



Lomonosov Moscow State University

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Stress Test of Islamic Banks: a Model Example Magomet Yandiev¹

Article info

Abstract

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A stress test of a nominal Islamic bank demonstrated that the liabilities structure which ensures the maximal bank resilience to shocks is the one featuring prevalence of debt financing. On the other hand, the assets structure which ensures the maximal bank resilience to shocks is either the structure featuring prevalence of debt financing or the structure where all the asset items have approximately equal shares.

1 Introduction

The purpose of this work is to perform a stress test for a nominal Islamic bank and to identify the balance items that have the most significant influence on the financial soundness of Islamic banks.

2 Literature Review

Searching of relevant scientific publications using the key words “Islamic bank stress test” in the databases of libraries of Social Science Research Network (www.ssrn.com), ResearchGate (www.researchgate.net) and Russian Science Citation Index (www.elibrary.ru) had no effect.

At the same time, there is a large variety of scientific papers dealing with the problems of risks in the management of Islamic banks. In particular, it is affirmed that Islamic banks’ assets are exposed to a higher risk than assets of conventional banks (Ariss, 2010), or that the market risk is higher for Islamic banks than for conventional ones (Fuad Farooqi, 2015).

Due to existence of numerous papers concerned with stress tests of commercial banks, development of stress test methods for Islamic banks is not a complicated task. The only detail to be taken into consideration is the peculiar structure of assets and liabilities of Islamic banks.

3 Stress Test Methods

The stress test consists in exploring the way the bank liquidity changes in response to certain external events (shocks). An event or the aggregate of linked events have an influence on values of individual items of the bank’s assets and liabilities structure, which results in the change in the instant,

¹ Associate professor, Lomonosov Moscow State University, email: mag2097@mail.ru

current and long-term liquidity. The new liquidity value is compared with the threshold values, and after that the conclusion is drawn on the stress tolerance of the bank.

I. In order to perform a stress test, we need first to define the typical structure of assets and liabilities of an Islamic bank (hereinafter referred to as IB). The IB liabilities structure includes the following items:

- 1 Authorized capital (ordinary shares);
- 2 Undistributed profit;
- 3 Debt financing (sukuk);
- 4 Demand deposits (the customer does not receive the remuneration for keeping money at the account; the IB does not use the funds of this category of customers for its operational needs);
- 5 saving deposits (the customer gets a share in the IB's profit, while the bank uses the funds for its operational needs);
- 6 Investment deposits (the customer receives income from investing of his/her/its funds to financial instruments or projects by the Islamic bank).

The IB assets structure includes the following items:

- 1 Material assets (murabaha);
- 2 Investments to the authorized capital of other companies;
- 3 shared financing (musharaka, mudaraba);
- 4 debt financing (sukuk);
- 5 lease (ijara);
- 6 obligatory deposits at the central bank;
- 7 cash (on hand, at the settlement account).

II. Items of assets and liabilities have various degrees of maturity. We expertly divide the assets and liabilities items according to the degree of liquidity. Liabilities (L):

- long-term (L1, L2);
- medium-term (L3, L6);
- short-term (L4, L5).

Assets (A):

- low liquid (A1, A2, A3, A5, A6);
- liquid (A4);
- highly liquid (A7).

III The liquidity ratios can be defined as follows. Instant liquidity (highly liquid assets, i.e., the financial assets to be received on the immediate following day divided by the demand liabilities, immediate repayment of which can be requested by the depositor or the lender; the value recommended in the Russian Federation is more than 15%):

$$C1 = A7 / (L4 + L5)$$

Current liquidity (liquid assets, i.e., the financial assets which shall be received by the bank or can be claimed within the immediate following 30 calendar days, divided by the demand liabilities, immediate repayment of which can be requested by the depositor or the lender, and the bank's liabilities to lenders (depositors) with the due date within the immediate following 30 calendar days; the value recommended in the Russian Federation is more than 50%):

$$C2 = A4 / (L3 + L6)$$

Long-term liquidity (loans with the term of payment of more than 365 or 366 calendar days divided by the bank's capital plus the bank's obligations related to loans and deposits received by the bank as well as to the bank's publicly traded debt with the term of payment of more than 365 or 366 calendar days; the value recommended in the Russian Federation is more than 120%):

$$C3 = (A1 + A2 + A3 + A5 + A6) / (L1 + L2)$$

IV The list of shocks (S) shall be limited to the following events:

- 1 inflation increase;

- 2 decrease of the housing cost;
- 3 deposit decrease (outflow of funds);
- 4 the market index decrease;
- 5 increase in profitability of the traditional bond market;
- 6 increase of the key rate in the traditional financial system;
- 7 increase of the rates on the interbank credit market.

V Let us expertly define the consequences of the shocks effect on the balance items of an Islamic bank. Negative change of a shock value by 1% results in the following change of liabilities and assets, shares:

**Quantitative effects of shocks
on the assets and liabilities items of an Islamic bank**

Table 1

No	Shock	L1	L2	L3	L4	L5	L6	A1	A2	A3	A4	A5	A6	A7
1	S1	1.01	1.01	1.02	0.99	0.99	1	1	1	1	0.99	1	1	0.99
2	S2	0.98	0.95	0.96	0.99	0.98	1	1	1	1	0.99	1	1	0.98
3	S3	0.99	1	0.99	0.99	0.99	0.99	0.94	1	1	1	0.97	0.98	0.99
4	S4	1	1	0.995	1	0.995	1	1	1	1	1	1	0.99	0.97
5	S5	1	1	1	0.99	0.95	1	1	1	1	0.99	0.99	0.99	1.03
6	S6	1	0.99	0.99	0.99	0.99	1	1	1	0.99	0.99	0.98	1	1.02
7	S7	1	1	1	1	1	1	0.99	1	1	1	1	1	1.01
	Total	0.979	0.949	0.954	0.950	0.898	0.909	0.930	1	0.99	0.960	0.941	0.960	0.988

VI In order to define the total effect on each item of assets and liabilities of all the simultaneous shocks (the "Total" line in Table 1) the geometrical mean shall be calculated.

VII All the values and connections shall be united in an Excel file: by putting the initial values of assets and liabilities to the balance sheet of an Islamic bank, at the output we get the balance sheet of an Islamic bank with a view to the shocks and the relative values of the liquidity ratios.

4 Stress test procedure. First stage

Stress test is performed in two stages. The most shock-resistant structure is selected at the first stage for the liabilities and at the second stage for the assets.

At the first stage the most widespread (general) assets structure of the Islamic bank is selected, units:

- | | | |
|----|--|----|
| 1. | Material assets (murabaha) | 30 |
| | Investments to the authorized capital of third parties | |
| 2. | | 5 |
| 3. | Shared financing (musharaka, mudaraba) | 4 |
| 4. | Debt financing (sukuk) | 30 |
| 5. | Lease (ijara) | 20 |
| 6. | Deposits with the central bank | 5 |
| 7. | Cash (on hand, at the settlement account) | 6 |

This most general assets structure will remain unchanged for the four different options of the liabilities structure:

- Option 1. Authorized capital as the major source of capital
- Option 2. Debt financing as the major source of capital
- Option 3. Saving and investment deposits as the major source of capital
- Option 4. All the sources in equal parts as the major source of capital

So, the stress test is performed for the four different options of the liabilities structure of the Islamic bank, but always for the same assets structure.

Option 1. Authorized capital as the major source of capital, units:

1.	<i>Authorized capital</i>	70
2.	<i>Undistributed profit</i>	10
3.	Debt financing (sukuk)	5
4.	Demand deposits	5
5.	Saving deposits	5
6.	Investment deposits	5

Calculations result in the following values of the liquidity ratios:

Table 2

	Liquidity ratios	Shock	Actual value	Recommended values
1.	Instant liquidity	0.587	0.600	> 0.15 (15%)
2.	Current liquidity	2.927	3.000	> 0.50 (50%)
3.	Long-term liquidity	0.679	0.711	< 1.20 (120%)

Intermediate conclusions:

- Initially, the liabilities structure is satisfactory: all the ratios are within the recommended limits.
- Under the influence of the shocks the current liquidity is changed to the greatest extent; it is decreased by 7.3%.
- The long-term liquidity, despite the negative shock influence, is improved by 3.1%.
- The instant liquidity changes are not significant; it is worsened by 1.3%.

Option 2. Debt financing as the major source of capital, units.:

1.	Authorized capital	10
2.	Undistributed profit	5
3.	<i>Debt financing (sukuk)</i>	70
4.	Demand deposits	5
5.	Saving deposits	5
6.	Investment deposits	5

Calculations result in the following values of the liquidity ratios:

Table 3

	Liquidity ratios	Shock	Actual value	Recommended values
1	Instant liquidity	0.587	0.600	> 0.15 (15%)
2	Current liquidity	0.395	0.400	> 0.50 (50%)
3	Long-term liquidity	0.699	0.711	< 1.20 (120%)

Note: the values beyond the recommended limits are highlighted in yellow.

Intermediate conclusions:

- Initially, the liabilities structure is not satisfactory: the current liquidity ratio is beyond the recommended limits.

- Under the influence of the shocks the current liquidity is changed to the greatest extent; it is decreased by 1.3%.
- The long-term liquidity, despite the negative shock influence, is improved by 1.2%.
- The current liquidity changes are not significant; being already unsatisfactory, it is worsened by 0.5%.

Option 3. Saving and investment deposits as the major source of capital, units:

1	Authorized capital	10
2	Undistributed profit	5
3	Debt financing (sukuk)	5
4	Demand deposits	5
5	<i>Saving deposits</i>	40
6	<i>Investment deposits</i>	35

Calculations result in the following values of the liquidity ratios:

Table 4

	Liquidity ratios	Shock	Actual value	Recommended values
1	Instant liquidity	0.129	0.133	> 0.15 (15%)
2	Current liquidity	0.724	0.750	> 0.50 (50%)
3	Long-term liquidity	1.120	1.164	< 1.20 (120%)

Intermediate conclusions:

- Initially, the liabilities structure is not satisfactory: the instant liquidity ratio is beyond the recommended limits, the long-term liquidity ratio is close to the threshold value.
- Under the influence of the shocks the long-term liquidity is changed to the greatest extent; it is improved by 4.4%.
- The current liquidity is decreased by 2.6%.
- The instant liquidity, being already in the negative range, is worsened by 0.4%.

Option 4. All the sources in equal parts as the major source of capital, units:

1.	Authorized capital	15
2.	Undistributed profit	5
3.	Debt financing (sukuk)	20
4.	Demand deposits	20
5.	Saving deposits	20
6.	Investment deposits	20

Calculations result in the following values of the liquidity ratios:

Table 5

	Liquidity ratios	Shock	Actual value	Recommended values
1	Instant liquidity	0.147	0.150	> 0.15 (15%)
2	Current liquidity	0.732	0.750	> 0.50 (50%)
3	Long-term liquidity	1.033	1.067	< 1.20 (120%)

Intermediate conclusions:

- Initially, the liabilities structure is satisfactory, all the ratios are within the recommended limits. The instant liquidity is therewith at the lower threshold of the permissible range.
- Under the influence of the shocks the long-term liquidity is changed to the greatest extent; it is decreased by 3,4%.

- The current liquidity is worsened by 3.1%.
- The instant liquidity changes are not significant, only by 0.3%. But it turns out to be enough for the ratio value to go beyond the permissible range.

So, only one option of liabilities structure, the one with the authorized capital as the major source of capital, can be recommended for an Islamic bank with the most widespread assets structure. All other options feature high liquidity risk.

5 Stress test procedure. Second stage

At the second stage we use the liabilities structure with the authorized capital as the major source of capital, and the following options of the assets structure:

- Option 1. Trading transactions as the major investment pattern
- Option 2. Shared financing as the major investment pattern
- Option 3. Debt financing as the major investment pattern
- Option 4. Renting as the major investment pattern
- Option 5. Cash as the major investment pattern
- Option 6. All the sources in equal parts as the major investment pattern

Option 1. Trading transactions as the major investment pattern, units:

1	Material assets (<i>murabaha</i>)	70
2	Investments to the authorized capital of third parties	5
3	Shared financing (<i>musharaka</i> , <i>mudaraba</i>)	5
4	Debt financing (<i>sukuk</i>)	5
5	Lease (<i>ijara</i>)	5
6	Deposits with the central bank	5
7	Cash (on hand, at the settlement account)	5

Calculations result in the following values of the liquidity ratios:

	Liquidity ratios	Shock	Actual value	Recommended values
1	Instant liquidity	0.489	0.500	> 0.15 (15%)
2	Current liquidity	0.488	0.500	> 0.50 (50%)
3	Long-term liquidity	0.977	1.000	< 1.20 (120%)

Intermediate conclusions:

- Initially, due to the assets structure, the value of the current liquidity ratio takes on a threshold value. After a shock has occurred, the value goes beyond the recommended limits.

Option 2. Shared financing as the major investment pattern, units:

1	Material assets (<i>murabaha</i>)	5
2	Investments to the authorized capital of third parties	25
3	Shared financing (<i>musharaka</i> , <i>mudaraba</i>)	50
4	Debt financing (<i>sukuk</i>)	5
5	Lease (<i>ijara</i>)	5
6	Deposits with the central bank	5
7	Cash (on hand, at the settlement account)	5

Calculations result in the following values of the liquidity ratios:

	Liquidity ratios	Shock	Actual value	Recommended values
1	Instant liquidity	0.489	0.500	> 0.15 (15%)
2	Current liquidity	0.488	0.500	> 0.50 (50%)
3	Long-term liquidity	0.958	1.000	< 1.20 (120%)

Intermediate conclusions:

- Initially, due to the assets structure, the value of the current liquidity ratio takes on a threshold value. After a shock has occurred, the value goes beyond the recommended limits.

Option 3. Debt financing as the major investment pattern, units:

1	Material assets (murabaha)	5
	Investments to the authorized capital of third	
2	parties	5
3	Shared financing (musharaka, mudaraba)	5
4	Debt financing (sukuk)	70
5	Lease (ijara)	5
6	Deposits with the central bank	5
7	Cash (on hand, at the settlement account)	5

Calculations result in the following values of the liquidity ratios:

	Liquidity ratios	Shock	Actual value	Recommended values
1	Instant liquidity	0.489	0.500	> 0.15 (15%)
2	Current liquidity	6.830	7.000	> 0.50 (50%)
3	Long-term liquidity	0.266	0.278	< 1.20 (120%)

Intermediate conclusions:

- All the three liquidity ratios have satisfactory values both before and after the shock occurrence.

Option 4. Renting as the major investment pattern, units:

1	Material assets (murabaha)	5
	Investments to the authorized capital of third	
2	parties	5
3	Shared financing (musharaka, mudaraba)	5
4	Debt financing (sukuk)	5
5	Lease (ijara)	70
6	Deposits with the central bank	5
7	Cash (on hand, at the settlement account)	5

Calculations result in the following values of the liquidity ratios:

	Liquidity ratios	Shock	Actual value	Recommended values
1	Instant liquidity	0.489	0.500	> 0.15 (15%)
2	Current liquidity	0.488	0.500	> 0.50 (50%)
3	Long-term liquidity	0.918	1.000	< 1.20 (120%)

Intermediate conclusions:

- Initially, due to the assets structure, the value of the current liquidity ratio takes on a threshold value. After a shock has occurred, the value goes beyond the recommended limits.

Option 5. Cash as the major investment pattern, units:

1	Material assets (murabaha)	5
	Investments to the authorized capital of third	
2	parties	5
3	Shared financing (musharaka, mudaraba)	5
4	Debt financing (sukuk)	5
5	Lease (ijara)	5
6	Deposits with the central bank	5
7	Cash (on hand, at the settlement account)	70

Calculations result in the following values of the liquidity ratios:

	Liquidity ratios	Shock	Actual value	Recommended values
1	Instant liquidity	6.851	7.000	> 0.15 (15%)
2	Current liquidity	0.488	0.500	> 0.50 (50%)
3	Long-term liquidity	0.266	0.278	< 1.20 (120%)

Intermediate conclusions:

- Initially, due to the assets structure, the value of the current liquidity ratio takes on a threshold value. After a shock has occurred, the value goes beyond the recommended limits.

Option 5. Cash as the major investment pattern, units:

1	Material assets (murabaha)	15
	Investments to the authorized capital of third	
2	parties	15
3	Shared financing (musharaka, mudaraba)	15
4	Debt financing (sukuk)	15
5	Lease (ijara)	15
6	Deposits with the central bank	10
7	Cash (on hand, at the settlement account)	15

Calculations result in the following values of the liquidity ratios:

	Liquidity ratios	Shock	Actual value	Recommended values
1	Instant liquidity	1.468	1.500	> 0.15 (15%)
2	Current liquidity	1.464	1.500	> 0.50 (50%)
3	Long-term liquidity	0.744	0.778	< 1.20 (120%)

Intermediate conclusions:

- All the three liquidity ratios have satisfactory values both before and after the shock occurrence.

5 Conclusions

- Not all the assets or liabilities structures are acceptable for the balance sheets of an Islamic bank in terms of liquidity provision.

- 2 The liabilities structure featuring prevalence of debt financing is the one which ensures the maximal resistance of the bank's liquidity ratios to shocks.
- 3 The assets structure featuring prevalence of debt financing or the structure where all the asset items have approximately equal shares are those ensuring the maximal resistance of the bank's liquidity ratios to shocks.
- 4 Islamic banks, unlike the conventional ones, are not so free to select financial instruments or make financial transactions. Consequently, their assets and liabilities are more exposed to shocks than those of conventional banks. So, Islamic banks managers must perform stress tests and correct the balance item structure on a regular basis.
- 5 Islamic banks managers should pay special attention to managing the current liquidity, as it is more susceptible to shocks.

6 References

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