

Les déterminants du risque de liquidité dans le système bancaire islamique

The liquidity risk determinant in the islamic bank system

ACHIBANE Mustapha

Enseignant chercheur

Ecole Nationale de Commerce et de Gestion de Kénitra (ENCGK)

Université Ibn Tofail

Laboratoire de Recherche en Sciences de Gestion

Maroc

achibm@hotmail.com

FENNASSI ADDOULI Intissar

Doctorante chercheuse

Ecole Nationale de Commerce et de Gestion de Kénitra (ENCGK)

Université Ibn Tofail

Laboratoire de Recherche en Sciences de Gestion

Maroc

intissar.fennassi@gmail.com

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Résumé

Le risque de liquidité est d'une importance particulière pour les banques islamiques. En effet, elles sont confrontées d'une part au manque d'instruments conformes à la charia et d'autre part, à l'impossibilité de transférer l'excédent de liquidité aux banques conventionnelles. Ce qui leur génère un problème de refinancement et donc une pénurie de liquidités.

Dans ce travail, nous étudions la liquidité bancaire en analysant les instruments de refinancement et d'autres facteurs internes et externes dans 8 banques islamiques sur 8 ans.

Pour cela, un modèle de données de panel est exprimé par la trésorerie et les équivalents de trésorerie en tant que variable dépendante et par un ensemble de facteurs internes et externes considérés comme des variables indépendantes. Ces variables explicatives sont les dépôts, les opérations interbancaires, les fonds propres, les opérations sur titres « sukuk », Return on Assets (ROA), Return On Equity (ROE), Net Cash Flow généré par l'activité, Net Cash Flow lié aux opérations d'investissement, Net Cash Flow liés aux opérations de financement et les variables macroéconomiques.

Les résultats de cette étude montrent que les variables relatives aux instruments de refinancement et aux opérations de trésorerie ont une relation positive avec la liquidité des banques islamiques, tandis que la variable relative aux ratios de rentabilité et aux indicateurs macroéconomiques est négativement liée à la liquidité bancaire.

Mots clés : Risque de liquidité ; Banques islamiques ; Instruments de refinancement ; Ratios de rentabilité ; Opérations de trésorerie.

Abstract

Nowadays, the illiquidity risk is very important for Islamic banks, because they face on one hand the lack of sharia compliant instruments and on the other hand, the impossibility of transferring the liquidity excess to conventional banks.

This situation leads to a problem in Islamic banks refinancing and a liquidity shortage.

In this work we study the banking liquidity by analyzing the refinancing instruments and internal and external factors that affect the liquidity of 8 Islamic banks in different countries over 8 years.

A panel data model is expressed by cash and cash equivalents at the end of the year as a dependent variable and by a set of internal and external factors considered as independent variables. This explanatory variables are Deposits, Interbank Operations, Equity, Securities Transactions “sukuk”, Return on Assets (ROA), Return On Equity (ROE), Net Cash Flow generated by the activity, Net Cash Flow linked to investment operations, Net Cash Flow linked to financing operations and Macroeconomic variables.

The study results showed that the variables relating to refinancing instruments and cash flow operations have a positive relationship with the liquidity, while the variable relating to profitability ratios and macroeconomic indicators are negatively related to bank liquidity.

Keywords: Islamic Banks; Liquidity Risk; Refinancing Instruments; Profitability Ratios; Cash Flow Operations.

Introduction

The liquidity concept is more than ever a hot topic. The recent financial crisis has shown us that liquidity risk is a crucial factor in the vulnerability of the financial system and a liquidity shortage can very quickly turn into a solvency problem. Liquidity could put the creditworthy bank into bankruptcy because it has to sell its assets well below their value to meet its current financial obligations (ALAOUI MDAGHRI A.(2020)).

However, even if islamic finance has not yet experienced serious crises and its basic principles can promote ethics in banking practice, this does not mean that the islamic financial system is safe from the abuses to which the classical system is exposed (Jouini, E., et O. Pastre (2009)). Moreover, the islamic or conventional world-size banks are dependent on the liquid and operational financial markets, to satisfy their needs for both liquidity and financing.

As in the case of conventional banks, islamic banks must integrate the financial system to carry out transformation operations, manage risks and in addition keep more cash compared to its conventional counterparts because they are new to the market. This automatically increases the risk in islamic banks (DAMAK (2014)).

In addition, unlike conventional banks, Islamic banks are confronted on the one hand with the sharia investment instruments lack and on the other hand with the impossibility of transferring the liquidity to organizations which are not Shariah compliant.

This is why, with the advent of Islamic finance, several authors have reviewed the structure of the specific Islamic banks liquidity risk determinants. Several authors have also studied the foundations of the interbank market and its effects on the composition of a bank's portfolio.

Based on several theoretical and empirical studies, unforeseen liquidity needs can be covered by collecting new deposits or by liquidating short-term investments. If that is not enough, a bank borrows on the interbank market (M.Costisor (2010)). As such, the authorities of several countries of the world have introduced sharia-compatible liquidity instruments so that Islamic banks can refinance themselves on the money market.

Therefore, the liquidity risk management is of particular importance for the case of Islamic banks and becomes a study subject worthy of further.

For the reasons aforementioned, we are convinced that a study of liquidity risk in the context of Islamic finance would promote the understanding of its management. This will lead us to define the liquidity risk determinants and identify their impact on Islamic banks liquidity position.

Thus, our research problem revolves around the following central question:

What are the liquidity risk determinants and what impact do they have on the Islamic banks liquidity position?

Thus, the objective of our study is to familiarize on the one hand, with the liquidity concept and Islamic banks refinancing of and to analyze on the other hand, the factors which influence the liquidity risk of 8 Islamic financial institutions in different country, by introducing internal variables mainly the refinancing instruments and other external indicators over the 8-year period from 2011 to 2018.

The purpose of this analysis is to know if the final results will indicate that the microeconomic and macroeconomic variables are positively correlated with the Islamic banks liquidity or have no impact on this liquidity.

It's in this context that this article is written and tries to explain the liquidity risk determinants and their impact on the Islamic banks liquidity position. We will firstly present a literature review which details the liquidity risk concept and the bank liquidity level determinants, as identified in the theoretical and empirical literature. Secondly, we will present the methodology adopted to finally present the results and discuss them.

1. LITERATURE REVIEW

1.1. Liquidity risk

The literature has retained, in the firstly, a narrow liquidity definition called funding liquidity. A second, broader definition, which relates more to market liquidity, considers that financial institutions are constantly involved in the assets trading (Arab & Anas,2008).

Bank liquidity, which designates the ability to meet repayment obligations by respecting the contractual deadline, integrates the interactions between these two dimensions of liquidity. In these conditions, it is necessary to differentiate between funding liquidity and market liquidity. These two forms of liquidity are different in nature, are not measured in the same terms and are not regulated in the same way.

The concept of funding liquidity mainly refers to assets that can be quickly converted into cash intended to meet requests for short-term funds withdrawal.

Market liquidity, on the other hand, relates to the banks ability to liquidate a non-monetary asset such as an investment security originally acquired to be held until maturity. (Valla et al., 2006).

Historically, the best practices in measure liquidity risk have focused on the liquidity ratios use. The ratios used include the ratio of liquid assets / deposits (Shen et al. (2001)) and the ratio of liquid assets to total assets. The lowest value of liquidity ratio makes the bank less liquid and more vulnerable to default. In addition, another studies use net loans to customer and short term funding ratio to assess bank's liquidity risk. The lower the value of these ratios, the lower the banks liquidity risk.

After the last financial crisis, several authors were interested in reviewing the determinants structure of the commercial banks liquidity risk.

Other means of assessing bank liquidity risk in addition to traditional liquidity ratios have emerged. The Basel Committee on Banking Supervision (2000) proposed a method for staggering maturities to measure the liquidity risk. Matz and Neu (2007) also indicated that banks can apply a balance sheet liquidity analysis, a cash capital position and a maturities mismatch approach to assess the liquidity risk.

1.2. Theoretical framework

The banks liquidity level determinants, as identified in the theoretical and empirical literature, can be represented as follows:

1.2.1. The Islamic banks characteristics:

The liquidity level determinants are mainly the islamic banks specific characteristics and macroeconomic conditions (Deléchat, C and al. (2012)).

The Islamic banks specific characteristics include the liquid assets components and external funding dependence (Chen, Y. K. and al. (2018)).

The approach developed by Allen and al. (2009), Schnabel and Shin (2004), Cifuentes et al. (2005) is based on the assumption that the markets are incomplete and imperfect and, as a result, banks short of funds are forced to sell assets to have liquidity.

From the models of Allen and al. (2009), Cifuentes and al. (2005) and the algorithm of Estrada and Osorio (2006), an illiquid bank will have to sell negotiable assets on the financial asset markets to obtain liquidity, particularly financial securities. Note that the most important liquidity sources are government securities (Froot and Stein, 1998). Indeed, Zheng (2006) indicate that liquidity risk exists due to lower investment in risk free government assets (bonds). On the one hand, they respond to agents who need liquidity, and on the other hand, they provide a diversification solution to investors concerned with finding financial products that meet their ethical requirements.

The recent global financial crisis that began in 2007 has shown us that a liquidity shortage can easily cause a solvency problem which can very quickly lead to bank failure (Khomsî A. and Britel F.(2018)). Financial institutions had to sell assets, first to meet the sudden demand for liquidity from investors and then to replenish their equity (Blanchard, 2009).

As the great economist Charles Goodhart (2008) wrote, liquidity and solvency are the two banking activity pillars that are often indistinguishable from one another. An illiquid bank can quickly become insolvent, and vice versa.

In terms of solvency, decisions have been taken within the framework of the Basel system, with a view to enabling the banking system to be more resilient, with reinforced foundations in equity and liquidity. Five objectives were targeted, in particular: strengthening the quality of equity, improving risk coverage, setting international standards in terms of liquidity and limiting leverage and reducing the system's pro-cyclicality (DANIÈLE NOUY (2012)).

In addition, liquidity risk arises when depositors collectively decide to withdraw more funds than those immediately available to the bank or when borrowers fail to meet their financial obligations to banks (Khomsî A. and Britel F.(2018)). A bank fulfills withdrawal requests using the income generated by the investments made. Unexpected liquidity needs can be covered by collecting new deposits or by liquidating short-term investments. If that is not enough, a bank borrows on the interbank market (Costisor, M. (2010)).

In the models of Jacklin and Bhattacharya (1988), Chari and Jagannathan (1988), and Diamond and Dybvig (1983), the demand deposit contract protects depositors against liquidity risk by allowing each of them to withdraw their assets according to consumption needs. They are vulnerable to this risk because they have to operate with an unbalanced asset and liability structure of turning illiquid financing into cash. In these models, a bank's liquidity is determined based on the probability of a rush to occur. Withdrawals at each period are thus well anticipated and an adequate reserve of funds is kept in this regard. However, if withdrawals are greater than anticipated, banks are forced to liquidate their long-term assets at a loss, calling into question the continuation of their activity.

In fact, due to the externalities of bank liquidity, shocks to market liquidity can spread more, especially to money or interbank markets, and seriously threaten financial stability. A liquidity shock to a bank can spread if counterparties refuse to provide short-term liquidity because they cannot find a lender themselves if there is a shortage of liquidity in the secondary market. (Acharya (V.), Gromb (D.) and Yorulmazer (T.) (2007)). In addition, the

sudden drying up of liquidity has particularly caused severe disruptions in the interbank markets, which are the very heart of the financial system (Mihaela Costisor (2010)).

The interbank approach is based particularly for Islamic finance on investment deposits. These deposits are named for the Moroccan case Wakala Bil Istithmar. It is an investment formula where a islamic or conventional bank can invest funds in the projects of another islamic bank in return for a return on this investment. Several banks in different countries of the world also use the wakala contract to refinance themselves, such as the United Arab Emirates.

However, given the small size of the interbank market open to them, Islamic banks depend on a small number of institutional depositors and can place their cash with a limited number of bank counterparties (HASSOUN A.(2012)).

Unexpected liquidity needs can be covered by collecting new deposits or by liquidating short-term investments. If that is not enough, a bank borrows on the interbank market.

Regarding theoretical work, several authors have studied the foundations of the interbank market and its effects on the composition of a bank's portfolio. For example, Bhattacharya and Gale (1987) show that interbank markets play a positive role, since banks can better cope with liquidity shocks if they can borrow / lend liquidity on the interbank market. This should subsequently help to improve the final situation of depositors.

The most important contribution to the analysis of the phenomenon of contagion by interbank links is, in our opinion, made by Allen and Gale (2000). Their model focuses on the role of interbank deposits (crossed financial holdings) as a means of ensuring liquidity to cope with unforeseen withdrawals.

Based on the microstructure of the interbank market, Iori et al. (2006) develop a microeconomic simulation model in order to highlight the role of interbank financing in liquidity management on the one hand and in contagion on the other hand. the stochastic nature of daily fluctuations in renewed deposits and financing opportunities, combined with the mismatch in maturity between assets and liabilities, makes banks vulnerable to liquidity risk. To fill a possible liquidity gap, they have the possibility of borrowing on the interbank market.

⇒ **Hypothesis 1: There is a positive relationship between bank refinancing instrument and bank liquidity**

A change in liquidity can result in valuation problems for these assets. This results in tension on the result and consequently a decrease in the level of income which can compromise the

bank's access to the financing markets. (Huang (J.) and Wang (J.) (2009)). To estimate the profitability of banks, two ratios were chosen in our analysis: Return on Asset (ROA) and Return on Equity (ROE).

According to the empirical study established by Rahman & Banna on the liquidity risk of Islamic banks in 2015, the profitability ratios have a negative relationship with bank liquidity. several other researchers attest that holding liquidity involves an opportunity cost for the bank, which would therefore have a negative impact on profitability. Among these authors, we can mention MOLYNEUX and THORNTON (1992); EICHENGREEN and GIBSON (2001); GODDARD et al. (2008).

⇒ **Hypothesis 2: profitability ratios negatively affects bank liquidity**

With the existence of liquidity risk, banks need to be cautious with the cash flow. (Norazwa Ahmad Zolkifli and Al.(2015)). To determine the identifiers of liquidity risk, Matz and Neu (2007) indicated that banks can apply an analysis of balance sheet liquidity and a cash position through the statement of cash flows which can influence the significantly decision makers (Kate Culbertson (2017)).

According to IFRS standards, this statement has 3 main categories which assess the collection and disbursement of each of its components. Cash flows from operating, financing and investing activities.

⇒ **Hypothesis 3 : Cash Flow operations positively affects bank liquidity**

1.2.2. Country-specific macroeconomic characteristics:

Macroeconomic imbalances is another path that leads to liquidity risk. This factor is particularly important in developing countries. Excessive government borrowing in domestic markets increases the cost of funding for banks. In many countries, financial repression is created where banks are required to finance public spending at a price below the market price. In these circumstances, the banks' liquidity risk largely increases either involuntarily or voluntarily by changing the composition of the bank's asset portfolio. Second, any shock to the system can create liquidity problems for individual banks and for the banking sector as a whole.

Moreover, the imperfection of the capital markets implies a demand for countercyclical¹ liquidity. This is due to the fact that banks would hoard liquid assets during recessions and discharge them in a timely manner. This suggests that the liquidity buffers are negatively linked to measures of real GDP growth.

Aspachs et al. (2005) reported that banks amass liquidity during economic downturns when lending opportunities may not be as good and that they deplete liquidity reserves during economic expansions when lending opportunities may have resumed. As such, we expect higher economic growth to force banks to reduce their cash reserves and encourage them to lend more.

Fiscal imbalances and hoarding are not the only macro sources of liquidity risk. High inflation can also pose similar risks.

To capture the effect of each country's macroeconomic environment in determining liquidity risk, the two macroeconomic variables used are:

- Annual change in GDP in% GDP

This variable represents the relative change in the volume of GDP in constant dollars between two years. It reflects the increase (or decrease in the case of negative growth) of the level of economic activity in a country. This is an indicator often used when one wants to make short- and medium-term forecasts on the economic situation of a country.

The health of an economy and that of its banks are closely linked. A two-way relationship: when the economy is doing well, banks do business; When banks are doing well, households and businesses can easily get the financing they need, which supports activity.

Aspach, Nier and al. (2005) find that the liquidity reserves of British banks are negatively linked to real GDP growth and to the key rate. Agénor, Aizenmann and Hoffmaister (2000) and Dinger (2009) find that the cash held is negatively linked to the growth of real GDP and real GDP per capita.

- Inflation:

This entry provides the annual percentage change in consumer prices compared to the consumer prices of the previous year.

According to Tiesset. (2005), inflation is negatively linked to the liquidity of commercial banks. This is likely due to the fact that inflation could affect the value of money, purchasing

¹ The countercyclicality of liquidity buffers limits the effectiveness of monetary policy by trying to inject liquidity to stimulate the economy during a recession: liquidity buffers would remain stable or increase but credit would not necessarily resume.

power and the real interest rate that banks charge and receive. This hypothesis is to be confirmed or refuted in the case of our model.

⇒ **Hypothesis 4: there is a negative relationship between Country-specific macroeconomic characteristics and bank liquidity.**

2. METHODOLOGY

To achieve the research objectives, this study uses a sample of 8 Islamic banks. The countries were chosen on the basis of their commitment and involvement in the field of Islamic finance as well as their initiative to develop participatory finance and finance development initiatives. As for the banks, these were selected not only on the basis of the availability of data but also on the basis of their size. The data were collected from the annual reports of the various Islamic banks for the period 2011 to 2018. The financial data from these annual reports are used to calculate and assess the liquidity and the determinants of liquidity in several countries of the world.

Different financial and statistical tools and techniques, namely Pearson and Spearman correlation, variance inflation (VIF) and tolerance (TOL) factors, correction of multicollinearity by the PCA method, the variables stationarity study and Generalized method of moments. were used here to analyze the data collected. EVIEWS is used to investigate and measure the liquidity of Islamic banks

In this context, a panel data model is expressed by cash and cash equivalents at the end of the year as a dependent variable and by a set of internal and external factors considered as independent variables.

The objective of our study is to know whether the final results will indicate that microeconomic and macroeconomic variables are positively correlated with the liquidity of Islamic banks, or have no impact on the liquidity of Islamic banks.

2.1. Theoretical model

The liquidity risk modeling adopted in this work finds its origins in the work published by (Harvey, 1989) (Andrew C. Harvey, Forecasting structural time series models and the Kalman filter, Cambridge University Press, 1989).The short-term model is written as follows:

$$Y_t = c + \sum_{i=1}^p \rho_i Y_{t-1} + \sum_{i=1}^m \beta_i X_{it} + \varepsilon_t$$

The current research is being conducted to evaluate how liquidity risk depends upon different variables by applying linear regression model which already been developed and applied by

Iqbal, A. (2012), Akhter & Sadaqat (2011) et MD. LUTFOR RAHMAN et S. M. HASANUL BANNA (2015)

The model below inspired also by the work of Deléchat, C., Arbelaez, C. H., Muthoora, M. P. S., & Vtyurina, S. (2012) provides an economic description of the real causes of the liquidity risk of Islamic banks.

We will decompose the origins of liquidity risk into two factors: internal factors and external factors.

To examine the relationship (interrelation) between the liquidity risk and the variables specific to the Islamic bank and to the different macroeconomic factors, a panel model is taken into consideration (Shen and al. (2018)).

$$RL_{it} = \alpha_i + \sum_{j=1}^m \beta_j X_{i,t}^{Bank} + \sum_{\gamma=1}^{\tau} \beta_{\gamma} X_{\rho,t}^{Macro} + \xi_{it}$$

2.1.1. Variable relating to liquidity risk

RL_it is the liquidity risk of bank $i = 1, \dots, 4$ at time $t = 2011, \dots, 2018$. This ratio is measured by the cash and cash equivalents at the end of the year taken from the cash flow statement of 8 Islamic banks in 5 different countries: Malaysia, Bahrain, United Arab Emirates, Turkey and Qatar.

This indicator represents the bank's money, whether it is cash, savings bonds or money invested in the money market. Cash equivalents are another short-term asset, so called because they are almost equivalent to cash: short-term investments can be used as cash or quickly converted to cash without loss of value.

The variables $X_{i,t}^{Banque}$, $X_{i,t}^{Macro}$ designate the characteristics specific to participatory banking and the various macroeconomic factors specific to the countries with $j = 1, \dots, m$ and $k = 1, \dots, n$ and $\gamma = 1, \dots, \tau$. j corresponds to the country in which the bank operates. α_i is the constant term and finally ξ_{it} represents the composite random term.

2.1.2. Variables relating to the dimension specific to the characteristics of islamic bank

The variables used in our analysis are: Securities transactions “sukuk”; Equity; Deposits; Interbank operations; Net profit; Total assets; ROA ; ROE; Net cash flow linked to investment operations; Net cash flow linked to financing operations; Net cash flow generated by the activity.

2.1.3. Variable specific to the size of each country's macroeconomic environment

To capture the effect of each country's macroeconomic environment in determining liquidity risk, the two macroeconomic variables used are:

1. Annual change in GDP in% GDP;
2. Inflation.

2.1.4. Methods adopted

In order to study the impact of these variables on bank liquidity, we carried out modeling using Panel data estimates because of his advantages.

Indeed, before proceeding with the analysis of our data, we can note that in our case, it is the data of a cylindrical or balanced panel because the number of observations over time is ($t = 8$) is the same for all Islamic banks. The panel also has eight cross units ($N = 8$). In this particular case, we have a panel neither small nor large since ($N = t = 8$). so in total there are 64 observations for each variable retained in the analysis.

First, we performed a correlation analysis between the explanatory variables. To do this, we applied a pairwise correlation analysis which supposes the potential existence of a strong correlation between our explanatory variables since certain values of the Pearson correlation coefficient are greater than 0.6. Then we calculated the partial correlation coefficients that did indeed display values which are close to 1. This result justifies the first conclusion of pairwise correlation.

To remedy the effect of the increase in the variance of the OLS estimator following the increase in the correlations between the variables r_{xy} , we calculated a ratio called the variance-inflating factor which in our case corresponds to a very high value of 27.1. Subsequently, we proceeded to the correction of multicollinearity by the PCA method. The PCA method calculated 13 main components, denoted C_φ $\varphi = 1, 2, \dots, 13$ so that they are all mutually uncorrelated. These components are linear combinations of the original explanatory variables.

In our analysis, we obtained four main components given that the value of the Eigen-value is greater than 1 for these four components.

For a better factorial representation, we applied a new principal component analysis with rotation in order to define the composition of each component separately (explanatory variables).

We therefore defined 4 main components.

The first component absorbs 45% of the overall variability. This component groups together the variables: equity, deposits, interbank operations, sukuk, total assets. These variables measure the refinancing instruments from the balance sheets.

The second component absorbs 14.6% of the overall variability. This component groups the variables: ROE and ROA. These variables measure the Islamic banks financial profitability.

The fourth main component absorbs 13.1% of the overall variability of the model. This component groups together the variables: Cash Flow from Operating activities and Cash Flow from financing activities. These variables measure the Islamic bank cash flow activities.

The Cash flow From Investing activities and Net Results variables are excluded from the model.

Following the PCA analysis, we constructed each component by referring to the weights of each variable in the factor structure.

We have noticed that the problem of multicollinearity has been resolved. Indeed, the values of the coefficient of partial correlations are very low and less than 0.5.

There is also a very low degree of collinearity between several explanatory variables. In addition the average VIF is equal to 1.23: it is a value less than 2.

3. RESULTS

3.1. descriptive statistics for the new explanatory variables

Following the CPA analysis, the descriptive statistics for the new explanatory variables are as follows:

Table of descriptive statistics for the new explanatory variables

| Variable | Obs | Mean | Std. Dev | Min | Max |
|--------------|-----|-----------|-----------------------|-----------|-----------------------|
| Cinst | 64 | 9293339 | 1.30 ^e +07 | 415811.4 | 4.16 ^e +07 |
| Cprof | 64 | 0.0449705 | 0.0277163 | 0.0015076 | 0.0970245 |
| Cmac | 64 | 156422.4 | 125374.5 | 14388 | 475289.5 |
| Ccf | 64 | -122128.9 | 662373.2 | -3619148 | 1292375 |

Source: Eviews

To have elasticities we integrated the logarithm on the variables C Inst measuring refinancing instruments from the balance sheets of Islamic banks. And on the variable C Mac measuring the macroeconomic effects impacting the participative bank.

The variable $C_{i,t}^{CF}$ measuring the cash flow activities of the participating bank displays negative values; we can't put it in the logarithm. It should be retained as a semi-elasticity and taken into consideration in the interpretations of the coefficients.

Model revisited after the results of the CPA

$$\text{Log}(L_{it}) = \alpha_i + \beta_1 \log(C_{i,t}^{Inst}) + \beta_2 \log C_{i,t}^{Prof} + \beta_3 \log(C_{i,t}^{Mac}) + \beta_4 C_{i,t}^{CF} + \xi_{it}$$

L_{it} is the liquidity of bank $i = 1, \dots, n$ at time $t = 1, 2, \dots, T$.

β_k are the coefficients of the explanatory variables, with $k = 1, 2, 3, 4$

$C_{i,t}^{Inst}$ is the aggregated variable measuring refinancing instruments from the Islamic banks balance sheets.

$C_{i,t}^{Prof}$ is the aggregated variable measuring islamic bank profitability.

$C_{i,t}^{Mac}$ est is the aggregate variable measuring the macroeconomic effects specific to the country where the islamic bank is located.

$C_{i,t}^{CF}$ est is the aggregate variable of the the islamic banks cash flow activities.

3.2. Stationarity study

Following the analysis of the various explanatory variables and the establishment of a model following the PCA method, a study of stationarity is essential. Indeed, if the series is the result of a non-stationary process, we must first of all seek to "stationarize" it, that is to say find a stationary transformation of this process. Then, we model and estimate the parameters associated with the stationary component.

Based on the analysis of stationarity, the level tests affirm that the log (cash) variable is not stationary in level. We performed the tests on the dependent variable in prime differences.

The results indicate that the dependent variable must be differentiated to make it stationary.

The variable relating to refinancing instruments from the Islamic banks balance sheets is integrated in order 1. It must therefore be differentiated to make it stationary.

The variable relating to financial profitability is stationary after transformation. The scheme used is that which takes the constant into account in the estimate. The cash flow activities variable is stationary in level without taking into account the integration of the constant or the trend to identify the process.

3.3. Model retained after transformations and the panel structure study

- **The model**

Following the stationarity study, the model retained is as follows:

$$LL_{it} = \alpha_{it} + \beta_1 \Delta LC_{i,t}^{Inst} + \beta_2 \Delta C_{i,t}^{Prof} + \beta_3 \Delta LC_{i,t}^{Mac} + \beta_4 C_{i,t}^{CF} + \beta_4 LL_{it-1} + \xi_{it}$$

We are in the presence of a dynamic model on Panel data

- **The panel structure study**

Table : Hausman test result

| Test summary | Chi-sq. statistic | Chi-sq. d.f. | prob |
|----------------------|-------------------|--------------|--------|
| Cross-section random | 38,97 | 5 | 0,0000 |

Source: Eviews

From the table, the probability is 0.0000 which is less than 0.05, this shows that it is appropriate to adopt a fixed effects model. We are then faced with a dynamic model with fixed effects. Then, the model retained is as follows

$$LL_{it} = \alpha_i + \beta_1 \Delta LC_{i,t}^{Inst} + \beta_2 \Delta C_{i,t}^{Prof} + \beta_3 \Delta LC_{i,t}^{Mac} + \beta_4 C_{i,t}^{CF} + \beta_4 LL_{it-1} + \xi_{it}$$

3.4. Dynamic model estimation:

In order to arrive at the results, the generalized method of moments (GMM) estimator was used.

This method allows not only to analyze and examine the specific individual and temporal effects but also to compensate for the endogeneity biases of the variables, particularly when there is a lag of the dependent variable appearing as explanatory variable.

| Variable | Coefficient | Std. Error | T-statistic | Prob |
|------------------------------|-------------|--------------------|-------------|----------|
| C | 11.11153 | 2.052306 | 5.414168 | 0.0000 |
| D(LC Inst) | 0.117042 | 0.706394 | 0.165690 | 0.8692 |
| D(C Prof) | -4.798874 | 1.887063 | -2.543039 | 0.0147 |
| D(LC MAC) | -0.598071 | 0.257297 | -2.324434 | 0.0249 |
| C CF | 1.36E-07 | 3.74E-08 | 3.638534 | 0.0007 |
| LCASH(-1) | 0.159573 | 0.151921 | 1.050363 | 0.2994 |
| Weighted Statistics | | | | |
| R-squared | 0.961748 | Mean dependent var | | 21.72956 |
| Adjusted R-squared | 0.951073 | S.D. dependent var | | 12.41095 |
| S.E. of regression | 0.526775 | Sum squared resid | | 11.93217 |
| Durbin-Watson stat | 1.847775 | J-statistic | | 2.996927 |
| Instrument rank | 14 | Prob(J-statistic) | | 0.083423 |
| Unweighted Statistics | | | | |
| R-squared | 0.953919 | Mean dependent var | | 13.18899 |
| Sum squared resid | 12.24553 | Durbin-Watson stat | | 2.476825 |

Source: Eviews

The established multiple linear regression equation becomes:

$$LL_{it} = 11.11153 + 0.117042\Delta LC_{i,t}^{Inst} - 4.798874\Delta C_{i,t}^{Prof} - 0.598071\Delta LC_{i,t}^{Mac} + 1.36E - 07C_{i,t}^{Act} + 0.159573LRL_{it-1} + \xi_{it}$$

4. DISCUSSION

The variables used in our analysis effectively explain the downward or upward trend in liquidity risk. As for the significance of the variables, we note that all the coefficients are statistically significant at the 5% threshold, except that of the LC inst variable which corresponds to a value of 0.8692.

The R-squared value shows that 0.961748 or 96% of the variability in liquidity risk is explained by the explanatory variables.

The adjusted Rsquare represents a value of 0.951073, this means that 95% of the variable to be explained is explained by the independent variables.

The Durbin-Watson statistics value is 1.847775, which shows that the error term is independent and without autocorrelation, in other words there is no autocorrelation in the error term.

The variable relating to refinancing instruments from the balance sheets of Islamic banks which include investment securities "sukuks", equity, interbank transactions, total assets and deposits has a positive relationship with the liquidity risk. Indeed, an increase of 1 unit in the refinancing instrument variable will lead on average, to an increase in the variable relating to bank liquidity of 0.117042 unit.

These results join those of Bhattacharya and Gale (1987) who show that the interbank markets play a positive role, because banks can better face liquidity shocks if they can borrow / lend liquidity on the interbank market. This should subsequently help to improve the final situation of depositors. Sokol Ndoka et al. (2017) also indicate that there is a positive relationship between bank liquidity and customer deposits. Zaphaniah akunga maaka (2013) also found that the level of customer deposits positively affected the profitability of the bank. There is then a positive relationship between the level of bank deposits and the level of profitability achieved by the bank. This goes in the direction that when a bank has a high deposit base, it can invest the funds carefully and be able to generate an adequate return. Gatev and Strahan (2003) also argue that deposits provide natural hedging for banks against liquidity risk.

The variable relating to profitability ratios shows a negative coefficient of -4.798874 which agrees with the empirical study established by Rahman & Banna on the liquidity risk of Islamic banks in 2015. Other researchers attest that holding liquidity involves an opportunity cost for the bank, which would have a negative impact on profitability. Among these authors, we can mention Molyneux & Thornton (1992), Mansouri & Afroukh (2009) This means that profitability ratios have a negative relationship with bank liquidity. Indeed, an increase of 1 unit in the variable relating to profitability ratios will result in a decrease in the variable relating to bank liquidity by 4.798874 unit.

The macroeconomic variables which are GDP and inflation are negatively linked to the banks' liquidity position to the extent that a 50% drop in the liquidity position is observed due to a 1% increase in the value of macroeconomic variables.

These results join the results of the various studies carried out by Aspach, Nier and Tiesset (2005) and also Agénor, Aizenmann and Hoffmaister (2000) and Dinger (2009) who find that the liquidity held is negatively linked to the growth of the GDP.

According to Tiesset. (2005), inflation is also negatively linked to the liquidity of commercial banks. This is likely due to the fact that inflation could affect the value of money and purchasing power.

Cash flow operations are positively linked to the liquidity position with a coefficient corresponding to $1.36E-07$. This means that an increase of $1.36E-07$ unit in net cash at the end of the year of the bank will lead on average, to an increase of half a unit in the variables relating to the net cash flow generated by operating activity and financing operations (given the semi-elasticity).

In terms of managerial and scientific implications, this work made it possible to identify the determinants of liquidity risk and to study the Islamic banks liquidity position by analyzing microeconomic and macroeconomic factors. The objective is to know whether or not these variables have a positive impact on the Islamic banks liquidity. this work will enable these banks to properly manage liquidity risks and establish appropriate mechanisms for good governance and effective risk management at a time of intensifying financial globalization and the diversification of instruments and vehicles investment funds. In addition, considering the gradual growth of this industry and the experience of the global financial crisis in 2008-2009, Islamic banks are forced to establish a good liquidity risk management program to meet their obligations. financial obligations to third parties.

CONCLUSION

Ultimately, we can conclude that our results converge with the empirical studies previously established.

Refinancing instruments are positively linked to bank liquidity. Indeed, an increase of 1 unit in the refinancing instrument variable will lead to an increase in the variable relating to bank liquidity of 0.117042 unit.

These results lead us to conclude that Islamic banks must invest in instruments that meet both the criteria of regulatory compliance, compliance with Islamic precepts but also financial and economic profitability to the extent that these instruments improve bank liquidity and meet their financing needs. Islamic banks must also improve their cash flow operation in order to perform and be able to grow.

In addition, referring to the article entitled “refinancing on the money market and liquidity risk management developed by us: it is recommended to set up an international Islamic refinancing market to further develop Islamic finance and international refinancing instruments and allow a better distribution of wealth around the world, which would also allow certain social objectives to be achieved. It is also recommended to create several refinancing markets in several countries or regions and to have an intergovernmental

institution which can help, regulate and accompany the refinancing markets in the different countries where these banks exist (FENNASSI ADDOULI I. &ACHIBANE M. (2019).

As for Islamic banks in Morocco, it should meet several challenges in order to develop liquidity risk management instruments and to be able to grow. This should be done by adapting the following measures:

- Issue by the State investment securities and adequately design Islamic public financial instruments based on a systematic link between public expenditure and their financing,
- Facilitate financing by the central bank by issuing liquidity through redemptions of sukūk held by participating banks by encouraging money market securities issued by private funds,
- Get the central bank more involved by regularly issuing Musharak certificates
- Issuing in the near future of the Wakala sukuk, in order to efficiently manage interbank operations and to be able to impose itself more and more in the world economy.

The variable relating to the profitability ratios shows a negative coefficient of -4.798874, this means that the profitability ratios have a negative relationship with bank liquidity. Indeed, an increase of 1 unit in the variable relating to profitability ratios will result in a decrease in the variable relating to bank liquidity by 4.798874 unit.

The macroeconomic variables which are GDP and inflation are negatively linked to the banks' liquidity position to the extent that a 50% drop in the liquidity position is observed due to a 1% increase in the value of macroeconomic variables. Islamic banks must also ensure liquidity reserves and invest in Sharia-compliant instruments over the long term to anticipate any macroeconomic shock.

And finally, Cash flow operations are positively linked to the liquidity position with a coefficient which corresponds to 1.36E-07. These Islamic financial institutions need to hone their operating and financing operations in order to improve and scale.

The results presented above present some limits which could offer opportunities for interesting improvements, in particular, an increase in the observations number seems to be a significant way to improve the quality of the estimation of the different parameters of our econometric model. In addition, studying each refinancing instrument in isolation will make it possible to understand the impact of sukuks or each type of sukuk, equity, interbank operation and deposits on the banks and Islamic windows liquidity. In the Morocco case, islamic banks experience an under-liquidity position which forces them to borrow liquidity in the form of

wakala bil isthithmar from the parent company at excessive rates. This under liquidity position undoubtedly impacts the islamic banks competitiveness and profitability. Moreover, islamic banks are faced more than traditional banks with the vagaries of their liquidity management. Islamic interbank and money markets are non-existent, and traditional central bank instruments do not fit in with Shariatic demands.

As such, Bank al Maghrib should adapt its legal texts to cover the specificities of islamic banking activity. The essential adaptations should relate to taking into account the treatment of Sukuk in the list of instruments considered as liquid assets as well as the integration of specific instruments such as resources collected in the form of Wakala Bil Isthitmar, investment deposits, or also Hamish Al Jiddiya collected from clients to secure their funding requests.

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