LIQUIDITY RISK

BANKS AND FINANCIAL INTERMEDIARIES JUAN F. IMBET

Introduction

- Liquidity risk is a normal aspect of the everyday management of a Financial Institution
- For example, Depository Institutions must manage liquidity so they can pay out cash as deposit holders request withdrawals on their deposits.
- Not all FIs have the same exposure to liquidity risk. One one side of the spectrum, commercial banks ar e highly exposed to liquidity risk. On the other side, open end mutual funds have a low exposure to liquidity risk.
- The Financial Crisis of 2008-2009 was in part due to liquidity risk. As credit and mortgage-backed securities markets froze, banks would only lend at anything but high overnight rates. Without interbank funding, banks became reluctant to lend to other credit markets, resulting in a more general and widespread liquidity crisis.

What is Liquidity Risk?

- The risk of incurring losses resulting from the inability to meet payment obligations.
- Not being able to convert quickly and cheap non-current assets into cash or cash-like securities.

What causes liquidity risk? I) Liability Side Reason

- Occurs when an FI liability holder, such as a depositor or an insurance policy-holder, seek to cash in their financial claims immediately.
- When depositors withdraw, commercial banks need to borrow, use cash, or sell assets to meet obligations.
- FIs tend to hold as little cash as possible, since cash holdings pay no interests.
- In order to convert a long-term asset into cash, the price the asset holder must accept for immediate sell may be far less than it would receive with a longer horizon to negotiate the sell.
- **Fire-sale price:** The price received for an asset that has to be sold immediately.
- In normal times, commercial banks rarely liquidate their assets, and use interbank lending as a source of liquidity.

What causes liquidity risk? I) Asset Side Reason

- Ability of exercise of, off balance-sheet loan commitments.
- Loan commitments allow a customer to borrow funds on demand.
- Just like with liability withdrawals, a FI can use cash, debt, or sell assets in order to meet the demand.

LIQUIDITY RISK AT DEPOSITORY INSTITUTIONS

- A depository institution's (DI's) balance sheet typically has a large amount of short-term liabilities, such as demand deposits and other transaction accounts, which fund relatively long-term assets.
- Demand deposit accounts, money market deposit accounts (MMDAs), and other transaction accounts are contracts that give the holders the right to put their claims back to the DI on any given day and demand immediate repayment of the face value of their deposit claims in cash.
- Accounts with this type of put option include demand deposits, NOW accounts (interest-bearing checking accounts with minimum balance requirements), and money market accounts (checking accounts often with minimum balance and number-of-checks-written restrictions)
- Thus, an individual demand deposit account holder with a balance of $10,000 can demand cash to be repaid immediately, as can a corporation with $100 million in its demand deposit account.

Liquidity Risk at DIs

Assets			Liabilities*		
Total cash assets	$ 1,924.2	13.06%	Total deposits	$11,155.5	85.26%
Total securities	4,024.0	27.31	Borrowings	1,580.0	12.08
Total loans	7,612.2	51.65	Other liabilities	348.6	2.66
Other assets	1,176.2	7.98	Total liabilities	$13,084.1	
Total assets	$14,736.6				

*Excluding bank equity capital.

Liquidity Risk at DIs

- In reality, a depository institution knows that normally only a small proportion of its deposits will be withdrawn on any given day. Most demand deposits act as consumer core deposits on a day-by-day basis, providing a relatively stable or long-term source of savings and time deposit funds for the DI.
- Deposit withdrawals may in part be offset by the inflow of new deposits (and income generated from the DI's on- and off-balance-sheet activities).
- The DI manager must monitor the resulting net deposit withdrawals or net deposit drains. Specifically, over time, a DI manager can normally predict—with a good degree of accuracy—the probability distribution of net deposit drains (the difference between deposit withdrawals and deposit additions) on any given normal banking day.

Purchased Liquidity Management

Panel A: Balance Sheet Immediately before and after Deposit Drain

Before the Drain

Assets		Liabilities and Equity	
Assets	150	Deposits	100
		Borrowed funds	20
		Other liabilities	5
		Equity	25
	150		150

After the Drain

Assets		Liabilities and Equity	
Assets	150	Deposits	95
		Borrowed funds	20
		Other liabilities	5
		Equity	25
	150		145

Panel B: Adjusting to a Deposit Drain through Purchased Liquidity Management

Assets		Liabilities and Equity	
Assets	150	Deposits	95
		Borrowed funds	25
		Other liabilities	5
		Equity	25
	150		150

Stored Liquidity Management

Panel A: Balance Sheet Immediately before Deposit Drain

Assets		Liabilities and Equity	
Cash	12	Deposits	100
Other assets	138	Borrowed funds	20
		Other liabilities	5
		Equity	25
	150		150

Panel B: Adjusting to a Deposit Drain through Stored Liquidity Management

Assets		Liabilities and Equity	
Cash	7	Deposits	95
Other assets	138	Borrowed funds	20
		Other liabilities	5
		Equity	25
	145		145

Example with Asset Side Liquidity Risk

- Just as deposit drains can cause a DI liquidity problems, so can loan requests and the exercise by borrowers of their loan commitments and other credit lines. In recent years, DIs, especially commercial banks, have increased their loan commitments tremendously with the belief they would not be used.
- What is the impact of a 5 million exercise of a loan commitment?

Example with Asset Side Liquidity Risk

Panel A: Balance Sheet Immediately before and after Exercise

(a) Before Exercise

Cash	12	Deposits	100
Other assets	138	Borrowed funds	20
		Other liabilities	5
		Equity	25
	150		150

(b) After Exercise

Cash	12	Deposits	100
Other assets	143	Borrowed funds	20
		Other liabilities	5
		Equity	25
	155		150

Panel B: Adjusting the Balance Sheet to a Loan Commitment Exercise

(a) Purchased Liquidity Management

Cash	12	Deposits	100
Other assets	143	Borrowed funds	25
		Other liabilities	5
		Equity	25
	155		155

(b) Stored Liquidity Management

Cash	7	Deposits	100
Other assets	143	Borrowed funds	20
		Other liabilities	5
		Equity	25
	150		150

Measuring Liquidity Risk

Financing Gap and the Financing Requirement

- Financing gap = Average loans − Average deposits

If this financing gap is positive, the DI must fund it by using its cash and liquid assets and/or borrowing funds in the money market.
Financing gap = Borrowed funds – Liquid Assets
Financing gap + Liquid Assets = Financing requirement (borrowed funds)

The liquidity and managerial implications of the **financing requirement** (the financing gap plus a DI's liquid assets) are that the level of core deposits and loans as well as the amount of liquid assets determines the DI's borrowing or purchased fund needs.

The larger a DI's financing gap and liquid assets holdings, the larger the amount of funds it needs to borrow in the money markets and the greater is its exposure to liquidity problems from such a reliance

Sources and Uses of Liquidity

- A second measure of liquidity risk exposure a DI manager might use is to measure the DI's liquidity position on a daily basis, if possible. A useful tool is a net liquidity statement that lists sources and uses of liquidity and thus provides a measure of a DI's net liquidity position.

Sources of Liquidity	
1. Total cash-type assets	$ 2,000
2. Maximum borrowed funds limit	12,000
3. Excess cash reserves	500
Total	$14,500
Uses of Liquidity	
1. Funds borrowed	$ 6,000
2. Federal Reserve borrowing	1,000
Total	7,000
Total net liquidity	$ 7,500

Peer Group Ratio Comparisons

- A third way to measure a DI's liquidity exposure is to compare certain key ratios and balance sheet features of the DI—such as its loans to deposits, borrowed funds to total assets, and commitments to lend to assets ratios—with those of DIs of a similar size and geographic location

	Northern Trust Bank	Bank of America
Borrowed funds to total assets	8.84%	10.22%
Loans to deposits	36.94	68.07
Core deposits to total assets	35.77	71.24
Commitments to lend to total assets	33.37	47.13

Liquidity Index

- Measures the potential losses an FI could suffer from a sudden or fire-sale disposal of assets compared with the amount it would receive at a fair market value established under normal market (sale) conditions— which might take a lengthy period of time as a result of a careful search and bidding process

$$I = \sum_{i=1}^{N} [(w_i)(P_i / P_i^*)]$$

(P_i) Fire-sale price

(P_i^*) Fair value price

Example

Suppose that a DI has two assets: 50 percent in one-month Treasury bills and 50 percent in real estate loans. If the DI must liquidate its T-bills today (P_1), it receives \$99 per \$100 of face value. If it can wait to liquidate them on maturity (in one month's time), it will receive \$100 per \$100 of face value (P_1^*). If the DI has to liquidate its real estate loans today, it receives \$85 per \$100 of face value (P_2). Liquidation at the end of one month (closer to maturity) will produce \$92 per \$100 of face value (P_2^*). Thus, the one-month liquidity index value for this DI's asset portfolio is:

$$\begin{aligned} I &= [½(0.99/1.00)] + [½(0.85/0.92)] \\ &= 0.495 + 0.462 \\ &= 0.957 \end{aligned}$$

Suppose, alternatively, that a slow or thin real estate market caused the DI to be able to liquidate the real estate loans at only \$65 per \$100 of face value (P_2). The one-month liquidity index for the DI's asset portfolio is:

$$\begin{aligned} I &= [½(0.99/1.00)] + [½(0.65/0.92)] \\ &= 0.495 + 0.353 \\ &= 0.848 \end{aligned}$$

The value of the one-month liquidity index decreases as a result of the larger discount on the fire-sale price—from the fair (full value) market price of real estate—over the one-month period. The larger the discount from fair value, the smaller the liquidity index or higher the liquidity risk the DI faces.

Liquidity Coverage Ratio

Proposed by the Bank for International Settlement's Basel Committee on Banking Supervision

- The liquidity coverage ratio (LCR) aims to ensure that a DI maintains an adequate level of high-quality liquid assets (HQLA) that can be converted into cash to meet liquidity needs for a 30-day time horizon under an "acute liquidity stress scenario" specified by supervisors.

$$\text{Liquidity coverage ratio} = \frac{\text{Stock of high-quality liquid assets}}{\text{Total net cash outflows over the next 30 calendar days}} \geq 100\%$$

Liquidity Coverage Ratio

The stock of high-quality liquid assets (the numerator of the LCR) is defined as follows:

- Liquid assets must remain liquid in times of stress (i.e., convertible into cash at little loss of value and can be used at the central bank discount window as collateral).
- The liquid assets must be "unencumbered."
- Liquid assets are divided into level 1 and level 2. Level 1 amount has no cap, and level 2 amount is capped at 40 percent of total liquid assets.

Level 1 = Cash + Central bank reserves + Sovereign debt

Level 2A = (Mortgage-backed securities that are government guaranteed) + [Corporate bonds (plain vanilla) rated at least AA–]

Level 2B = (Residential mortgage-backed securities that are not government guaranteed) + [Lower-rated corporate bonds (plain vanilla)] + (Blue chip equities)

Net Stable Funding

- The net stable funding ratio (NSFR) takes a longer-term look at liquidity on a DI's balance sheet. The NSFR evaluates liquidity over the entire balance sheet and provides incentives for DIs to use stable sources of financing.
- This longer-term liquidity ratio requires a minimum amount of stable funding be held over a one-year time horizon based on liquidity risk factors assigned to liquidity exposures of on- and off-balance sheet assets.
- The NSFR is intended to ensure that long-term assets are funded with a minimum amount of stable liabilities. It limits reliance on short-term wholesale funding, which was a major problem in the financial crisis. Basically, stable funding is sought for all illiquid assets and securities held where stable funding is defined as equity and liability financing expected to be reliable sources of funds over a one-year time horizon
- The available amount of stable funding (ASF) is calculated by first assigning the value of a DI's equity and liabilities to one of five categories. The amount assigned to each category is multiplied by an ASF factor. The total ASF is the sum of the weighted amounts

Definition

$$\text{NSFR} = \frac{\text{Available amount of stable funding}}{\text{Required amount of stable funding}} > 100\%$$

Available stable funding (the numerator of the ratio) includes:

- Bank capital.
- Preferred stock with a maturity > 1 year.
- Liabilities with maturities > 1 year.
- The portion of retail deposits and wholesale deposit expected to stay with bank during a period of idiosyncratic stress.

ASF Factor	Components of ASF Category
100%	• The total amount of capital, including both Tier 1 and Tier 2 as defined in existing global capital standards issued by the committee. • The total amount of any preferred stock not included in Tier 2 that has an effective remaining maturity of one year or greater, taking into account any explicit or embedded options that would reduce the expected maturity to less than one year. • The total amount of secured and unsecured borrowings and liabilities (including term deposits) with effective remaining maturities of one year or greater, excluding any instruments with explicit or embedded options that would reduce the expected maturity to less than one year. Such options include those exercisable at the investor's discretion within the one-year horizon.
95%	• "Stable" nonmaturity (demand) deposits and/or term deposits (as defined in the LCR) with residual maturities of less than one year provided by retail customers and small business customers.
90%	• "Less stable" (as defined in the LCR) nonmaturity (demand) deposits and/or term deposits with residual maturities of less than one year provided by retail and small business customers.
50%	• Unsecured wholesale funding, nonmaturity deposits, and/or term deposits, with a residual maturity of less than one year, provided by nonfinancial corporate, sovereigns, central banks, multilateral development banks, and PSEs.
0%	• All other liabilities and equity categories not included in the preceding categories.

Assets		Required Stable Funding Factor	Liabilities and Equity		Available Stable Funding Factor
Cash	$ 10	0%	Stable retail deposits	$ 95	95%
Deposits at the Fed	15	0	Less stable retail deposits	40	90
Treasury securities	100	5	Unsecured wholesale funding from:		
GNMA securities	75	15	Stable small business deposits	100	95
Loans to A-rated corporations (maturity > 1 year)	110	65	Less stable small business deposits	80	90
			Nonfinancial corporates	50	50
Loans to B-rated corporations (maturity < 1 year)	85	50			
Premises	15	100	Equity	45	100
Total	$410			$410	

The net stable funding ratio for OneBank is calculated as follows:

Available amount of stable funding =

$$\$45 \times 1.00 + (\$95 + \$100) \times 0.95 + (\$40 + \$80) \times 0.90 + \$50 \times 0.50 = \$363.25\text{m}$$

Required amount of stable funding =

$$(\$10 + \$15) \times 0.00 + \$100 \times 0.05 + \$75 \times 0.15 + \$110 \times 0.65 + \$85 \times 0.50 + \$15 \times 1.00 = \$145.25\text{m}$$

Net stable funding ratio = \$363.25m/\$145.25m = 232.87%. The bank is in compliance with liquidity requirements based on the NSFR.

Liquidity at Life Insurance Companies

- Depository institutions are not the only FIs exposed to liquidity risk or run problems.
- Like DIs, life insurance companies hold cash reserves and other liquid assets to meet policy cancelations (surrenders) and other working capital needs that arise in the course of writing insurance.
- The early cancelation of an insurance policy results in the insurer's having to pay the insured the **surrender value** of that policy
- Concerns about the solvency of an insurer can result in a run in which new premium income dries up and existing policyholders seek to cancel their policies by cashing them in early

Property Casualty Insurers

- Property–casualty (PC) insurers sell policies insuring against certain contingencies impacting either real property or individuals. Unlike those of life insurers, PC contingencies (and policy coverages) are relatively short term, often one to three years.
- PC claims are harder to predict
- PC insurers' assets tend to be shorter term and more liquid than those of life insurers
- PC insurers' greatest liquidity exposure occurs when policyholders cancel or fail to renew policies with an insurer
- Large unexpected claims may materialize and exceed the flow of premium income and income returns from assets.

Open end mutual fund

- The price at which an open-end investment fund stands ready to sell new shares or redeem existing shares is the **net asset value** (NAV) of the fund. NAV is the current or market value of the fund's assets divided by the number of shares in the fund.
- An investment fund's willingness to provide instant liquidity to shareholders while it invests funds in equities, bonds, and other long-term instruments could expose it to liquidity problems similar to those that banks, and life insurance companies face when the number of withdrawals (or mutual fund shares cashed in) rises to abnormally and unexpectedly high levels