468
R-squared: 0.849475; Adjusted R-squared: 0.804317; Durbin-Watson stat: 1.720938			

Source: Author's Computation (2018)

5.4 Results of Autoregressive Distributive Lag (ARDL) Model

Results of the ARDL regression with bounds testing (see Table 4.4 below) show that there is evidence of long run relationship in the model estimated as the F-statistic (4.84) is higher than the upper critical bound (4.35) at the 5% level of significance. This implies that the null hypothesis which states that there is no lung run relationship between LQD and macroeconomic variables has to be rejected at the 5% level. Results also show that, in the long run, both CPI and RIR have negative and statistically significant effects on LQD at the 5% level of significance. Specifically, 1% increase (decrease) in each of RIR and CPI is expected to bring about 6.73% and 2.04% decrease (increase) in LQD, respectively.

Table 5.4: Results of Autoregressive Distributive Lag (ARDL) Model

Dependent Variable: ALQD			
Selected Model: ARDL(1, 1, 1, 0)			
Cointegrating Form			
Variable	**Coefficient**	**t-Statistic**	**Prob.**
D(GDPG)	5.490601	1.899438	0.0993
D(RIR)	-0.067434	-0.04638	0.9643
D(CPI)	-1.661242	-3.59405	0.0088

CointEq(-1)	-0.812488	-3.71332	0.0075
Long Run Coefficients			
Variable	Coefficient	t-Statistic	Prob.
GDPG	0.669622	0.148479	0.8862
RIR	-6.728323	-2.46056	0.0434
CPI	-2.044635	-4.01941	0.0051
C	249.852663	4.365008	0.0033

Source: Author's Computation (2018)

Furthermore, the error correction term is negative as expected and significant at the 1% level (ECT = -0.81; $p < 0.01$), indicating that the long run relationship is significant and that about 81% of short run deviations of LQD from long run equilibrium path due to shocks from the macroeconomic variables will be corrected for annually. In the short run, CPI has a negative and statistically significant effect on LQD at the 5% level while GDP growth has a positive effect and is only significant at the 10% level of significance. Specifically, 1% increase (decrease) in CPI will result in 1.66% decrease (increase) in LQD annually while 1% increase (decrease) in GDP growth is expected to bring about 5.49% increase (decrease) in LQD annually. Both Breusch-Godfrey serial correlation LM and Breusch-Pagan-Godfrey heteroskedasticity tests show that the model is free from serial correlation and heteroskedasticity. Cusum test also shows that the model is stable at the 5% level of significance. Similarly, the residual diagnostic check using the Jarque-Bera test shows that the residual of the regression is normally distributed. These show that the regression model is adequate.

4.6 Discussion of Findings

Correlation analyses reveal that LQD is strongly and negatively associated with all the three bank level determinants (EQT, ROA and LTA) and moderately and negatively associated with CPI while it does not show any significant association with GDPG and RIR. Specifically, the findings of this study indicate that there is statistical evidence of a negative correlation of liquidity with all three bank level variables and CPI. Even though cointegration was found among the bank level variables and liquidity the long-run coefficients are not statistically significant at the 5% level while only ROA has a negative and statistically significant effect on bank liquidity.

The implication of the findings of the relationship between bank liquidity and bank level determinants is that, of the three bank level determinants considered; only ROA has a negative and significant effect on liquidity, and only in the short run. The negative effect of ROA on bank liquidity in the short run is in agreement with a priori expectation of a negative relationship since liquidity of banks is expected to hinder bank's ability to put funds to profit yielding ventures.

These findings agree with Mohamad *et al*. (2013) and the theory of too big to fail but is in contrasts with Laeven and Levine (2003), Kosmidou, Tanna and Pasiouras, (2005). The insignificant impact of EQT and LTA is in line with Chagwiza (2014) findings. Similarly, results of the ARDL regression with bounds testing reveals that only CPI and RIR have a negative and significant long run effects on LQD while only CPI has a negative and significant

short run effect on LQD. These findings agree with Smith and Staikouras dan (2003) & Azam et al. (2013) and in contrasts with Chagwiza (2014) findings.

6.0 SUMMARY

6.1 Conclusion

Based on the findings, the study draws the following conclusions. Counteraction is established between liquidity and selected bank-level variables; however, no significant long-run relationship can be established. In the short run, performance of Islamic Banks in Malaysia negatively affects their liquidity while capital and size of these banks do not have significant effects on their liquidity.

Furthermore, counteraction exists between liquidity and selected macroeconomic variables. Cost of capital and general price level are found to negatively and significantly affect liquidity of Islamic banks in the long run while economic growth does not affect their liquidity. However, in the short run, only general price level negatively affects liquidity of Islamic banks in Malaysia while economic growth and cost of capital do not affect their liquidity.

Finally, general price level and cost of capital are found to have causal effects on liquidity in the long run. Bank performance and general price level have causal effects on liquidity in the short run. Granger causality result also reveals that liquidity causes both bank performance and general price level in Malaysia in the short run.

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