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Determinants of Liquidity Shortage Risk in the Banking Sector in Sudan

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Abstract: The aim of this study is to investigate the determinants of the liquidity shortage risk in the banks operating in Sudan, it applies panel logit regression model for the sample of 25 banks during the period from 2012 to 2017. The dependent variable is the extreme shortage of liquidity which has been identified by using Value at Risk (VaR) technique. The independent variables are bank specific and macroeconomic factors. The bank specific are the banks' size measured by the total deposits, the investment variable measured as the total finance extended through the modes of finance, and the profit approximated by the net profit. The macroeconomic factors are the black market exchange rate premium and the budget deficit. The findings of the analysis show that the bank size and the investment are significantly associated with the liquidity shortage risk but negatively. This implies that the larger the bank, in terms of total deposits, the lower the liquidity shortage it faces, moreover the investment is dominated by short term investments, i.e. deferred sales receivables (murabaha financing). The profit factor is also negative but insignificant, this implies that banks' profits can be generated via short term investment activities that increase cash holdings of the banks and reduce liquidity shortage. The black market exchange rate premium is positive but insignificant whereas the budget deficit is positive and significant. The positive sign of the black market exchange rate premium implies that increase in the exchange premium lead to decrease in the local currency value which induce higher deposit withdrawals by the depositors also banks reduce their holdings of local currency, and this increase liquidity shortage. The positive sign of the budget deficit factor implies that the government finances its deficit mainly by resorting to debt financing (money creation), this lead to increase in inflation rate which cause depreciation of the value of the local currency, this induce the banks to adjust their portfolios of local currency holdings as a result the liquidity shortage increases. The stress testing results reveal that as the black market exchange rate premium increases the probability of the liquidity shortage risk rises, therefore the Sudanese banking system is susceptible to high liquidity shortage risk as the black market rate premium exceeds 50 Sudanese pounds per dollar.

Keywords: Determinants, Liquidity, shortage, Risk, Banking, Sudan.

1- Introduction:

The key role of a bank is to provide intermediation services between savers and borrowers that is by accepting deposits that can be withdrawn on demand and to lend money to business organizations and individuals on request. Molyneux and Wilson (2007) highlight, that banks are of central importance for economic growth, credit allocation, financial stability, and the development of manufacturing and service firms. Islamic banks like their conventional counterparties provide financial intermediation services that comply with shariah principles. The two main principles Islamic banks should adhere to are the prohibition of interest (riba) and excessive uncertainty (gharar).

Banks, whether Islamic or conventional, are subject to many types of risks that can negatively affect their operations and performance. The nature and complexity of these risks have changed rapidly over time and become more disastrous not only for banking operations but also bank's survival (Bessis, 2002; Rahman, Abdullah and Ahmad, 2012). Abu Hussain and Al-Ajmi (2012) point out that the understanding of different types of risks is very important for effective risk management in banks and these institutions ought to accept only those risks which are uniquely a part of their array of services.

The available literature describes different types of banking risks including, credit risk, interest rate risk, market risk, liquidity risk, solvency risk operational risk, foreign exchange risk, country risk, settlement risk, and performance risk. Among all types of risks, liquidity risk can be considered as the most influential risk banks are exposed to because it can lead to bank collapse which causes instability of the whole banking system.

Liquidity risk can be described in terms of inability to transform assets into cash in a timely manner and at low cost. It can also be explained as maturity miss-match between assets and liabilities. Liquidity risk emanates from many sources; the most important one is the nature of the banking business i.e. banks utilize short-term funds in long-term investments. Moreover, funding liquidity risk can be of two types, the first one is the shortage of liquidity that banks are unable to cover liquidity demands when it becomes due. The second kind is the excessive liquidity that banks hold large amounts of liquid assets due to underutilization of available financial resources. Although the first type

seems more dangerous because it directly harms the existence of the bank, the second one is not less harmful as it affects the profitability of the bank and its existence in the long run in a competitive environment. There are a number of tools and instruments conventional banks use to manage their liquidity risk, but most of these instruments are interest-based, which are incompatible with shariah principles. In theory, Islamic banks rely on Islamic modes of finance that based on profit and loss sharing; as a result depositors who share the risk with the bank on the liabilities side absorb any shocks occurring on the assets side of the bank. But in fact Islamic banks are subject to liquidity risk which is difficult to manage due to several factors; specifically, the limited number of shariah instruments to cater for liquidity risk management, and the underdevelopment of the financial market in general. This is followed by the constraints imposed by the legal environment and unavailability of Lender of Last Resort facility to them. Therefore Islamic banks need to control their liquidity in order to be solvent. In particular, if Islamic banks want to be more engaged in any business activity, having a rigorous liquidity risk assessment and mechanism is very important. However, somewhat different from conventional approaches on managing liquidity, Islamic banks would need to construct a liquidity management program which complies with their characteristics and risk profiles. The most important aspect is compliance with Sharia principles.

This study aims to address liquidity risk management issue in banks operating in Sudan, which is a full-fledged Islamic system. The banking sector in Sudan dominate the financial sector activities, it has a crucial role to play in the economic growth and development of Sudan that is by mobilizing savings to the real sector. As a result, preserving and developing the Sudanese banking system is of a paramount importance. One way to achieve this is by addressing and then proposing solutions for liquidity risks it faces. The remaining of the paper is organized as follows, the second part provide literature review, section three present the methodology, the forth part include the empirical analysis, and the last section conclude the paper.

2- The literature review:

Although, there are limited empirical studies devoted to the liquidity risk of Islamic bank, but Islamic banks liquidity is influenced by many internal and external factors. Moreover, previous researches focusing on Islamic banks within the same country, stress different conclusions.

Ahmed et al (2011) studied a sample of 6 Islamic banks of Pakistan for the period of 2006 to 2009 and suggested that the bank size is directly associated to liquidity risk. Furthermore, there is a negative and significant association between the gearing ratio, the Non Performing Loans ratio and the liquidity risk. In contrast, the capital adequacy is positively associated to liquidity risk.

Muharam and Kurnia (2012) investigate Islamic and conventional banks liquidity in Indonesia for period 2007-2011. They highlight a positive and significant impact of Net Interest Margin (NIM) and Return on Equity (ROE) on the liquidity risk of Islamic bank. In addition, liquidity gaps, Risky Liquid Assets to Total Assets (RLA) have insignificant effect. For conventional bank, the study concludes to negative and significant influence of Capital Adequacy Ratio (CAR) and ROE on liquidity risk.

The empirical study of Ramzan and Zafar (2014) investigates relationships between internal bank's characteristics and liquidity risk (measured by the ratio of the most liquid assets to total assets) of Islamic banks of Pakistan over the period 2007-2011. This study concludes to positive and significant correlation between size of the bank and liquidity risk (other variables are statistically insignificant). Thus, strong asset base of Islamic bank helps to more strengthen liquidity control. In contrast, Capital Adequacy Ratio (CAR), The Return on Equity (ROE), Return on Assets (ROA) and Networking Capital (NWC) has insignificant relationship with liquidity risk.

Iqbal (2012) investigated liquidity risk on a sample of 5 conventional and 5 Islamic banks from 2007 to 2010. The findings showed that non-performing loans have a negative relationship with liquidity risk, while capital adequacy ratios, return on assets, return on equity and size have a positive relationship with liquidity risk.

Jedidia and Hamza (2015) used a panel of 60 Islamic banks in MENA and Southeastern Asian countries. The period of study is from 2004 to 2012. The findings illustrate that liquidity risk depends on idiosyncratic factors such as bank profitability, capital adequacy ratio and investment ratio. While the profitability bank indicator (ROA) positively affects the exposure to liquidity shortage, the capital adequacy ratio (CAR) and the ratio of bank's investment have statistically significant negatively relationships with the liquidity risk measure. Nevertheless, the bank size does not matter probably because both small and large Islamic have difficulties to manage their liquidity risk. The real growth rate of Gross domestic product has negative but irrelevant association with liquidity risk.

AbdulGaniyy, Zainol and Ahmad (2017) compare the determinants of liquidity risk of Islamic banks in the two environments of full Islamic banking scheme and dual banking system. The researchers used samples of Islamic banks in Sudan and Malaysia to represent the two banking environment, three banks in each of the countries from 2004 and 2015 was used for the study. Using panel data analysis techniques, the authors conclude that the different environment the Islamic banks operate determines the significance of liquidity risk determinants. There are conflicting effects of bank's specific (micro) factors including bank's size, capital adequacy ratio as well as macroeconomic variables like GDP and Money Supply on liquidity of Islamic banks. However, the study concludes that management efficiency is a common factor in the two settings.

Mohmed, Mohamed, and Samsudin (2013) have investigated the liquidity behaviour of Malaysian Islamic banks using several macroeconomic variables for 17 Islamic banks from 1994 to 2009. Their study has found that the macroeconomic variables, total investment, and total asset (size) are inversely related to liquidity while profitability is positively related to the level of banks' liquidity.

Chowdhury and Islam (2009) have compared the liquidity positions of a conventional bank and an Islamic bank in Bangladesh from 2003 to 2006. The study has reported that the investment ratio, return on assets, earnings per share, price earnings ratio and net interest margin/profit margin are the important determinants of banks' liquidity gap. Islamic banks are found to be more efficient in liquidity management when compared to their conventional counterparts.

Akhtar, Ali, and Sadaqat (2011) have evaluated the liquidity risk in conventional and Islamic banks of Pakistan for 2006 to 2009. The study has reported a positive but statistically insignificant relationship between capital-to-net assets ratio with liquidity risk.

Rashid, Ramachandran, and Fawzy (2017) examine the determinants of liquidity in Islamic banks in Malaysia and the Gulf Corporation Council (GCC) countries. They also examine the dynamic nature of the liquidity position of the selected banks. they have used panel data fixed effect models, their sample constitute 39 Islamic banks in Malaysia and GCC countries, excluding Oman, over a six-year period from 2009 to 2014. The study employed 'cash-to-asset' and 'total investment to total assets ratio' as the two proxies for the liquidity position of the Islamic banks against several macro-economic and bank-specific independent variables. The macroeconomics independent variables include inflation rate, growth rate of gross domestic product and the growth rate of broad money. The bank specific independent variables include bank size, loan loss provision ratio and return on asset. The findings reveal that liquidity risk management in Islamic banks is primarily contingent upon three bank specific variables – past liquidity condition, size of the bank and loan loss provision, and two industry specific variables – growth of broad money and growth of GDP.

4- The Data & Methodology:

The data used in this study is secondary data from the Central Bank of Sudan reports, as well as the financial statements of 25 banks operating in Sudan during the period from 2012 to 2016.

The methodology: the study used logit regression model to analyze the data which is binary model. In a binary choice model, the dependent variable takes the value of either 1 or 0, with a probability that is a function of one or more independent variables. Probit and logit models are two commonly used models to formulate binary choice, response or categorization. Their relationship and presentation are:

$$Y^* = X\beta + \varepsilon \qquad (1)$$

For:

$$Y = \{1, if\ Y^* \geq 0\}$$

$$Y = \{0, if\ Y^* < 0\}$$

The logit model is based on the odds of an event taking place. The logit of a number P between 0 and 1 is defined as the probability of an event taking place :

$$Logit\ (P) = Ln\left(\frac{P}{1-P}\right) \quad (2)$$

$$\text{If} \quad P = P(Y = (1|X\beta) \quad (3)$$

The probability can be solved as:

$$P\ (Y = 1|X\beta) = \frac{(\exp(x\beta))}{(1+\exp(x\beta)} \quad (4)$$

Estimation of the logit model is usually made through maximizing its likelihood function.

For the logit model, the probability of Y being 1 is :

$$\mathrm{P}\ (\mathrm{Y} = 1|\mathrm{X}\beta) = \frac{(\exp(x\beta))}{(1+\exp(x\beta)} \quad (5)$$

And the probability of Y being 0 is :

$$\mathrm{P}(\mathrm{Y} = (0\ |\mathrm{X}\beta) = 1 - \mathrm{P}(\mathrm{Y} = 1|\mathrm{X}\beta) = \frac{1-\exp(\mathrm{X}\beta)}{1+\exp(\mathrm{X}\beta)})\ ) \quad (6)$$

The dependent variable in this analysis is the liquidity risk, which is the extreme shortage of liquidity in each bank, based on VaR approach as follows:

Using the liquid assets values including the short term securities, we calculate the VaR for each year of the 6 years of the sample based on 95% confidence interval using the following equation:

$$VaR = \mu \pm Z_\alpha(\frac{\sigma}{\sqrt{n}}) \quad (7)$$

Where: μ is the mean, Z_α is the confidence limit, δ is the standard deviation, and n is the sample size.

We set the extreme lowest value as our benchmark and each value below it considered as liquidity shortage, all other values considered as normal liquidity position. And the liquidity shortage positions, have been given value (1), and the normal position (below the extreme value) given (0). After following these steps the dependent variable which is the liquidity shortage risk has been transformed into the form of binary variable, i.e. (0, 1) form to meet the specification of Logit and Probit models.

4- Empirical Analysis:

The analysis section of the paper is divided into two parts the first part we investigate the determinants of the liquidity shortage risk, then in the second part we stress test the increase in the black market exchange premium on the liquidity shortage risk.

Table (1) below shows the results of panel logit regression analysis for the determinants of liquidity shortage risk for a sample of 25 Islamic banks operating in Sudan during the period from 2012 to 2017. The independent variables are bank specific as well as macroeconomic factors. The bank specific variables include, the bank size (measured by total deposits), the investment, and the profit. The macro variables are, the black market exchange rate premium, and the budget deficit.

The model fitness indicators, the Akaike info. Criterion, the Lagrange multiplier (LR), and the R-squared reveal the fitness of the model. It also indicates that the explanatory power of the independent variables is about 62% of the total variability of the dependent variable.

The findings of the determinants of the liquidity shortage risk model indicate that, two of the bank specific variables, the banks' size, and the investment, are statistically significant but negatively associated with liquidity shortage risk. Whereas the profit variable sign is negative but insignificant. Regarding the macroeconomic variables, both are positively associated with liquidity risk, but the black market exchange premium is insignificant, whereas the budget deficit variable is significantly related to the liquidity shortage risk.

The negative sign of X1 variable reveal that the bank size variable (measured by total deposits) is negatively related with the liquidity shortage risk, which implies that the larger the bank, in terms of total deposits, the lower the liquidity shortage it faces. This

can be explained as that most of the bank deposits are in the form of demand deposits that exist in terms of liquid assets as cash or short term securities. Another explanation is that, banks that have large deposits are keeping huge amount of liquid assets to meet cash withdrawals of their depositors. Furthermore, Sudanese interbank liquidity management fund (ILMF) requires from the banks to invest in the fund an equivalent amount to the ratio of each bank's total deposits to the total deposits of all banks investing in the fund, therefore banks, at least, keep liquid assets that is proportionate to their total deposits.

The impact of the investment portfolios on banks' liquidity shortage is reflected by the effect of the X2 variable, which is negative and significant. This implies that the type of the investment, included under the variable X2 dominated by short term investments, i.e. murabaha financing. However, if the investment variable dominated by long term investment portfolios we could have expected a non-significant effect of this variable with the liquidity risk. This result support the findings in the literature that investment portfolios in Islamic banks dominated by the short term investment due to the absence of Islamic risk hedging tools in Islamic banking system in general.

The negative but insignificant sign of profit coefficient imply that as the profit increases liquidity shortage risk decreases. This negative association reveals that, banks' profits can be generated via short term investment activities that increase cash holdings of the banks and reduce liquidity shortage. Furthermore, it means that banks invest in safe activities that have low level of defaults and low returns. This evidenced by the fact that Sudanese banks invest most of their recourses in government short term securities and murabaha financing. The forth independent variable X4 is the black market exchange rate premium, which has positive but insignificant impact on liquidity shortage risk. This positive sign implies that the higher the exchange premium the higher the liquidity shortage risk. This can be explained in two ways; first, the increase in the exchange premium lead to decrease in the local currency value which induce higher deposit withdrawals by the depositors that increase the liquidity shortage of the banks. The other explanation could be that as premium increases the value of local currency decreases and therefore banks reduce their holdings of local currency, and this increase liquidity shortage. The insignificance of the black market premium may be because during the study period the black market premium fluctuation is not too large.

The budget deficit variable, which is the fifth independent variable X5, is positively and significantly associated with liquidity shortage risk. This implies that, when the government finances its deficit mainly by resorting to debt financing (money creation), this lead to increase in inflation rate which cause depreciation of the value of the local currency, this induce the banks to adjust their portfolios of local currency holdings as a result the liquidity shortage increases. Also the depreciation of the local currency increase deposit withdrawals.

Table (1): The determinants of the banks' liquidity shortage risk

Variable	Coefficient	p- value
C	-2.816399	0.0250**
X1(Bank size)	-2.83E-09	0.0001*
X2 (Investment)	-1.92E-09	0.0524***
X3 (Profit)	-4.53E-09	0.1909
X4 (Black market exchange rate premium)	0.162376	0.1335
X5 (Budget deficit)	9.90E-10	0.0000*
MC Fadden R-squared	0.625077	
Akaike info. criterion	0.596483	
LR statistic	129.1632	0.00000
Total number of observations	150	

*significant at 1% level. ** significant at 5% level. ***significant at 10% level.
1- The size variable measured by total deposits.
2- The investment variable includes murabaha, musharakah, mudarabah, mugawala, salam and istisna financing.
3-Black market exchange premium is the difference between the black market rate and the official rate(Sudanese pounds per a unit of USD).

Stress testing the black market premium increases on liquidity shortage:

In table (2) below we simulated the impact of increasing the black market exchange rate premium on the liquidity shortage risk. We used the values of the intercept (α = -2.8164), and the coefficient of the black market exchange rate premium, that is X4 variable (β4=0.162376) from table (1) above which presents the determinants of liquidity risk shortage. And apply them on the stress testing equation number (6).

Table (2) Stress testing black market premium increases on liquidity shortage

Year	Black market exchange rate premium	Probability
2012	1.72	0.073297
2013	1.57	0.071659
2014	3.038	0.089227
2015	3.58	0.096643
2016	7.43	0.166596
2017	20	0.606141
2018	30	0.886439
2019	35	0.946178
2020	40	0.975364
2021	50	0.995045

*****Black market exchange rate premium is the difference between the black market rate and the official rate (Sudanese pounds per a unit of USD).

The stress testing results in table (2) above show that, as the black market exchange rate premium increases the probability of liquidity shortage risk rises from (0.073) at premium level of (1.5) Sudanese pounds in 2012 to (0.99) at premium level of (50)Sudanese pounds in 2021.

These results imply that the Sudanese banking system is susceptible to high liquidity shortage risk as the black market rate premium exceeds 50 Sudanese pounds per dollar.

5- Conclusion:

The results of panel logit regression analysis regarding the determinants of liquidity shortage risk for the banks operating in Sudan indicate that, two of the bank specific variables, which are the banks' size, and the investment, are statistically significant but negatively associated with the liquidity shortage risk, whereas the profit variable sign is negative and insignificant. Furthermore, both of the macroeconomic variables are positively associated with liquidity shortage risk, but the black market exchange premium is insignificant, whereas the budget deficit variable is significant. The coefficients' signs of the three bank specific variables, the size, investment, and profit are negative. On the other hand the macroeconomic variables are positively associated with the dependent variable i.e. the liquidity shortage risk. On the other hand the stress testing results show that, as the black market exchange rate premium increases the probability of the liquidity shortage risk rises. These results imply that the Sudanese

banking system is susceptible to high liquidity shortage risk as the black market rate premium exceeds 50 Sudanese pounds per dollar.

The study recommends that capital of smaller banks should be increased or such banks should undergo merger strategy. Moreover, it is required from the central Bank of Sudan, which is the official body that is responsible for the monetary policy, to set policies that aim at stabilizing the exchange rate through organizing the foreign exchange market. In addition, the government is recommended to control the budget deficit and to finance it through real resources such as direct taxes, issuing gold based securities, and reducing the non-productive expenditure, rather than relying on money creation which lead to increase the inflation rate.

References

Abu Hussain, H. and Al-Ajmi, J., 2012. Risk management practices of conventional and Islamic banks in Bahrain. The Journal of Risk Finance, 13(3), pp.215 – 239.

Ahmed, N., Ahmed, Z., & Naqvi, I. (2011). Liquidity Risk and Islamic Banks: Evidence from Pakistan. Interdisciplinary Journal of Research in Business, 1(9), 99-102. Retrieved from http://lahore.comsats.edu.pk/ CIF/Downloads/Publications/8.pdf

Akhtar, M. F., Ali, K., & Sadaqat, S. (2011). Liquidity Risk Management: A comparative study between Conventional and Islamic Banks of Pakistan, Interdisciplinary Journal of Research in Business, 1 (1), 35-44.

Mohamad, A., Mohammad, M., & Samsudin, M. (2013). How Islamic banks of Malaysia managing liquidity? An emphasis on confronting Economic Cycles. International Journal of Business and Social Science, 4(7), 253-263.

Bessis, J., 2002. Risk management in banking. 2nd Ed. West Sussex, United Kingdom: John Wiley and Sons, Inc.

Iqbal, A. (2012). Liquidity Risk Management: A Comparative Study between Conventional and Islamic Banks of Pakistan. Global Journal of Management and Business Research, 12(5), 54-64.

International Monetary Fund. (2008, April). Global financial stability report. Washington, DC: Author.

Jedidia, K. B., & Hamza, H. (2015). Determinants of Liquidity Risk in Islamic Banks: A Panel Study. Islamic Management and Business, 2(2), 137-146.

Mohamad, A. A. S., Moh Chowdhury, H. A. (2009). A Comparative Study of Liquidity Management of an Islamic Bank and a Convetional Bank: The Evidence from Bangladesh. Journal of Islamic Economics, Banking and Finance, 5(1), 89-108.

Muharam, H., & Kurnia, H. P. (2012). The Influence of Fundamental Factors to Liquidity Risk on Banking Industry: Comparative Study between Islamic Bank and Conventional Bank in Indonesia, Conference .

Mamunur Rashid, Jayalakshmy Ramachandran , and Tunku Suleiman Bin Tunku

Mahmood Fawzy (2017) Cross-country panel data evidence of the determinants of liquidity in Islamic banks: A contingency Theory Approach .International Journal of Business and Society, Vol. 18 S1, 2017, 3-22

Molyneux, P. and Wilson, J.O.S., 2007. Developments in European banking. Journal of Banking and Finance, 31 (7), pp.1907–1910.

Rahman, N.A.A., Abdullah, N.A.H. and Ahmad, N.H., 2012.Banking risk: ownership structure, moral hazard and capital regulation. Saarbrucken, Germany: Lap Lambert Academic Publishing.

Ramzan, M., & Zafar, M. I. (2014), Liquidity Risk Management in Islamic Banks: A Study of Islamic Banks of Pakistan, Interdisciplinary Journal of Contemporary Research in Business, 5 (12), 199-215.