Micro liquidity stress test and a practice on Algerian commercial Bank

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Abstract:

This paper examin the use of stress tests in the banking industry as a tool for managing liquidity risk. We applied a micro- liquidity stress test to a single commercial bank at the central bank of Algeria using a descendant approach (Top-Down).

We treated the situation of the bank in two scenarios: one basic scenario that involved projecting the bank's initial data while adhering to the Financial Modeling Process (FPM) methodology and another scenario involving a single factor that involved the follow-up of 5% deposits made over the course of 12 weekly Periods.

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1. INTRODUCTION

The need to anticipate, recognize, and manage risk has become the primary concern for participants in the financial markets as well as regulators operating within them in all economies.

The 2007 financial crisis upended the risk management industry by bringing outdated management and oversight tools out of date and introducing the use of stress testing as a risk management tool to improve risk management.

A stress test, also known as a test of bank resistance, is a procedure that involves creating extremely realistic financial and economic conditions in order to study the effects on the entity and gauge its ability to withstand such circumstances. Stress tests are typically implemented by regulators for banking supervision purposes or by financial institutions on an individual basis as part of risk management.

The Basel Committee's recommendations emphasize the value and significance of this tool; the second pillar of the Solvability II Reform requires the use of the stress test as an internal control tool. On a national level, the stress test series that the Bank of Algeria conducted towards the end of 2015 demonstrate the regulator's intention to align itself with international practices.

However, this idea is still underdeveloped and rarely applied at the bank level. Our work's goal is to comprehend the function of one of the banking supervisory tools, the "stress test," in managing liquidity risk within a bank and to explain how it applies. We will achieve this by shedding light on the various concepts related to the stress test, including typologies, approaches, and models, as well as the procedure for implementing stress tests. We apply two stress scenarios to a bank in order to emphasize the liquidity risk. Through this exercise, we were able to test the bank's vulnerabilities related to the stressed risk and implement a set of recommendations aimed at optimizing the risk's management.

Question: How does the stress test help with managing liquidity risk within a bank?

In order to provide the most relevant answers to our problem and to respond to the following questions, it is appropriate to respond as follows:

- What is a stress, exactly?
- What is the purpose of this tool in liquidity risk management?
- How would one conduct a liquidity stress test at the Algerian bank level?

The following hypotheses are visible:

H1: The stress test is a new tool for covering and managing liquidity risk.

H2: If liquidity risk is not well managed and controlled, it is one of the major risks that could lead to a real crisis.

H3: Stress testing identify the bank's weaknesses to lower the risk of a liquidity crisis that causes disruptions.

2. Bank Stress testing

Stress testing defined as an analysis to assess the effect of a significant change in a macroeconomic environment, or an extreme but plausible event on a financial institution or a system. This kind of analysis has a growing importance since it is crucial to estimate, test, and be prepared for any adverse scenario in financial markets. (ONDER, DAMAR, & HEKIMOGLU, 2016, p. 20)

The objectives of the stress test are summarized as follows:

- Identify the impact of a shock on a portfolio, a company or the banking system as a whole.
- Determine a company's risk profile, check existing limits and assess business risks.
- Evaluate the capacity of the bank's equity capital to absorb large potential losses and identify the changes the bank can make to reduce its risk and preserve its equity capital.
- Identify vulnerabilities in normal times and provide information on how to deal with them.
- Communicate with managers and regulators alike.

2.1 Stress test typology and approach

There are many different forms, approaches and models of stress test:

2.1.1 The stress test typology :

The types of stress test vary according to their degree of complexity. There are **two** main types: (supevision, 2017, p. 17)

a. Sensitivity analysis :

There are two types of sensitivity stress test:

- Simple sensitivity stress tests:

These tests are easy to implement and do not require a great deal of resources. They provide a quick and simple assessment of the portfolio's sensitivity to changes in a risk factor.

- Stress envelopes: (CROUHY, 2013, p. 259)

Stress envelopes or multi-factor sensitivity tests are an approach that consists of applying several sensitivity tests simultaneously and consistently to the bank's portfolio.

b. Scenario-based stress tests

This involves assessing the impact of a plausible adverse scenario on the bank's portfolio.

Two distinct scenarios are built into the implementation of a stress test: baseline scenarios and adverse stress scenarios.

2.1.2. Stress test approach

There are three main scenario development approaches in practice: (BOLGUN & AKCAY, 2008, pp. 357-358)

a. Historic Scenarios

Risk variables in historic crisis periods (as in April 1994, October 2000, February 2001, 2007-2008 mortgage crisis, etc.) are applied to current variables to maintain a scenario. Latest and most significant crises can also be directly taken as a scenario.

b. Statistical Scenarios

Last one or two-year standard deviation levels of each risk variable can be considered in scenarios.

c. Hypothetical Scenarios

Defined risk variables can be considered with some deviations such as 15%, 40%, 60%, etc.

Moreover, worse case historic scenarios can be compounded more.

2.2 Stress test models and their limitations

2.2.1 Stress test models

Two models can be distinguished:

a. Micro stress tests

Generally used by financial institutions, at individual level, as part of risk management.

b. The macro stress test

Are implemented by supervisors to assess the resilience of a group of financial institutions. In terms of supervisory analysis, there are two main types of stress testing applications: "Top down "and "Bottom up" approaches. (ONDER, DAMAR, & HEKIMOGLU, 2016, p. 21)

- **Top down approach**

Specified risk factors and portfolios are considered similarly in each financial institution for the same scenario. Then results can be aggregated.

- **Bottom up approach**

Same scenarios are again given to each financial institution and asked to be applied by themselves in line with their own risk structures and portfolios in detail. Supervisors can later aggregate results. It is expected to get results that are more accurate from bottom up approach if it is applied correctly. However, top down approach can be much more practical and can provide instant outputs if adequate assumptions are used for a group of relatively homogeneous financial institutions.

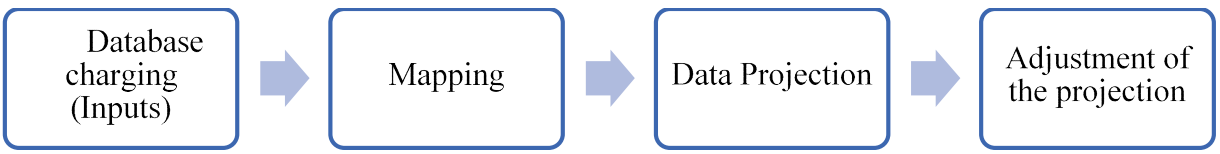
2.2.2 The limits of stress tests

Four weaknesses in stress testing exercises identified in the wake of recent crises: (INGENFI, 2012, p. 11)

1. A lack of integration in risk governance.
2. Shortcomings in methodologies.
3. The danger of specific stress tests.
4. Underestimated scenarios.

2.3 Methodology for implementing stress tests

We can summarize the stress test procedure as follows:



3. Financial projection model 2.0 version

The Financial Projection Model is an Excel-based system of equations that establishes the links between the different variables in a bank's balance sheet, income statement, cash flow and risk management indicators. The model's methodology involves using historical information combined with a forward-looking approach to perform different types of projections and calculations. It has been designed for financial institutions primarily to simulate adverse events on an individual scale as well as at the level of a group of financial institutions.

Murat Arslaner, Joon Soo Lee and Joaquin Gutierrez, experts from the World Bank, initiated the development of the program in 2008, following the financial crisis. The first version of the program (FPM 1.0) was launched in 2010.

In 2014, Murat Arslaner updated the model by designing FPM 2.0. This new version has an improved methodology and a simplified structure. (ARSLANER, 2021, p. 05)

3.1 Prerequisites for using the model

The functioning of the FPM depends on: (ALGERIA, 2021, p. 20)

- Diagnosis: knowing the strengths and weaknesses of banks is important in order to make an assessment of their emotional viability with FPM 2.
- Data: successful uses of the model require reliable data.
- Skills: To run a robust projection, users need analytical skills.

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3.2 Model structure and power supply

The model is structured in the same order as the steps involved in implementing a projection. The model file subdivided into 13 sheets: (ALGERIA, 2021, p. 20)

- **User guide:** This sheet provides basic step-by-step instructions for using the model.
- **Dash Board:** This sheet used to enter key parameters such as the projection horizon and frequency, and the regulatory thresholds for solvency ratios.
- **Data Entry:** This sheet used to enter balance sheet and income statement items, as well as other information relating to capital adequacy, liquidity and other parameters. This data entered in local format.
- **Mapped Data:** Data already entered in "Data Entry" linked to "Mapped Data" elements by assigning codes to them. The user can use this sheet to enter data directly in the model format.
- **BS Assomptions:** Once the model has been populated, projection assumptions are made based on historical data. The user if necessary adjust these.
- **Calculations:** This sheet contains the calculations required for the projection.
- **Funds Flow Summary:** This sheet calculates cash flow.
- **Projections:** This sheet displays projections for the balance sheet and income statement.
- **Summary and Indicators:** This sheet projects information relating to the balance sheet and income statement as well as CAMEL's viability and performance indicators.
- **Scenario Analysis–%:** This sheet used to introduce the stress test scenario in the form of percentage variations in the risk factors.
- **Scenario Analyses–$:** The scenario introduced in the form of variations in the amounts of balance sheet and income statement items.
- **Liquidation: This** sheet used to simulate the liquidation value of the bank in the event of default. In this case, the net asset value calculated automatically based on the last day of the projections.
- **Present Value:** This sheet gives the current value of the bank projected over twelve periods.

4. The application of a liquidity stress test at an Algerian bank

Our study is based on the application of a liquidity stress test scenario to a bank that we have named ". Commercial Bank "Given the confidential nature of the industry and the data we have access to, we clarify that the name of the bank participating in the tests will remain anonymous.

It is important to note that we have not obtained the complete financial statement of the "Commercial Bank" but rather we have just obtained the essential components for our analysis

(Consolidated balance sheet), including the constituent parts, the liabilities components, and the indicators related to this bank's liquidity.

4.1 Presentation of the bank's situation before stress

We will use the presentation of two scenarios—one being the initial financial position and the other being the circumstance where a base scenario is applied—to convey the stress-free state of our bank.

4.1.1 Overview of the initial situation

The base period that includes historical data in null values transmitted by this bank at the end of 2023 represents the beginning financial state of the "Bank Commercial Bank."

Table 1. The initial position of the "Commercial Bank" balance sheet items.

(Unit **: MDA).**

ASSETS	AMOUNT	%	LIABILITIES	AMOUNT	%
Cash	**7 950**	3	**Customer Deposit Accounts**	**197 037**	75,6
CBA Reserve Requirement	**23 283**	9	Demand Deposits	121 149	
CB Account	**3 483**	1 ,3	Term Deposits	11 739	
Money Market Activities	**8 359**	3,2	Saving Accounts for Houssing	0	
Capital Market Activities	**15 208**	5,8	Other Saving Accounts	30 252	
Net Loans	**179 509**	69	Others Deposits	**33 896**	
			Eligible Capital Instruments	**33 429**	12,8
			Money MKT Activities	**311**	0,12
			Capital MKT Activities	**0**	
Other Assets	**22 707**	8,7	**Other Liabilities**	**26 580**	10,2
			Net Profit After Dividents	4 432	1,7
TOTAL ASSETS	**260 502**	100	**TOTAL LIABILITIES**	**260 502**	100

Source: Compiled by us using the balance sheet document provided by the documentary audit department of the Bank of Algeria.

- The **cash** represents 3% of the commercial Bank’s assets.
- **Reserve requirement** represents 11,8% of the total deposits, which means that this bank hat not complied with the standard concerning the amount of the mandatory reserve.
- **Net loans** represent 69% of uses, which means that 69% of resources are used to grant loans.

Table 2. Initial situation of the "Commercial Bank" liquidity indicators

(Unit **: MDA).**

Periods / Items	Period 0
Net Interbank Position	8 048
Liquid Assets	66 688
Liabilities	60 564
Liabilities with Liquidity Requirements	60 564
Net Liquidity Requirement	0
Liquidity Ratio	**110,1 %**
Liquidity Ratio with Liquidity Needs	**110,1 %**
Interest on Loans	6,95 %
Interest on Deposits	0,55 %

Source: Compiled by us using the balance sheet document provided by the documentary audit department of the Bank of Algeria.

The table shows that the liquidity ratio is 110, 1%, with Liquid Assets exceeding **Current Liabilities.**

The bank's situation under a baseline scenario:

The process of applying a base scenario involves projecting the bank's basic data while adhering to the FPM process.

- The **cash** represents 3% of the commercial Bank's assets.
- **Reserve requirement** represents 11,8% of the total deposits, which means that this bank hat not complied with the standard concerning the amount of the mandatory reserve.
- **Net loans** represent 69% of uses, which means that 69% of resources are used to grant loans.

Using a base scenario to project the initial bank commercial data, we were able to obtain a total positive flow over all periods. This indicates that the "Commercial Bank" does not experience any liquidity difficulties, with its liquidity ratio exceeding the regulatory threshold.

Table 3. Commercial banking data projection

(Unit: **MDA)**

	Period 0	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6
Eligible Capital							

Instruments	**33 429**	**33 612**	**33 826**	**34 041**	**34 256**	**34 472**	**34 687**
TOTAL ASSETS	**260 502**	**260 873**	**261 251**	**261 630**	**262 010**	**262 390**	**262 771**
Cash & Checks	7 950	7 955	7 960	7 965	7 971	7 976	7 981
CBA Reserve Requirement	23 283	19 716	19 729	19 741	19 754	19 767	19 780
CBA	3 483	6 518	6 518	6 518	6 518	6 518	6 518
Due from Banks Gross	8 359	8 505	8 505	8 505	8 505	8 505	8 505
Net Due From Banks	8 359	8 505	8 505	8 505	8 505	8 505	8 505
Due to Banks	311	312	312	313	314	315	316
Net Interbank assets	8 048	8 193	8 192	8 191	8 190	8 189	8 189
Net AFS Investment	15 189	15 453	15 453	15 453	15 453	15 453	15 453
Net HTM Investment	0	0	0	0	0	0	0
Net Financial Assets Held for Trading/FVA	0	0	0	0	0	0	0
Gross Loans	**192 067**	**192 455**	**192 632**	**192 846**	**193 060**	**193 275**	**193 491**
Net Loans	179 509	180 007	180 294	180 617	180 942	181 266	181 591
Total Deposits	197 037	197 164	197 291	197 419	197 547	197 676	197 805
Net Profit After Dividents(+-)	4 432	213	214	214	214	214	215
Liquid Assets	66 688	67 109	67 162	67 221	67 280	67 339	67 398
Current Liabilities	60 564	60 597	60 629	60 662	60 695	60 728	60 761
Current Liabilities with Liquidity need	60 564	60 597	60 629	60 662	60 695	60 728	60 761
Net Liquidity Need	0	0	0	0	0	0	0
% Regulatory Liquidity Ratio	**110,1%**	**110,7%**	**110,8%**	**110,8%**	**110,8%**	**110,9%**	**110,9%**
% Regulatory Liquidity Ratio (with Liquidity need)	**110,1%**	**110,7%**	**110,8%**	**110,8%**	**110,8%**	**110,9%**	**110,9%**
Loans' Adjusted Interest Income to Gross Loans	6,95%	10,09%	10,08%	10,08%	10,07%	10,07%	10,06%
% Average Cost of Deposits	0,55%	0,65%	0,65%	0,65%	0,65%	0,65%	0,66%

% ROA	3,43%	4,95%	4,97%	4,96%	4,96%	4,95%	4,95%
% ROE	25,31%	40,98%	40,88%	40,61%	40,37%	40,12%	39,88%

	Period 7	Period 8	Period 9	Period 10	Period 11	Period 12
Eligible Capital Instruments	**34 843**	**34 997**	**35 152**	**35 307**	**35 462**	**35 617**
TOTAL ASSETS	**263 093**	**263 414**	**263 736**	**264 058**	**264 381**	**264 705**
Cash & Checks	7 986	7 991	7 997	8 002	8 007	8 013
CBA Reserve Requirement	19 793	19 806	19 819	19 832	19 845	19 858
CBA	6 518	6 518	6 518	6 518	6 518	6 518
Due from Banks Gross	8 505	8 505	8 505	8 505	8 505	8 505
Net Due From Banks	8 505	8 505	8 505	8 505	8 505	8 505
Due to Banks	317	317	318	319	320	321
Net Interbank assets	8 188	8 187	8 186	8 185	8 184	8 183
Net AFS Investment	15 453	15 453	15 453	15 453	15 453	15 453
Net HTM Investment	0	0	0	0	0	0
Net Financial Assets Held for Trading/FVA	0	0	0	0	0	0
Gross Loans	181 857	193 803	193 960	194 117	194 275	194 433
Net Loans	193 647	182 122	182 388	182 655	182 922	183 189
Total Deposits	197 935	198 065	198 195	198 326	198 457	198 589
Net Profit After Dividents(+-)	155	154	154	154	154	154
Liquid Assets	67 448	67 497	67 546	67 596	67 645	67 695
Current Liabilities	60 761	60 828	60 862	60 895	60 929	60 963
Current Liabilities with Liquidity need	60 761	60 828	60 862	60 895	60 929	60 963
Net Liquidity Need	0	0	0	0	0	0
% Regulatory Liquidity Ratio	**110,9%**	**111,0%**	**111,0%**	**111,0%**	**111,0%**	**111,0%**
% Regulatory Liquidity Ratio (with Liquidity need)	**110,9%**	**111,0%**	**111,0%**	**111,0%**	**111,0%**	**111,0%**
Loans' Adjusted Interest Income to						

Gross Loans	10,06%	10,05%	10,05%	10,05%	10,04%	10,04%
% Average Cost of Deposits	0,66%	0,66%	0,66%	0,66%	0,66%	0,66%
% ROA	3,75%	3,68%	3,68%	3,68%	3,67%	3,67%
% ROE	28,62%	28,38%	28,26%	28,14%	28,03%	27,95%

Source: Compiled by us using the FPM scoreboard document provided by the Bank of Algeria's desk audit department.

The table shows That :

- The projection of **TOTAL ASSETS (total liabilities)** resulted in an increase throughout the 12 periods, with a margin of change of more than 320 MDA.
- For the Eligible Capital Instruments account, the projection led to an increase that lasted until the last period, with a growth margin of between 154 MDA and 216 MDA.
- The projection of the **Cash & Checks** account resulted in an increase of 6 MDA for periods 4, 9 and 12, and 5 MDA for the rest of the periods.
- The **CBA Reserve Requirement** projection resulted in a decrease of 3567 MDA in the first projection period (compared to the base period), then an increase of 13 MDA in the remaining periods.
- As for the **CBA** projection, we can say that it increased by 3 035 MDA compared to the base period, then remained stable throughout the 12 periods.
- Projected **Net Due from Bank**s (equal to **Gross Interbank Assets**) increased by 146 MDA in period 1, and remained stable until the last projection period.
- **Interbank Liabilities** increased by 1 MDA in all projection periods.
- The projected **Interbank Position** also moved by a margin of 145 MDA in period 1, then fell by one during the rest of the periods.
- The securities portfolio projection consists of projecting the bank's three types of securities:
- **Net AFS Investment** increased by 264 MDA in the 1st period, and remained stable over all the remaining projection periods.
- **Net HTM Investment** and **Net Financial Assets Held for Trading/FVA** have both been null, which has resulted in null values throughout the projection.
- Over the course of the 12 projected periods Net Loans, Gross Loans and Deposits have all increased.
- Interest on Credit increased by 3.14 % in the first period and decreased by 2.44 % in the second, seventh, and eleventh periods, with a margin of 0.01%.
- **Average Cost of Deposits** increased in period 1 at a rate of 0.1%, then stabilised at the same percentage until period 6, when it increased by 0.01%.
- Also, the projection of **Net Profit after Dividends** resulted in a decrease in the 1st projected period with a margin of 4,219 MDA, then an increase in the 2nd period (with a margin of 1 MDA) and the amount stabilised for the 3rd, 4th and 5th periods. The amount fell again in the 6th period (with a margin of 60 MDA) and the 7th period (with a margin of

1 MDA) and stabilised for the rest of the periods.

- The projection of **Liquid Assets** resulted in an increase in the 1st period with a margin of 421 MDA, then a change of between 49 and 59 MDA for the rest of the periods.
- **Current liabilities** (without and with liquidity needs) increased by a margin of between 32 and 34 MDA.
- The **Liquidity Requirement** remained zero throughout the projected periods.
- The **Liquidity Ratio** (whether with or without Liquidity Requirement) increased by 0.6% in period 1, then by 0.1% in periods 2, 4 and 7.

Table 4. Commercial banking cash flow projections

(Unit: **MDA**)

Periods / Items	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6
PLA Operational Cash Flow (OCF)	105	106	106	106	107	107
Balance Sheet Funds Flow (BFF)	3 727	70	108	108	108	108
Initial Fund Flow	**3 833**	**177**	**214**	**215**	**215**	**216**
Initial Funds Flow after paying previous Liquidity need	3 833	177	214	215	215	216
Funds Flow after reducing CBA	3 833	177	214	215	215	216
Funds Flow after reducing Interbank	3 833	177	214	215	215	216
Funds Flow after selling HFT Securities	3 833	177	214	215	215	216
Funds Flow after selling AFS Securities	3 833	177	214	215	215	216
Funds Flow after selling HTM Securities	3 833	177	214	215	215	216
Final Funds Flow	3 833	177	214	215	215	216
Final Funds Flow Allocated to	3 833	177	214	215	215	216
Net Loans	389	177	214	215	215	216
Net HTM Investment	0	0	0	0	0	0
Net AFS Investment	264	0	0	0	0	0
Net Financial Assets Held for Trading/FVA	0	0	0	0	0	0
Interbank Assets	145	0	0	0	0	0
CBA	3 034	0	0	0	0	0

Periods / Items	Period 7	Period 8	Period 9	Period 10	Period 11	Period 12
PLA Operational Cash Flow (OCF)	91	87	83	79	76	73 3
Balance Sheet Funds Flow (BFF)	-7 025	-6 639	-6 273	-5 928	-5 602	-5 294
Initial Fund Flow	-6 934	-6 551	-6 190	-5 849	-5 526	-5 221
Initial Funds Flow after paying previous Liquidity need	-18 746	-25 298	-31 488	-37 337	-42 863	-48 085
Funds Flow after reducing CBA	-18 746	-25 298	-31 488	-37 337	-42 863	-48 085
Funds Flow after reducing Interbank	-18 746	-25 298	-31 488	-37 337	-42 863	-48 085
Funds Flow after selling HFT Securities	-18 746	-25 298	-31 488	-37 337	-42 863	-48 085
Funds Flow after selling AFS Securities	-18 746	-25 298	-31 488	-37 337	-42 863	-48 085
Funds Flow after selling HTM Securities	-18 746	-25 298	-31 488	-37 337	-42 863	-48 085
Final Funds Flow	-18 746	-25 298	-31 488	-37 337	-42 863	-48 085
Final Funds Flow Allocated to	0	0	0	0	0	0
Net Loans	0	0	0	0	0	0
Net HTM Investment	0	0	0	0	0	0
Net AFS Investment	0	0	0	0	0	0
Net Financial Assets Held for Trading/FVA	0	0	0	0	0	0
Interbank Assets	0	0	0	0	0	0
CBA	0	0	0	0	0	0

Source: Compiled by us using the FPM scoreboard document provided by the Bank of Algeria's desk audit department.

- From the below, we can see that both **CR** and **Balance Sheet Flows** are **positive** throughout the projected periods, giving a similarly positive **Fund Flow fo**r all periods.
- **TOTAL FLOWS** = **Balance Sheet Flows** + **RC Flows**, where **Balance Sheet Flows** represent total changes in balance sheet accounts, and **RC Flows** represent total changes in RC accounts.

- A positive **TOTAL CASH FLOW** means that the ″ **Commercial Bank** ″ is not experiencing any liquidity difficulties, which means that its **Liquidity Requirement** is zero (as we saw in the Liquidity Requirement projection in Table 04), so this bank did not need to absorb any cash:

TOTAL CASH FLOW = Initial Funds Flow after paying previous Liquidity need

= Funds Flow after reducing CBA
= Funds Flow after reducing Interbank
= Funds Flow after selling HFT Securities
= Funds Flow after selling AFS Securities
= Funds Flow after selling HTM Securities
= Final Funds Flow

- These positive flows allocated to **Loans**, **Securities**, **Interbank Assets** and **CBA** respectively according to their shares. For example, to obtain the share of Gross Loans in the[1st] period, we will calculate the sum of these accounts in the 1st projected period of the balance sheet:

Total shares = Gross loans (192,455) + HTM (00) + AFS (15,453) + HFT (00) + Gross interbank assets (8,505) + CBA (6,518) = 222,931 ⇒ 100%.

$$\textbf{Share of gross loans} = \frac{192\,455 * 3\,833}{222\,931} = 389$$

After deducting:

- **Share of Gross Loans**: Final Flows - Share of Gross Loans = 3,833 - 389 = 3,444
- **Share of HTM (**= 00**)**: 3 444 - 0 = 3 444.
- **Share of AFS (**= 264**)**: 3,444 - 264 = 3,180.
- **Share of HFT (**= 00**)** : 3,180 - 0 = 3,180.
- **Share of Interbank Assets** (= 145) : 3,180 - 145 = 3,035
- **CBA's share** is 3,035.

4.2 Presentation of the bank's situation after stress

For our stress test, we also chose a hypothetical scenario, for which we -first of all- projected the " Commercial Bank " data with a base scenario and a single-factor scenario, whose factor is the leakage of deposits carried out over 12 periods with a frequency of one week per period (weekly), which means that the duration of our stress test -which is 84 days- did not exceed 3 months.

Bank's situation with a 5.5% deposit outflow

By applying a liquidity stress test to a commercial bank, we were able to see the deterioration in the bank's financial position in the face of a 5.5% deposit outflow, which is our scenario.

Table 5. Results of (-5.5%) deposit outflow on the bank's projected data

(Unit: **MDA**)

	Period 0	**Period 1**	**Period 2**	**Period 3**	**Period 4**	**Period 5**	**Period 6**
Eligible Capital Instruments	**33 429**	**33 612**	**33 589**	**32 933**	**32 838**	**33 049**	**33 248**
TOTAL ASSETS	**260 502**	**249 909**	**239 646**	**229 316**	**224 586**	**223 483**	**222 481**
Cash & Checks	7 950	7 513	7 100	6 709	6 340	5 991	5 662
CBA Reserve Requirement	23 283	18 620	17 595	16 628	15 713	14 849	14 032
CBA	3 483	0	0	0	0	0	0
Due from Banks Gross	8 359	6 251	0	0	0	0	**0**

Net Due From Banks	8 359	6 251	0	0	0	0	0
Due to Banks	311	312	312	313	314	315	316
Net Interbank assets	8 048	5 939	-312	-313	-314	-315	-316
Net AFS Investment	15 189	15 189	12 528	3 500	0	0	0
Net HTM Investment	0	0	0	0	0	0	0
Net Financial Assets Held for Trading/FVA	0	0	0	0	0	0	0
Gross Loans	192 067	192 066	192 065	192 065	192 064	192 063	192 062
Net Loans	179 509	179 618	179 727	179 836	179 945	180 054	180 163
Total Deposits	197 037	186 200	175 959	166 281	157 136	148 493	140 326
Net Profit After Dividents(+-)	4 432	214	-22	-661	-113	203	199
Liquid Assets							
Current Liabilities							
Current Liabilities with Liquidity need							
Net Liquidity Need							
% Regulatory							

	Period 7	**Period 8**	**Period 9**	**Period 10**	**Period 11**	**Period 12**
Eligible Capital Instruments	**33 443**	**33 635**	**33 822**	**34 007**	**34 188**	**34 366**
TOTAL ASSETS	**221 542**	**220 663**	**219 840**	**219 070**	**218 351**	**217 679**
Cash & Checks	5 350	5 056	4 778	4 515	4 267	4 032
CBA Reserve Requirement	13 260	12 531	11 842	11 190	10 575	9 993
CBA	0	0	0	0	0	0
Due from Banks Gross	**0**	**0**	**0**	**0**	**0**	**0**

Net Due From Banks	0	0	0	0	0	0
Due to Banks	317	317	318	319	320	321
Net Interbank assets	-317	-317	-318	-319	-320	-321
Net AFS Investment	0	0	0	0	0	0
Net HTM Investment	0	0	0	0	0	0
Net Financial Assets Held for Trading/FVA	0	0	0	0	0	0
Gross Loans	192 062	192 061	192 060	192 059	192 059	192 058
Net Loans	180 271	180 380	180 489	180 597	180 706	180 814
Total Deposits	132 608	125 315	118 422	111 909	105 754	99 938
Net Profit After Dividents(+-)	195	191	187	184	181	178
Liquid Assets	35 111	34 856	34 617	34 391	34 179	33 980
Current Liabilities	44 514	42 698	40 981	39 359	37 826	36 378
Current Liabilities with Liquidity need	69 812	74 186	78 319	82 223	85 911	89 396
Net Liquidity Need	25 298	31 488	37 337	42 863	48 085	53 018
% Regulatory Liquidity Ratio	78,9%	81,6%	84,5%	87,4%	90,4%	93,4%
% Regulatory Liquidity Ratio	**50,3%**	**47,0%**	**44,2%**	**41,8%**	**39,8%**	**38,0%**

Source: Compiled by us using the FPM scoreboard document provided by the Bank of Algeria's desk audit department.

Table 6. Commercial banking flows after deposit outflows (5.5%)

Periods / Items	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6
PLA Operational Cash Flow (OCF)	105	-131	-769	-221	95	91
Balance Sheet Funds Flow (BFF)	-5 697	-8 782	-8 257	-7 783	-7 402	-7 025

Initial Fund Flow	**-5 591**	**-8 913**	**-9 027**	**-8 005**	**-7 306**	**-6 934**
Initial Funds Flow after paying previous Liquidity need	-5 591	-8 913	-9 027	-8 005	-11 811	-18 746
Funds Flow after reducing CBA	-2 107	-8 913	-9 027	-8 005	-11 811	-18 746
Funds Flow after reducing Interbank	0	-2 661	-9 027	-8 005	-11 811	-18 746
Funds Flow after selling HFT Securities	0	-2 661	-9 027	-8 005	-11 811	-18 746
Funds Flow after selling AFS Securities	0	0	0	-4 505	-11 811	-18 746
Funds Flow after selling HTM Securities	0	0	0	-4 505	-11 811	-18 746
Final Funds Flow	0	0	0	-4 505	-11 811	-18 746
Final Funds Flow Allocated to	0	0	0	0	0	0
Net Loans	0	0	0	0	0	0
Net HTM Investment	0	0	0	0	0	0
Net AFS Investment	0	0	0	0	0	0
Net Financial Assets Held for Trading/FVA	0	0	0	0	0	0
Interbank Assets	0	0	0	0	0	0
CBA	0	0	0	0	0	0

	Period 7	Period 8	Period 9	Period 10	Period 11	Period 12
PLA Operational Cash Flow (OCF)	87	83	79	76	73	70
Balance Sheet Funds Flow (BFF)	-6 639	-6 273	-5 928	-5 602	-5 294	-5 003
Initial Fund Flow	**-6 551**	**-6 190**	**-5 849**	**-5 526**	**-5 221**	**-4 933**
Initial Funds Flow after paying previous Liquidity need	-25 298	-31 488	-37 337	-42 863	-48 085	-53 018
Funds Flow after reducing CBA	-25 298	-31 488	-37 337	-42 863	-48 085	-53 018
Funds Flow after reducing Interbank	-25 298	-31 488	-37 337	-42 863	-48 085	-53 018
Funds Flow after selling HFT Securities	-25 298	-31 488	-37 337	-42 863	-48 085	-53 018
Funds Flow after selling AFS Securities	-25 298	-31 488	-37 337	-42 863	-48 085	-53 018
Funds Flow after selling HTM Securities	-25 298	-31 488	-37 337	-42 863	-48 085	-53 018
Final Funds Flow	-25 298	-31 488	-37 337	-42 863	-48 085	-53 018
Final Funds Flow Allocated to	0	0	0	0	0	0
Net Loans	0	0	0	0	0	0
Net HTM Investment	0	0	0	0	0	0
Net AFS Investment	0	0	0	0	0	0
Net Financial Assets Held for Trading/FVA	0	0	0	0	0	0

Interbank Assets	0	0	0	0	0	0
CBA	0	0	0	0	0	0

Source Compiled by us using the FPM scoreboard document provided by the Bank of Algeria's desk audit department.

The outflow of deposits has led to a fall in most of the assets and liabilities on its balance sheet, as well as its indicators and flows. This is due to the role that deposits play as the bank's most important source of liquidity.

- An increase in **Net Loans** and a decrease in most balance sheet assets and liabilities such as: **Cash, Reserve Requirement, Net Profit after Dividends** and **Eligible Capital Instruments.**
- The decrease in the amount of **Gross Loans** during all periods with a margin of 1 MDA, as well as the increase in the amounts of **Due to Banks** with a margin of 1 MDA, means that the " **Commercial Bank** " borrowed on the interbank market because it needed liquidity from the 4th period.
- The **Net Interbank assets** fell in the 2nd period and took on negative values throughout the rest of the periods, due to the fall in **Net Due From Banks** in the 1st period and its disappearance in the other periods, as well as the increase in **Due to Banks**.
- **Liquidity assets** and **liabilities** have fallen, but the amounts of **liquid assets** are lower than those of **liabilities**, which explains the fall in the **liquidity ratio** from the 1st period of the test to the 4th period, after which it rose from 71.1% to 93.4% towards the end of the test, below the regulatory limit (100%).
- **Current Liabilities with Liquidity need** fell throughout the first 3 periods of the test, due to the absorption of the **Liquidity Requirement** during these periods. They then increased from the 4th period onwards in parallel with the **Liquidity Requirement**, and with the fall in the **Liquidity Ratio with Liquidity Requirement** (compared with the Ratio without Liquidity Requirement).
- **Interest on Loans** and **Deposits** increased during the test. This is due to the decrease in total deposits.

Table 7. Final position of the "Commercial Bank" liquidity indicators

Items \ **Periods**	
Net Interbank Position	8 048
Liquid Assets	57 731
Liabilities	57 864
Liabilities with Liquidity Requirements	57 864
Net Liquidity Requirement	0
Liquidity Ratio	**99,8%**

Liquidity Ratio with Liquidity Needs	**99,8 %**
Interest on Loans	6,95 %
Interest on Deposits	0,55 %

Source: Compiled by us using the FPM scoreboard document provided by the Bank of Algeria's desk audit department.

- **Liquid Assets** of 57,731 MDA are less than **Current Liabilities** of 57,864 MDA, which justifies the liquidity ratio of less than 100% (equal to **99. 8%).**

4.3 Discussion of the results

The projection results of the Bank's data using a base scenario show that:

- The bank is not in danger of experiencing a liquidity crisis and is in good financial standing.
- The excess liquidity ratio over the regulatory threshold, which is 110.1%.
- Positive total flow and zero liquidity deficit indicate that the bank is not experiencing any liquidity difficulties.
- Increase in the total amount deposited as well as most of the active and passive components of the balance.
- The bank is in a lending situation since its interbank loans exceed its interbank loans.

The "Commercial Bank" projected balance, indicators, and flow, along with a 5.5% failure rate for deposits, have allowed us to observe the decline in this latter's financial status, specifically:

- The bank has a liquidity deficit; from the beginning of the scenario, its liquidity ratio (99, 8%) was below the regulatory threshold.
- Total negative flow, explained by the existence of a liquidity surplus.
- Reduction of the bank's deposits.
- The bank took out a loan on the interbank market because, starting in the fourth period, it needed liquidity.
- A decrease in the majority of the constituent and liabilities elements of its balance, such as the **Cash**, **Reserve Requirement** and the **Net result After Dividends**, and the Regulated Private Funds, has resulted from the withdrawal of deposits.

5. CONCLUSION

A risk of liquidity can typically arise when there is a lack of confidence in the concerned institution by the market or the clientele (who make up a large portion of the deposits). This crisis can be the result of a decline in the establishment's earnings, a major breach by third parties, increased competition on the markets, fraud, a societal crisis, etc., which supports our first hypothesis.

A stress test, also known as a bank resistance test, is an exercise that involves creating extremely realistic but extreme economic and financial conditions in order to study the effects on

banks and gauge their ability to withstand such circumstances, which supports our second hypothesis. From then, the manager will focus on identifying, measuring, and covering the liquidity risk in order to conduct the best possible control over it.

The third hypothesis verified after analysing the outcomes of our deposit failure scenario, we have determined that deposits are this bank's primary source of liquidity.

In response to our question, we would say that stress tests enable the director to have a clearer understanding of the commercial bank's situation and identify its weaknesses and vulnerabilities, which will aid in decision-making and enable the installation of the necessary safeguards to prevent a liquidity crisis.

In order to address this issue, we believe it is essential to provide the Commercial Bank with some recommendations. In order to improve the Bank's liquidity risk management and fortify its resilience, it advised that the Bank:

- Maintaining a regular check on the bank's overall condition and its liquidity status in particular, while identifying the factors influencing it and the potential risks it faces.
- It is necessary to have better communication with the deposants in order to increase their trust or win it back in an emergency.
- Expand the portion of the titles she holds as a source of compensation.
- Create effective emergency refinancing plans.
- Strengthening his free deposits with the BA (his CBA account).
- Expand its interbank assets and distribute them among several banks.

For a number of reasons, stress testing are still not very effective in Algeria. The best possible use of stress tests limited by a weak banking data infrastructure. Hence, inadequate training provided to bank staff to sharpen their analytical and resistance test application tools. To do this, Algerian financial supervisors should keep developing in the area of risk management by utilizing a variety of mechanisms.

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