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ASYMMETRIC CAUSAL LINKAGES BETWEEN LIQUIDITY AND PROFITABILITY FOR MENA ISLAMIC BANKS

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ABSTRACT

This paper investigates the impact of liquidity on Islamic bank profitability. We examine the existence of asymmetric causal linkages or structural shifts in the profitability-liquidity nexus for a sample of 34 Islamic banks in the Middle East and North Africa (MENA) countries over the period 2005-2017 using the Panel Threshold Regression and controlling for the bank-specific and macroeconomic variables. Empirical evidence highlights a non-linear relationship between liquidity and Islamic bank profitability. Indeed, there is a significant negative relationship between liquidity and profitability if the ratio of loan/total assets does not exceed the threshold. Contrariwise, liquidity positively affects profitability. Furthermore, the empirical evidence shows that bank size is adversely related to banks' profitability given the economies of scale issues of Islamic banks. The CAR impact is well emphasized above and below the threshold. We highlight that Islamic banks face a trade-off between liquidity and profitability. They are recommended to strengthen the liquidity risk management instruments to improve their profitability notably within a framework of Basel III liquidity requirements to maintain adequate high-quality liquid assets.

Keywords: Liquidity, Profitability, Nonlinear approach, Islamic banks.
JEL classification: G21; G32; Z12.

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I. INTRODUCTION

After the 2008 global financial crisis, Basel III requires that banks should maintain a minimum net stable funding ratio (NSFR) as safer and more stable funding sources and also unencumbered high-quality liquid assets to meet liquidity needs in a 30-day liquidity stress scenario (LCR). This regulatory change highlights the growing importance of liquidity risk and its management. Moreover, it revives the debate regarding the liquidity-profitability nexus.

On one hand, some authors note that the new liquidity rule boosts bank profitability. As the liquidity increases, the likelihood of default is reduced resulting in higher profit thanks to the financing costs reduction (Khan et al, 2015). With LCR requirements, the bank can better manage its stable funding sources contributing to higher bank performance (Said, 2014). On the other hand, it is argued that while banks can at first earn higher profit, they lose money afterward. Indeed, the narrowing spread between interest income and interest expenses limits the bank's performance (Sidhu et al, 2022). Consequently, banks are trading their profitability off for low-earning liquid assets to avoid risks (Ahmad et al, 2022).

Nevertheless, maintaining adequate liquidity while maximizing profits is particular to Islamic banks. Global Islamic banking is reaching USD 2.10 trillion in the fourth trimester of 2021 with a growth of 6.5% year-on-year despite a resurgence of the COVID-19 pandemic (IFSB, 2022)[1]. Since Islamic bank activity is distinguished by a Profits and Losses Sharing principle on both the asset and liability sides, specificities are involved in the Islamic bank liquidity issue (Ben Jedidia, 2020). Furthermore, Islamic bank liquidity management is facing some challenges such as; "i. the refinancing risk, ii. the inadequacy of the liquidity infrastructure in the jurisdiction, or iii. the inability of a particular counterparty to renew a liquidity facility, in the absence of more general liquidity stress" (Central Bank of the U.A.E report, 2022, p.14). So, Islamic banks are "more exposed to liquidity risk" than conventional and hybrid ones (Mohamed et al, 2020). Considering a panel of 445 Islamic banks during the period 2010–2018, Abdo et al (2022) point out that although Islamic banks maintain a higher short-term liquidity buffer, they enjoy a lower net stable fund ratio (NSFR) compared to conventional banks.

Empirical research on the relationship between profitability and liquidity for Islamic banks reach different conclusions highlighting either positive (e.g. Wasiuzzaman and Tarmizi, 2010; Khasharmeh, 2018; Mumtaz et al, 2022) or negative (e.g. Alzoubi, 2017; Elfeituri and Alotaibi, 2021) or even insignificant links (e.g. Chowdhury, 2015; Malek and Rao, 2022). Consequently, it is difficult to make clear predictions of the liquidity and profitability trade-off for Islamic banks.

1 The compound annual growth rate of financing and deposits are respectively 4.4% and 3.7% from June 2014 to December 2021 (IFSB, 2022).

Moreover, few empirical studies have considered the nonlinear relationship between liquidity risk and bank profitability[2]. For example, Shahchera (2012) analyses the liquidity asset and liquidity asset-square for estimating the liquid asset and profitability relationship of the Islamic bank of Iran from the period (2002-2009) using the Generalized Method of Moment (GMM). The author concludes with a non-linear relationship between profitability and holding liquid assets[3]. Indeed, the performance is degrading with higher liquidity. There should be a balance between profitability and liquidity requirements. Dezfouli et al., (2014) demonstrate that the relation between liquidity and profitability ratios is U-shaped. The authors explain that if the bank maintains cash assets, this reduces its ability to invest and limits its profit opportunities. Nevertheless, raising cash sustains the investors' confidence in the bank's safety and increases its ability to absorb further credit, and in doing so, the bank's profitability goes up.

It appears that most of the studies on the Profitability-Islamic bank liquidity have used a linear model (Ramlan and Sharrizat, 2016). So, we dealt with this issue by investigating whether liquidity has an inverted U-shaped relationship with bank profitability for a sample of 34 Islamic banks in the Middle East and North African (MENA) countries over the period 2005-2017 by using a panel threshold regression. The MENA countries make up about 77.2% of the global Islamic banking assets in 2021 (IFSB, 2022): Saudi Arabia (30.6%), Iran (17%), UAE (10%), Qatar (6.6%), Kuwait (6.3%), Bahrain (3.3%), Egypt (1.3%), Jordan (0.9%), Oman (0.7%), Libya (0.3%) and Palestine (0.2%)[4].

This study contributes to the empirical literature on Islamic banking. To the best of the authors' knowledge, it is the first investigation of the nonlinear relationship between liquidity risks and profitability in MENA Islamic banks using an estimation technique forwarded by Hurlin (2010) known as the Panel Threshold Regression as an extension of Hansen's (1999) non-dynamic panel threshold regression.

The remainder of this paper was organized as follows: Section 2 provides an empirical literature review of the liquidity-bank profitability nexus for Islamic banks. Section 3 introduces our data and details our methodology. Our empirical results are reported in Section 4. The final section is devoted to drawing our main conclusions and forwarding some policy recommendations.

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2 In a conventional framework, Bordeleau and Graham (2010) examined the impact of liquid asset holdings on Bank Profitability for a sample of large U.S. and Canadian banks. Their empirical evidence shows that "profitability is improved for banks that hold some liquid assets, however, there is a point beyond which holding further liquid assets diminishes a bank's profitability, all else equal" (p.4). Besides, using panel data of Eastern and Central European commercial banks over the period 2003- 2010, Munteanu (2013) advocated that the slightly positive and negative impact of liquidity on both ROE and ROA respectively is explained by a non-linear relationship between the variables. Le et al. (2020) conclude a quadratic relationship between bank profitability and liquidity ratios for U.S. commercial banks.

3 The business cycle significantly affects banks since if regulations diminish the constraints imposed on banks, these banks achieve profit (Shachera, 2012).

4 As reported by IFSB (2022), Islamic banking share in total banking assets in 2021 in MENA countries are Iran (100%), Saudi Arabia (77.2%), Kuwait (51.9%), Qatar (28.1%), United Arab Emirates (23.9%), Jordan (21.3%), Bahrain (21.2%), Palestine (18%), Oman (15.3%), Iraq (6.1%), Libya (6.1%), Tunisia (5.1%), Egypt (4%), Algeria (2.4%) and Lebanon (0.4%).

II. EMPIRICAL LITERATURE REVIEW

The relationship between liquidity and profitability is an important topic in the banking field. Liquidity has been adopted as an explanatory variable of bank profitability in several studies (Bourke (1989), Molyneux and Thornton (1992); Khasharmeh, (2018) among others). In this section, we focus on some empirical research that look at Islamic banks.

Wasiuzzaman and Tarmizi (2010) investigate the determinants of the profitability of 16 Islamic banks/windows in Malaysia from 2005 to 2008. While capitalization and asset quality have an inverse relationship with bank performance, liquidity and operational efficiency positively affect the profitability of Islamic banks.

Iqbal (2012) performs a comparative study between 5 Islamic and 5 conventional banks in Pakistan over the period 2007-2010. The author comes to the evidence that similar to their conventional counterparts, Islamic banks' profitability is positively related to liquidity ratio. However, for the model of Islamic banks, it is shown that following a 1% increase in ROA, nearly 76% of the liquidity position is observed (compared to 40% for conventional banks).

The empirical study of Ramzan and Zafar (2014) investigates the relationships between the internal bank's characteristics and liquidity risk (measured by the ratio of the most liquid assets to total assets) for 5 Islamic banks in Pakistan over the period 2007-2011 using a Fixed Effect Least Square Regression model. They point out that only the bank's asset size has a statistically positive and significant relationship with liquidity risk. Moreover, the authors find that ROE, ROA, CAR, and Networking Capital have insignificant relationships with liquidity risk.

Ben Jedidia and Hamza (2014) explore the determinants of liquidity of IBs in the Middle East and North Africa (MENA) and Southeast Asian countries. They find that profitability is positively associated with liquidity risk while CAR and investment have a significant and negative relationship with this risk.

Chowdhury (2015) examines the factors that affect the profitability of 11 Islamic banks in Malaysia during the period from 2007 to 2013. The Pooled Ordinary Least Square estimates reveal that overhead costs negatively affect the bank's profitability whereas, equity financing positively and significantly influences the performance of Islamic banks. However, the liquidity risks have an insignificant impact on the profitability of Malaysian Islamic banks.

Alzoubi (2017) looks into the liquidity risk determinants in 42 Islamic banks in 15 countries from 2007 to 2014. He concludes that high profitability can be achieved at a very low liquidity level. He argues that when banks invest in more profitable assets, they reduce their investment in low-profit and highly liquid assets which explains the positive correlation between liquidity risk and profitability. In an Islamic framework, customers become partners in a real project which is very difficult to liquidate. This is different from conventional banks that can provide their customers with direct loans and sell them to third parties to provide liquidity if needed.

Using panel data analysis, Shamas et al., (2018) perform a research on 7 Bahraini Islamic Banks from 2007 to 2011 to identify the association between liquidity risk (cash to total assets as proxy) and specific bank determinants. The results show that the liquidity risk is reliant on idiosyncratic factors. They find a positive

relationship between liquidity risk and return on average assets. Besides, this study shows a significant and negative relationship between the Non- Performing Loans (NPLs) and Capital Adequacy Ratio (CAR); however, both the bank's size and the financial crisis have insignificant effects on liquidity risk.

Khasharmeh (2018) examines the impact of liquidity on six Islamic banks' profitability in Bahrain over the period from 2010 to 2015. Multiple regression analyses are used by integrating 4 liquidity variables (cash & due from banks to total assets (CDTA), cash & due from banks to total deposits (CDTD), investment to total assets (INVSTA), and investment to total deposits (INVSTD) and 3 profitability variables namely Return on assets (ROA), Return on Equity (ROE) and Return on deposits (ROD) as dependent variables. The main conclusion is that liquidity strongly affects the profitability of Islamic banks in Bahrain over the study period. The CDTA is significantly correlated with the profitability variables ROA and ROD at a 10% level but insignificantly correlated with ROE. Besides, only the INVSTA and INVSTD are found to be significant with ROE.

Insani and Muflih (2019) investigate the determinants of 12 Islamic banks' performance in Indonesia during the period 2013 - 2017. They use the Panel Least Square model to test the effect of many variables such as size, capital adequacy, liquidity Risk, operating cost, Income diversification, and other macroeconomic variables on bank performance. They show that bank performance (Return on Assets) is negatively related to liquidity risk, Operating Cost, and inflation.

Focusing on the impact of the principle of profit- and losses sharing on the exposure to liquidity risk of 23 Islamic banks in GCC Gulf Corporation Council (GCC) for the period 2005-2016, Ben Jedidia (2020), concludes that the profitability proxy namely the return on assets has a negative and significant impact on Islamic bank liquidity. The study explains that as "the bank holds more cash, it deprives itself of placing funds and earning returns, which causes its profitability to decline" (p. 1971).

Using a dynamic generalized method of moments, Elfeituri and Alotaibi (2021) consider a sample of Islamic banks from 12 developing counties during the period 2004-2017 and point out that Islamic bank profitability is negatively associated with liquidity (proxied by cash and cash equivalent to total assets) and deposit ratio. Furthermore, profitability is reduced by the increases in asset quality.

Addou and Bensghir (2021) examine variables that affect the liquidity risk for 4 Islamic Emirati banks during the period from 2014 to 2020. They note that although the CAR and ROE have a positive and significant effect on bank liquidity, ROA and NPL hurt Islamic bank liquidity.

Mumtaz et al (2022) find that the liquidity ratio has a positive significant effect on the financial performance of 7 banks (ROA, ROE) in Pakistan during the period 2010-2019 except quick ratio which presents an insignificant effect on bank performance.

Malek and Rao (2022) investigate the determinants of a panel of Islamic banking profitability from four regions: Gulf Cooperation Council countries, Middle East except (GCC) countries, Asian-Pacific and Western Asia over the period 2011- 2020. They conclude that the liquidity ratio proxied by current assets/ current liabilities is not significantly correlated with Return on Average Assets. Besides, they note that all macroeconomic factors such as GDP growth rate, inflation growth rate,

and the banking system type are not significantly associated with the selected Islamic banks.

Recently, Javid et al (2022) conclude that liquidity creation is negatively associated with profitability but positively with banking stability for a sample of 28 banks in Pakistan from 2006 to 2019 following the Generalized Method of Moments method. The authors point out the crucial role of liquidity creation in Pakistan's Islamic bank profitability.

In sum, there is no clear evidence regarding the liquidity-profitability nexus for Islamic banks. Besides, most of the previous research chooses a linear model and doesn't focus on asymmetric linkages between profitability and liquidity for Islamic banks. This investigation tries the fill the gap.

III. METHODOLOGY

In this section, we present our model, data description, and the test for the existence of liquidity threshold effects.

3.1. Model

Considering the previously discussed literature, our linear regression equation to study the relationship between liquidity risk and profitability of Islamic banks can be written in the following form:

$$ROA_{it} = \alpha_0 + \alpha_1 laon_{it} + \alpha_2 size_{it} + \alpha_3 car_{it} + \alpha_4 cost_{it} + \alpha_5 gdp_{it} + \alpha_6 inf_{it} + \varepsilon_{it} \quad (1)$$

i = 1, 2,…, N and t = 1,2,…,T

where ROA_{it} represents the logarithm of Returns on Assets, $laon_{it}$ denotes the logarithm of the ratio of loans on total assets; $size_{it}$ is the algorithm of total assets; car_{it} represents the logarithm of the ratio equity by total assets, $cost_{it}$ specifies the cost to income ratio; gdp_{it} is the logarithm of the real GDP per capita and inf_{it} is the logarithm of nnnual inflation rate. The εi_t is the error term assumed to be serially uncorrelated with zero mean and constant variance.

We aim to examine the existence of asymmetric relations in the profitability-liquidity risk nexus following Hansen (1999). Our Panel Threshold Regression (PTR) is written as follows:

$$y_{it} = \mu_i + \beta_1' x_{it} I(q_{it} < \delta) + \beta_2' x_{it} I(q_{it} > \delta) + \varepsilon_{it} \quad (2)$$

For $i = 1,\ldots, N$ denotes the cross-section; $t = 1,\ldots, T$ the time dimensions of the panel. μ_i is the bank-specific fixed effect. We assume that the error term ε_{it} is identically and independently distributed (iid) with a null mean and a constant variance. $I(.)$ is the indicator function of the regime defined by the threshold variable q_{it}, *laon* is a proxy of liquidity, δ is the threshold value, y_{it} is the profitability of a bank i in a country j at time t, and finally x_{it} is a k vector of the control variables.

The observations are divided into two 'regimes' distinguished by different regression slopes, β_1 and β_2. Noting that the elements of x_{it} and threshold variable q_{it} are assumed not time-invariant. The analysis is asymptotic with fixed T as $n \to \infty$.

The estimation process requires two stages. First, we calculate the averages of (1) over the time index *t* by considering:

$$\bar{y}_i = \mu_i + \beta' \bar{x}_i(\delta) + \bar{\varepsilon}_i \tag{3}$$

$$\bar{y}_i = \frac{1}{T}\sum_{t=1}^{T} y_{it},\ \bar{\varepsilon}_i = \frac{1}{T}\sum_{t=1}^{T} \varepsilon_{it} \text{ and } \bar{x}_i(\delta) = \frac{1}{T}\sum_{t=1}^{T} x_{it}\,(\delta)$$

$$\bar{x}_i(\delta) = \begin{pmatrix} \frac{1}{T}\sum_{t=1}^{T} x_{it}\, I(q_{it} \le \delta \\ \frac{1}{T}\sum_{t=1}^{T} x_{it} I(q_{it} > \delta \end{pmatrix}$$

The difference between (2) and (3) is :

$$y_{it}^* = \beta' x_{it}^*(\delta) + \varepsilon_{it}^* \tag{4}$$

Where $y_{it}^* = y_{it} - \bar{y}_{i'}\ x_{it}^*(\delta) = x_{it}(\delta) - \bar{x}_i(\delta)$ and $\varepsilon_{it}^* = \varepsilon_{it} - \bar{\varepsilon}_i$

Second, by eliminating the fixed individual effects, we apply the least squares sequential in the second step in TAR models. Then, we estimate the slope coefficients β for fixed thresholds. The equation (4) can be rewritten as follows:

$$Y^* = X^*(\delta)\beta + \varepsilon^* \tag{5}$$

Where β can be estimated following the OLS method for any δ. Thus:

$$\hat{\beta}(\delta) = \left(X^*(\delta)'X^*(\delta)\right)^{-1} X^*(\delta)'Y^* \tag{6}$$

So, the regression residuals vector is:

$$\hat{\varepsilon}^*(\delta) = Y^* - X^*(\delta)\hat{\beta}(\delta)$$

The sum of the squared errors is $S_1(\delta) = \hat{\varepsilon}^*(\delta)'\hat{\varepsilon}^*(\delta)$

According to Hansen (1999), the easiest way to estimate δ is to minimize the sum of the squared errors as a function of the expected threshold value. Consequently, the optimum value is:

$$\hat{\delta} = \arg\min\ S_1(\delta) \tag{7}$$

Once $\hat{\gamma}$ is obtained, the slope coefficient estimate is $\hat{\beta} = \hat{\beta}(\hat{\gamma})$. The residual vector is $\hat{\varepsilon}^* = \hat{\varepsilon}^*(\hat{\gamma})$.

Then, the Lagrange Multiplier (LM) bootstrap method is applied to calculate the asymptotic critical value and the p-value. By considering H_0, the standard F-statistics is calculated as follows:

$$F_1 = (S_0 - S_1(\hat{\delta}))/\hat{\sigma}^2 \quad (8)$$

Where S_0 and S_1 are the residual sums of squares under the null hypothesis.

Consequently, we test the null hypothesis if linearity is strongly rejected. The Likelihood Ratio (LR) statistic is calculated under the null hypothesis:

$$LR_1(\delta) = \frac{S_1(\delta) - S_1(\hat{\delta})}{\hat{\sigma}^2} \quad (9)$$

It is worth noting that $S_1(\delta)$ and $S_1(\hat{\delta})$ are the residual sums of squares from equation (5) given the true and the estimated value, respectively. The asymptotic distribution of $LR_1(\delta_0)$ is not normally distributed and has the inverse $c(\alpha) = -2\ln(1-\sqrt{1-\alpha})$. Thus, if $LR_1(\delta_0) \leq c(\alpha)$, the null hypothesis of H_0: $\delta = \delta_0$ cannot be rejected.

3.2. Data Description and Sources

In this research, the key relationship of interest is between liquidity risk and profitability for a sample of 35 Islamic banks in the Middle East and North Africa (MENA) countries over the period 2005-2017.

These variables can be described as follows:

- The dependent variable ROA is used as a proxy of bank profitability and measured by the ratio "Net income/Total assets". For Islamic banks, this ratio is expressed as the ratio of Net income after tax and Zakat to Total assets. Profitability is an indicator of Islamic banking performance. Following the existing literature, the return on equity (ROE) (reflects the shareholder point of view) and the return on assets (ROA) (designates the management point of view) (e.g. Koehn and Santomero, 1980), are the main proxies for performance. A higher level of profitability shows the best level of performance. The ROA ratio is usually employed in literature to compare the financial performances of banks.
- The ratio of loans on total assets (loan) is used as a proxy of liquidity risk. It designates the loan growth rate and includes all credit categories, that is to say customer loans and interbank loans. Since Islamic banks do not similarly offer loans as conventional banks, the term (loan) is a generic term used to describe equity financing products. In general, loans are less liquid than other assets. So, if loans on total assets are higher, the bank has a lower liquidity (Bunda and Desquilbet, 2008).
- As control variables, at the bank level, we used total assets to capture the bank size (size), the ratio equity/total assets as a proxy of capital adequacy (car), and cost to income ratio (cost) to reflect the cost of running a business compared to its operating income. At the macroeconomic level, the real GDP per capita (DPC) was considered a measure of economic development with 2005 serving as the base year and annual inflation rate (inf).

The variables were expressed in natural logarithm form and extracted from Bankscope and the World Bank Indicators database.

The descriptive statistics of our variables are reported in table 1.

Table 1.
Summary Statistics

Designation	ROA	loan	Size	car	cost	gdp	inf
Mean	0.1888	0.5537	14.1049	0.1813	61.0343	4.1668	5.5874
Median	0.0153	0.5705	14.4165	0.1395	50.5432	3.192	4.869
Maximum	3.6904	4.2075	18.126	1.1931	511.88	26.17	20.286
Minimum	-1.1140	0.0040	6.273	-0.1256	10.088	-8.632	-4.863
Standard Deviation	0.5611	0.2536	2.0819	0.1632	44.5651	3.8836	4.4144
Skewness	3.2853	6.4666	-.6819654	2.974763	5.282924	1.28059	.7691338
Kurtosis	15.4958	98.9878	3.301213	13.42592	47.14237	9.618495	3.396586
Jarque-Bera	3671	1.7e+05	35.93	2654	3.8e+04	927.5	46.48
Probability	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Observations	442	442	442	442	442	442	442

As shown in Table 1, the mean value of profitability (ROA) is significantly positive, showing that banks on the sample enjoy healthy profitability. The average ratio of loans to total assets of the MENA banks is around 0.55 from 2005 to 2017. During the same period, the average of ratio equity by total assets (car) is between -0.1256 and 1.1931 with a low standard deviation (0.1632). Besides, the skewness is not too high to affect the normality. The Kurtosis value for all the variables is positive and the probability of Jarque-Bera<0.001.

3.3. Test for the Existence of Liquidity Threshold Effects

To study the relationship between profitability and liquidity under different liquidity level regimes for the 34 Islamic banks, we test for the threshold effects considering *loan* as the threshold variable. We applied Hurlin (2010) testing procedure to determine the number of thresholds, which tests the linear model null hypothesis against the two-regime model alternative hypothesis. The results of the threshold test and asymptotic p-values are reported in Table 2.

Table 2.
Summary of the Threshold Test Results

Test Hypothesis	F_1 test	Bootstrap P-Value	Threshold Estimates	95 % Confidence Interval
H_0: No threshold	34.2342***	0.000	0.4957	[0.3380; 0.5395]
H_0: One threshold	21.499	1.000	0.655	-

Notes: Test of Null of no Threshold against Alternative of Threshold. The threshold is obtained by the minimized sum of the squared residual. *** represents significance at 1% levels

The F-statistics (F1) in the first line is 34.23 and is significant at 1%. The bootstrap p-value is 0.000 indicating the existence of a threshold. The threshold value is 0.4957.

Consequently, the data on liquidity level in Islamic banks can be divided into two regimes. We compute the LR test mentioned above, and the 95% confidence intervals as [0.3380, 0.5395] before and after the threshold. Therefore, the Islamic bank profitability may differ along with the liquidity level.

IV. RESULTS AND ANALYSIS

The empirical results are shown in Table 3. The linear estimation demonstrates that only bank size, cost, and inflation are significantly associated with Islamic bank profitability. Yet, the liquidity proxy seems not relevant for the bank's performance.

Table 3.
The Estimation Results of the Profitability –Liquidity Risk Relationship for Islamic Banks

Variables	Linear Model	Threshold Model	
	OLS without threshold	Regime 1 ≤ 0.4957	Regime 2 >0.4957
loan	0.1699(0.093)	-0.2547(2.555)**	0.6102 (2.655)**
size	-0.1233(0.000)**	-0.2421(11.79)***	-0.3306 (10.891)***
car	-0.1273(0.307)	-0.8424(-4.5949)**	0.5374(2.2285)**
cost	-0.0032(0.000)**	0.0021(0.4724)	-0.0024(1.98)*
gdp	-0.0092(0.020)	-0.0139(-2.8247)**	-0.02103(3.751)**
inf	-0.0245(0.000)**	0.0125(1.997)*	-0.00748(1.973)**
Observations	442	148	294

Notes: ***, **, and * represent significance at 1%, 5% and 10%, respectively.

For the threshold model, the empirical evidence shows a structural shift of regime and a coefficient change from one regime to another. The threshold of the ratio of Loan / total assets is 0.495, which means that the effect of liquidity risk on the Islamic bank profitability is not the same whether the ratio loan/total assets is under or above this threshold. This shows a non-linear relationship between liquidity risk and profitability. Our result is in line with that of Shahchera (2012) for Iranian banks over the period (2002-2009) concluding that there is a non-linear relationship between profitability and holding liquid assets. Besides, it conforms with the suggestion of Bordeleau and Graham (2010), Munteanu (2013) and Le et al. (2020) for conventional banks.

In the first regime, the relationship is negative which means that an increase in loan/total assets lowers Islamic banks' profitability. This is corollary to the fact that financing and doing so, with fewer liquid assets lead to less profitability if the ratio of loan/total assets is less than 0.49. In other words, liquidity risk reduces the profitability of Islamic banks. This is in line with the empirical evidence of Insani and Muflih (2019) pointing that performance (Return on Assets) is negatively related to liquidity risk. In others words, profitability and liquidity evolve in the same direction as pointed out by Khasharmeh (2018) and Mumtaz et al., (2022).

Nevertheless, in the second regime, if the proxy of liquidity risk is higher than the threshold, the relationship between loan/total assets and profitability

becomes positive. This result conforms Ben Jedidia and Hamza (2014), Alzoubi (2017), Shamas et al., (2018) among others revealing a positive relationship between liquidity risk and profitability. This means that if ratio of the loan/total assets exceeds 0.49, this contributes to a higher performance of Islamic banks. This can be attributed to the fact that financing growth leads to a better activity diversification and so to more profitability. The coefficient of about 0.6102 testifies that the magnitude of the liquidity effect is more important in the second regime compared to the first one.

Furthermore, the bank size negatively and significantly affects the Islamic bank's profitability. It appears that the coefficients in both regimes are very close and the size-profitability nexus seems to be invariant from one regime to another. Nevertheless, our empirical evidence is contrary to that of Insani and Muflih (2019) who finds that the bank size is not significantly associated with ROA. It is also opposite to the conclusion of Ramzan and Zafar (2014) highlighting a significant positive impact of size on Islamic bank profitability. This can be explained by the fact that the Islamic banks size does not enable them to enjoy the benefits of economies of scale through the supply of a large menu of financial services at lower costs.

The CAR coefficients are the most important among all the estimates, which sustains the relevance of the capital adequacy ratio for Islamic banks profitability and the importance of regulation on liquidity-profitability nexus. While the capital adequacy ratio negatively affects the bank profitability below the threshold, its effect is positive above the threshold. The shift is advocated by the fact that better conformity to capital regulation might induce a higher profitability as banks grant more financing. In this vein, Chowdhury et al. (2017) find that capital has a positive impact on the Islamic bank profitability.

Moreover, we find that cost has no significant effect on Islamic bank's profitability in the first regime. In the second regime, however, it has a significant negative impact on the return on assets of Islamic banks. In this regard, Zarrouk et al., (2016) concluded that Islamic bank's profitability is highly determined by cost-effectiveness. It can be argued, therefore, that more loans lead to more costs to endure, which in return lowers the bank's profitability, especially in the absence of economies of scale.

As for the macroeconomic factors, we find a negative relationship between GDP per capita and Islamic bank profitability for our sample. In addition, the impact of GDP in the second regime becomes almost twice that of the first one but remains lower compared to the other explanatory variables. In the MENA countries, the economic conditions do not contribute to boosting the Islamic bank profitability levels may be because of the competition with the conventional banks in a dual banking system.

In addition, the inflation level rate is among the determinants of Islamic bank profitability. It is positively correlated with profitability in the first regime. Yet, after the threshold, the inflation level lowers this profitability; in fact, the effect becomes very low (-0.00748). For instance, as loans grow, the Islamic banks' exposure to real economic activity increases and adjustment becomes more difficult.

V. CONCLUSION AND RECOMMENDATION

Profitability and liquidity are important variables in banking activities. This paper examines the asymmetric causal relationship between liquidity risk and bank profitability for a sample of 34 Islamic banks in the Middle East and North Africa (MENA) countries over the period 2005-2017. We controlled for bank-specific and macroeconomic variables using an estimation technique, known as the Panel Threshold Regression, forwarded by Hurlin (2010) as an extension of the non-dynamic panel threshold regression of Hansen (1999).

Our empirical evidence concludes that there is a structural shift in the liquidity risk-profitability nexus since there is a change from one regime to another. This is in agreement with Shachera (2012) and Bordeleau and Graham (2010) among others concluding a non-linear relationship between profitability and liquid assets holding.

In the first regime, an increase in loan/total assets lowers the Islamic bank profitability. This is a corollary to the fact that financing, and so fewer liquid assets, leads to less profitability if the loan/total assets ratio is less than 0.49. Nevertheless, in the second regime, if the liquidity risk proxy is higher than the threshold, liquidity risk and profitability are positively related.

As for the bank size effect, we note that it has a negative and significant impact on banks' profitability given the economies of scale issues of Islamic banks. The CAR impact is well emphasized above and below the threshold since it presents the most important coefficient among all the estimates. Besides, more loans lead to bearing more costs which in turn lowers the bank's profitability.

For the macroeconomic factors, we reveal a weak negative relationship between GDP per capita and Islamic bank profitability for our sample. The inflation level rate is among the determinants of Islamic bank profitability.

We highlight that Islamic banks face a trade-off between liquidity and profitability. It is recommended that MENA Islamic banks consider this threshold allowing a shift in the liquidity profitability relationship to optimize their liquidity position. Besides, they are invited to strengthen the liquidity risk management instruments to improve their profitability notably within a framework of LCR regulation that requires maintaining an adequate high-quality liquid asset. This should also be associated with the overcoming of the concentration in their assets' structure. Similarly, it is recommended to establish a well-organized Islamic monetary market providing sharia-compatible refinancing tools. Finally, we should note that this research can be further extended by investigating the effect of the COVID-19 crisis on the liquidity-profitability nexus of MENA Islamic banks.

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