Chapter Twelve

See Appendices Online at www.mhhe.com/saunders8e
- Appendix 12A: Sources and Uses of Funds Statement, Bank of America, March 2012

Liquidity Risk

INTRODUCTION

Chapters 10 and 11 examined how credit risk can threaten the solvency of an FI. This chapter looks at the problems created by liquidity risk. Unlike risks that threaten the very solvency of an FI, liquidity risk is a normal aspect of the everyday management of an FI. For example, DIs must manage liquidity so they can pay out cash as deposit holders request withdrawals of their funds. Only in extreme cases do liquidity risk problems develop into solvency risk problems, where an FI cannot generate sufficient cash to pay creditors as promised. This chapter identifies the causes of liquidity risk on the liability side of an FI's balance sheet as well as on the asset side. We discuss methods used to measure an FI's liquidity risk exposure and consequences of extreme liquidity risk (such as deposit or liability drains and runs) and examine regulatory mechanisms put in place to ease liquidity problems and prevent runs on FIs. Moreover, some FIs are more exposed to liquidity risk than others. At one extreme, depository institutions are highly exposed; in the middle, life insurance companies are moderately exposed; and at the other extreme, mutual funds, hedge funds, pension funds, and property–casualty insurance companies have relatively low exposure. However, these FIs are certainly exposed to some liquidity risk.

The financial crisis of 2008–2009 was, in part, due to liquidity risk. As mortgage and mortgage-backed securities markets started to experience large losses, credit markets froze and banks stopped lending to each other at anything but high overnight rates. The overnight London Interbank Offered Rate (a benchmark rate that reflects the rate at which banks lend to one another) more than doubled, rising from 2.57 percent on September 29, 2008, to an all time high of 6.88 percent on September 30, 2009. Banks generally rely on each other for cash needed to meet their daily liquidity needs. Interest rates on interbank borrowings are generally low because of confidence that financial institutions will repay each other. However, this confidence broke down in August of 2007. Without interbank funding, banks became reluctant to lend to other credit markets, resulting in a more general and widespread liquidity crisis.

CAUSES OF LIQUIDITY RISK

Liquidity risk arises for two reasons: a liability-side reason and an asset-side reason. The liability-side reason occurs when an FI's liability holders, such as depositors or insurance policyholders, seek to cash in their financial claims immediately. When liability holders demand cash by withdrawing deposits, the FI needs to borrow additional funds or sell assets to meet the withdrawal. The most liquid asset is cash; FIs use this asset to pay claim holders who seek to withdraw funds. However, FIs tend to minimize their holdings of cash reserves as assets because those reserves pay no interest. To generate interest revenues, most FIs invest in less liquid and/or longer-maturity assets. While most assets can be turned into cash eventually, for some assets this can be done only at a high cost when the asset must be liquidated immediately. The price the asset holder must accept for immediate sale may be far less than it would receive with a longer horizon over which to negotiate a sale. Thus, some assets may be liquidated only at low **fire-sale prices,** thus threatening the solvency of the FI. Alternatively, rather than liquidating assets, an FI may seek to purchase or borrow additional funds.

fire-sale price
The price received for an asset that has to be liquidated (sold) immediately.

The second cause of liquidity risk is asset-side liquidity risk, such as the ability to fund the exercise of off-balance-sheet loan commitments. As we will describe in Chapter 16, a loan commitment allows a customer to borrow (take down) funds from an FI (over a commitment period) on demand. When a borrower draws on its loan commitment, the FI must fund the loan on the balance sheet immediately; this creates a demand for liquidity. As it can with liability withdrawals, an FI can meet such a liquidity need by running down its cash assets, selling off other liquid assets, or borrowing additional funds.

To analyze the differing degrees of importance of liquidity risk across FIs, we next consider liquidity risk problems faced by depository institutions, insurance companies, and mutual and pension funds.

Concept Questions

1. What are the sources of liquidity risk?
2. Why is cash more liquid than loans for an FI?

LIQUIDITY RISK AT DEPOSITORY INSTITUTIONS

Liability-Side Liquidity Risk

As discussed in Chapter 2, 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.[1] Thus, an individual demand deposit account holder with

[1] 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). We describe these accounts in more detail in Chapter 18. Depository institutions typically liquidate deposit account contracts immediately upon request of the customer. Many savings account contracts, however, give a DI some powers to delay withdrawals by requiring notification of withdrawal a certain number of days before withdrawal or by imposing penalty fees such as loss of interest.

TABLE 12–1
Assets and Liabilities of U.S. Banks (in billions of dollars)

Source: Federal Deposit Insurance Corporation website, July 2012. *www.fdic.gov*

	Assets			Liabilities*	
Total cash assets	$ 1,220.6	9.55%	Total deposits	$ 9,383.0	82.85%
Total securities	3,798.0	29.72	Borrowings	1,598.5	14.11
Total loans	6,565.4	51.37	Other liabilities	344.3	3.04
Other assets	1,197.0	9.36	Total liabilities	$11,325.8	
Total assets	$12,781.0				

*Excluding bank equity capital.

a balance of $10,000 can demand cash to be repaid immediately, as can a corporation with $100 million in its demand deposit account. In theory, at least, a DI that has 20 percent of its liabilities in demand deposits, MMDAs, and other transaction accounts must stand ready to pay out that amount by liquidating an equivalent amount of assets on any banking day. Table 12–1 shows the aggregate balance sheet of the assets and liabilities of U.S. commercial banks as of March 2012. As seen in this table, total deposits are 82.85 percent of total liabilities (with 43.94 percent demand deposits, MMDAs, and other transaction accounts). By comparison, cash assets are only 9.55 percent of total assets. Also note that borrowed funds are 14.11 percent of total liabilities.

core deposits
Those deposits that provide a DI with a long-term funding source.

net deposit drains
The amount by which cash withdrawals exceed additions; a net cash outflow.

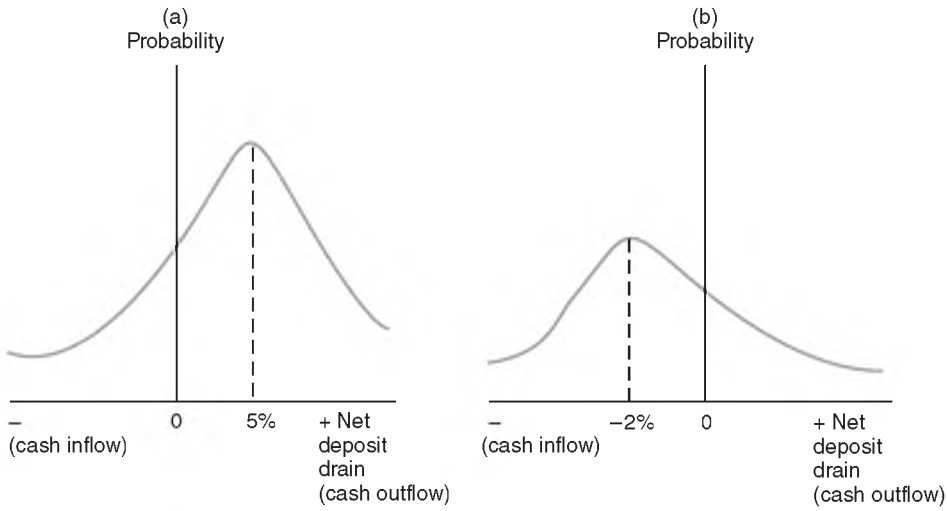
In reality, a depository institution knows that normally only a small proportion of its deposits will be withdrawn on any given day. Most demand deposits act as consumer **core deposits** on a day-by-day basis, providing a relatively stable or long-term source of savings and time deposit funds for the DI. Moreover, 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.[2] 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.[3]

Consider the two possible distributions shown in Figure 12–1. In Panel (A) of Figure 12–1, the distribution is assumed to be strongly peaked at the 5 percent net deposit withdrawal level—this DI expects approximately 5 percent of its net deposit funds to be withdrawn on any given day with the highest probability. The DI in Panel (A) has a mean, or expected, net positive drain on deposits, so its new deposit funds and other cash flows are expected to be insufficient to offset deposit withdrawals. The liability side of its balance sheet is contracting. Panel A in Table 12–2 illustrates an actual 5 percent net drain of deposit accounts (or, in terms of dollars, a drain of $5 million).

[2] Also a part of liquidity risk (although not as likely to cause an FI to fail) is an unexpected inflow of funds. For example, in 2008 as stock prices fell, investors liquidated their stock investments and deposited these funds in their banks and credit unions. With interest rates at historic lows, depository institutions faced a problem of finding sufficiently attractive (in a return sense) loans and securities in which to invest these funds.

[3] Apart from predictable daily seasonality to deposit flows, there are other seasonal variations, many of which are, to a greater or lesser degree, predictable. For example, many retail DIs face above-average deposit outflows around the end of the year and in the summer (due to Christmas and the vacation season). Also, many rural DIs face a deposit inflow–outflow cycle that closely matches the agricultural cycle of the local crop or crops. In the planting and growing season, deposits tend to fall, while in the harvest season, deposits tend to rise (as crops are sold).

FIGURE 12–1
Distribution of Net Deposit Drains



For a DI to be growing, it must have a mean or average deposit drain such that new deposit funds more than offset deposit withdrawals. Thus, the peak of the net deposit drain probability distribution would be at a point to the left of zero. See the −2 percent in Panel (B) in Figure 12–1, where the distribution of net deposit drains is peaked at −2 percent, or the FI is receiving net cash inflows with the highest probability.

A DI can manage a drain on deposits in two major ways: (1) purchased liquidity management and/or (2) stored liquidity management. Traditionally, DI managers have relied on stored liquidity management as the primary mechanism of liquidity management. Today, many DIs—especially the largest banks with access to the money market and other nondeposit markets for funds—rely on purchased liquidity (or liability) management to deal with the risk of cash shortfalls. A more extensive discussion of liability management techniques is left to Chapter 18. Here we briefly discuss the alternative methods of liquidity risk management.

TABLE 12–2
Effect of Net Deposit Drain on the Balance Sheet (in millions of dollars)

Panel A: Balance Sheet Immediately before and after Deposit Drain

Before the Drain				After the Drain			
Assets		**Liabilities**		**Assets**		**Liabilities**	
Assets	100	Deposits	70	Assets	100	Deposits	65
		Borrowed funds	10			Borrowed funds	10
		Other liabilities	20			Other liabilities	20
	100		100		100		95

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

Assets		**Liabilities**	
Assets	100	Deposits	65
		Borrowed funds	15
		Other liabilities	20
	100		100

Purchased Liquidity Management

A DI manager who purchases liquidity turns to the markets for purchased funds, such as the federal funds market and/or the repurchase agreement markets,[4] which are interbank markets for short-term loans. Alternatively, the DI manager could issue additional fixed-maturity wholesale certificates of deposit or even sell some notes and bonds.[5] For example, Table 12–2, Panel A shows a DI's balance sheet immediately before and after a deposit drain of $5 million. As long as the total amount of funds raised equals $5 million, the DI in Table 12–2 could fully fund its net deposit drain. However, this can be expensive for the DI since it is paying *market rates* for funds in the wholesale money market to offset net drains on low-interest-bearing deposits.[6] Thus, the higher the cost of purchased funds relative to the rates earned on assets, the less attractive this approach to liquidity management becomes. Further, since most of these funds are not covered by deposit insurance, their availability may be limited should the depository institution incur insolvency difficulties. Table 12–2, Panel B, shows the DI's balance sheet if it responds to deposit drains by using purchased liquidity management techniques.

purchased liquidity management
An adjustment to a deposit drain that occurs on the liability side of the balance sheet.

Note that **purchased liquidity management** has allowed the DI to maintain its overall balance sheet size of $100 million without disturbing the size and composition of the asset side of its balance sheet—that is, the complete adjustment to the deposit drain occurs on the liability side of the balance sheet. In other words, purchased liquidity management can insulate the asset side of the balance sheet from normal drains on the liability side of the balance sheet. This is one of the reasons for the enormous growth in recent years of FI purchased liquidity management techniques and associated purchased fund markets such as fed funds, repurchase agreements, and wholesale CDs. (We describe and discuss these instruments in more detail in Chapter 18.) In the early 2000s regulators expressed concerns about the increased use of these (wholesale) funding sources by DIs. Indeed, with the liquidity crunch experienced during the financial crisis, additional (wholesale) funds were hard and sometimes impossible to obtain.

Stored Liquidity Management

stored liquidity management
An adjustment to a deposit drain that occurs on the asset side of the balance sheet.

Instead of meeting the net deposit drain by purchasing liquidity in the wholesale money markets, the DI could use **stored liquidity management.** That is, the FI could liquidate some of its assets, utilizing its stored liquidity. Traditionally, U.S. DIs have held stored cash reserves only at the Federal Reserve and in their vaults for this very purpose. The Federal Reserve sets minimum reserve requirements for the cash reserves banks must hold.[7] Even so, DIs still tend to hold cash reserves in excess of the minimum required to meet liquidity drains.

[4] Securities companies and institutional investors use the repurchase agreement market extensively for liquidity management purposes.

[5] The discount window is also a source of funds. See the section "Bank Runs, the Discount Window, and Deposit Insurance" in this chapter and Chapter 19 for more discussion of the role of the discount window.

[6] While checking accounts pay no explicit interest, other transaction accounts such as NOW and MMDAs do. However, the rates paid are normally sticky, are slow to adjust to changes in market interest rates, and lie below purchased fund rates (see Chapter 18).

[7] Currently, the Fed requires 3 percent on the first $79.5 million and 10 percent on the rest of a DI's demand deposit and transaction account holdings. The $79.5 million figure is adjusted annually along with the growth in bank deposits. The first $12.4 million of the $79.5 million is not subject to reserve requirements (the figures are as of July 2013).

TABLE 12–3
Composition of the DI's Balance Sheet (in millions of dollars)

Panel A: Balance Sheet Immediately before Deposit Drain

Assets		Liabilities	
Cash	9	Deposits	70
Other assets	91	Borrowed funds	10
		Other liabilities	20
	100		100

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

Assets		Liabilities	
Cash	4	Deposits	65
Other assets	91	Borrowed funds	10
		Other liabilities	20
	95		95

Suppose, in our example, that on the asset side of the balance sheet the DI normally holds $9 million of its assets in cash (of which $3 million are to meet Federal Reserve minimum reserve requirements and $6 million are in an "excess" cash reserve). We depict the situation before the net drain in liabilities in Table 12–3, Panel A. As depositors withdraw $5 million in deposits, the DI can meet this directly by using the excess cash stored in its vaults or held on deposit at other DIs or at the Federal Reserve. If the reduction of $5 million in deposit liabilities is met by a $5 million reduction in cash assets held by the DI, its balance sheet will be as shown in Table 12–3, Panel B.

When the DI uses its cash as the liquidity adjustment mechanism, both sides of its balance sheet contract. In this example, the DI's total assets and liabilities shrink from $100 to $95 million. The cost to the DI from using stored liquidity, apart from decreased asset size, is that it must hold excess low-rate assets in the form of cash on its balance sheet.[8] Thus, the cost of using cash to meet liquidity needs is the forgone return (or opportunity cost) of being unable to invest these funds in loans and other higher-income-earning assets.

Finally, note that while stored liquidity management and purchased liquidity management are alternative strategies for meeting deposit drains, a DI can combine the two methods by using some purchased liquidity management and some stored liquidity management to meet liquidity needs.

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. Unused loan commitments to cash grew from 529.4 percent in 1994 to 1014.6 percent in October 2008 (before falling back to 608.6 percent during the financial crisis). Table 12–4, Panel A, shows the effect of a $5 million exercise of a loan commitment by a borrower: Part (a) in Table 12–4, Panel A is the balance sheet before the commitment

[8] DIs could hold highly liquid interest-bearing assets such as T-bills, but these are still less liquid than cash and immediate liquidation may result in some small capital value losses.

TABLE 12–4
Effects of a Loan Commitment Exercise (in millions of dollars)

Panel A: Balance Sheet Immediately before and after Exercise

(a) Before Exercise				(b) After Exercise			
Cash	9	Deposits	70	Cash	9	Deposits	70
Other assets	91	Borrowed funds	10	Other assets	96	Borrowed funds	10
		Other liabilities	20			Other liabilities	20
	100		100		105		100

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

(a) Purchased Liquidity Management				(b) Stored Liquidity Management			
Cash	9	Deposits	70	Cash	4	Deposits	70
Other assets	96	Borrowed funds	15	Other assets	96	Borrowed funds	10
		Other liabilities	20			Other liabilities	20
	105		105		100		100

exercise and part (b) is the balance sheet after the exercise. The exercise of the loan commitment means that the DI needs to provide $5 million in loans immediately to the borrower (other assets rise from $91 to $96 million). This can be done either by purchased liquidity management (borrowing an additional $5 million in the money market and lending these funds to the borrower) or by stored liquidity management (decreasing the DI's excess cash assets from $9 million to $4 million). We present these two policies in Table 12–4, Panel B.

Another type of asset-side liquidity risk arises from the FI's investment portfolio. Specifically, unexpected changes in interest rates can cause investment portfolio values to fluctuate significantly. If interest rates increase, the value of the investment securities portfolio falls and large losses in portfolio value can occur (see Chapter 15 on market risk). Further, there is the risk that liquidity in a particular market will deteriorate because market traders want to sell and no one wants to buy. It has been argued that technological and other developments have led to a steady improvement in the liquidity of financial markets. However, this is questionable in that there is an increasing tendency toward "herd" behavior, where most traders want to make the same type of trade (such as a sale) at a particular time. During the sell-off, liquidity dries up and investment securities can be sold only at fire-sale prices. The result is a reduction in the value of the investment portfolio and increased liquidity risk for the FI.

In Table 12–5, Panel A shows an FI's balance sheet immediately before and after a $5 million decrease in the market value of its investment portfolio. In addition to a loss in equity value, the FI must fund the $5 million loss in value on the balance sheet such that loan requests and deposit withdrawals can be met. The FI must replace the loss in value of the investment portfolio. This can be done either by purchased liquidity management (borrowing an additional $5 million in deposits or purchased funds) or by stored liquidity management (purchasing an additional $5 million in assets).[9] Panel B of Table 12–5 shows the effect of these two strategies on the balance sheet. Notice, in both cases, that the FI has lost $5 million in equity.

[9] Note that the FI could raise an additional $5 million in equity, e.g., through a common stock issue. However, this is likely to be more costly than adjusting to the loss via purchased liquidity management or stored liquidity management.

TABLE 12–5 Effects of a Drop in the Value of the Investment Securities Portfolio (in millions of dollars)

Panel A: Balance Sheet Immediately before and after Drop in Portfolio Value

Before Drop in Value				After Drop in Value			
Cash	$ 9	Deposits	$ 60	Cash	$ 9	Deposits	$60
Investment portfolio	40	Borrowed funds	10	Investment portfolio	35	Borrowed funds	10
Other assets	51	Other liabilities	20	Other assets	51	Other liabilities	20
		Equity	10			Equity	5
	$100		$100		$95		$95

Panel B: Adjusting the Balance Sheet for a Drop in Investment Portfolio Value

(a) Purchased Liquidity Management				(b) Stored Liquidity Management			
Cash	$ 9	Deposits	$ 65	Cash	$ 4	Deposits	$60
Investment portfolio	40	Borrowed funds	10	Investment portfolio	40	Borrowed funds	10
Other assets	51	Other liabilities	20	Other assets	51	Other liabilities	20
		Equity	5			Equity	5
	$100		$100		$95		$95

Measuring a DI's Liquidity Risk Exposure

Sources and Uses of Liquidity

As discussed earlier, a DI's liquidity risk arises from ongoing conduct of business such as a withdrawal of deposits or from new loan demand, and the subsequent need to meet those demands through liquidating assets or borrowing funds. Therefore, a DI manager must be able to measure its 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. Such a statement for a hypothetical U.S. money center bank is presented in Table 12–6.

The DI can obtain liquid funds in three ways. First, it can sell its liquid assets such as T-bills immediately with little price risk and low transaction cost. Second, it can borrow funds in the money/purchased funds market up to a maximum amount (this is an *internal* guideline based on the manager's assessment of the credit limits that the purchased or borrowed funds market is likely to impose on the DI). Third, it can use any excess cash reserves over and above the amount held

TABLE 12–6
Net Liquidity Position (in millions of dollars)

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

to meet regulatory imposed reserve requirements. In Table 12–6 the DI's *sources* of liquidity total $14,500 million. Compare this with the DI's *uses* of liquidity, in particular the amount of borrowed or purchased funds it has already utilized (e.g., fed funds, RPs borrowed) and the amount of cash it has already borrowed from the Federal Reserve through discount window loans. These total $7,000 million. As a result, the DI has a positive net liquidity position of $7,500 million. These liquidity sources and uses can be easily tracked on a day-by-day basis.

The net liquidity position in Table 12–6 lists management's expected sources and uses of liquidity for a hypothetical money center bank. All FIs report their historical sources and uses of liquidity in their annual and quarterly reports. Appendix 12A to this chapter (located at the book's website, **www.mhhe.com/saunders8e**) presents the March 2012 Sources and Uses of Funds Statement for Bank of America. As an FI manager deals with liquidity risk, historical sources and uses of liquidity statements can assist the manager in determining where future liquidity issues may arise.

Peer Group Ratio Comparisons

Another 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. A high ratio of loans to deposits and borrowed funds to total assets means that the DI relies heavily on the short-term money market rather than on core deposits to fund loans. This could mean future liquidity problems if the DI is at or near its borrowing limits in the purchased funds market. Similarly, a high ratio of loan commitments to assets indicates the need for a high degree of liquidity to fund any unexpected takedowns of these loans—high-commitment DIs often face more liquidity risk exposure than do low-commitment DIs.

Table 12–7 lists the March 2012 values of these ratios for two banks: Northern Trust Bank (NT) and Bank of America (BOA). BOA (a money center bank) relies on borrowed funds more heavily than does NT (a non–money center bank). The banks' ratios of borrowed funds to total assets were 7.48 percent for NT and 11.67 percent for BOA. Further, the ratios of loans to deposits were 38.26 percent and 71.02 percent for NT and BOA, respectively. As a major money center bank, BOA gets much more of the funding of its loans from the borrowed funds markets than from the deposit markets. Northern Trust, a smaller, non–money center bank, uses deposits much more than borrowed funds to fund its loans. The result is that BOA is subject to greater liquidity risk than NT. The banks' ratios of core deposits (the stable deposits of the FI, such as demand deposits, NOW accounts, MMDAs, other savings accounts, and retail CDs) to total assets, on the other hand, were 34.75 percent and 62.65 percent for NT and BOA, respectively. While BOA uses more borrowed funds than NT, more than half of NT's deposits are foreign accounts rather than domestic core deposits. Thus, while BOA gets more of its

TABLE 12–7
Liquidity Exposure Ratios for Two Banks, 2012 Values

	Northern Trust Bank	Bank of America
Borrowed funds to total assets	7.48%	11.67%
Loans to deposits	38.26	71.02
Core deposits to total assets	34.75	62.65
Commitments to lend to total assets	36.79	47.17

liquid funds from the borrowed funds market than NT, it has a much larger supply of stable deposits to limit the DI's liquidity risk. Furthermore, NT had a ratio of loan commitments (or credit lines) to total assets of 36.79 percent, while BOA had a much greater ratio of 47.17 percent. If these commitments are "taken down" (see Chapter 16), BOA must come up with the cash to fulfill these commitments, more so than NT. Thus, BOA is exposed to substantially greater liquidity risk than NT from unexpected takedowns of loan commitments by its customers.

Liquidity Index

liquidity index A measure of the potential losses an FI could suffer as the result of sudden (or fire-sale) disposal of assets.

A third way to measure liquidity risk is to use a **liquidity index.** Developed by Jim Pierce at the Federal Reserve, this 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. The greater the differences between immediate fire-sale asset prices (P_i) and fair market prices (P_i^*) the less liquid is the DI's portfolio of assets. Define an index I such that:

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

where w_i is the percent of each asset in the FI's portfolio:

$$\sum_{i=1}^{N} w_i = 1$$

The liquidity index will always lie between 0 and 1. The liquidity index for this DI could also be compared with indexes calculated for a peer group of similar DIs.

EXAMPLE 12–1 *Calculation of the Liquidity Index*

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:

$$\begin{aligned} I &= [\tfrac{1}{2}(0.99/1.00)] + [\tfrac{1}{2}(0.85/0.92)] \\ &= 0.495 + 0.462 \\ &= 0.957 \end{aligned}$$

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:

$$\begin{aligned} I &= [\tfrac{1}{2}(0.99/1.00)] + [\tfrac{1}{2}(0.65/0.92)] \\ &= 0.495 + 0.353 \\ &= 0.848 \end{aligned}$$

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.

Financing Gap and the Financing Requirement

A fourth way to measure liquidity risk exposure is to determine the DI's financing gap. As we discussed earlier, even though demand depositors can withdraw their funds immediately, they do not do so in normal circumstances. On average, most demand deposits stay at DIs for quite long periods—often two years or more. Thus, a DI manager often thinks of the average deposit base, including demand deposits, as a core source of funds that over time can fund a DI's average amount of loans.

financing gap
The difference between a DI's average loans and average (core) deposits.

We define a **financing gap** as the difference between a DI's average loans and average (core) deposits, or:

$$\text{Financing gap} = \text{Average loans} - \text{Average deposits}$$

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. Thus:

$$\text{Financing gap} = -\text{Liquid assets} + \text{Borrowed funds}$$

We can write this relationship as:

$$\text{Financing gap} + \text{Liquid assets} = \text{Financing requirement (borrowed funds)}$$

financing requirement
The financing gap plus a DI's liquid assets.

As expressed in this fashion, 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. In particular, the larger a DI's financing gap and liquid asset 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. The balance sheet in Table 12–8 indicates the relationship between the financing gap, liquid assets, and the borrowed fund financing requirement. See also the following equation:

$$\underset{(\$5 \text{ million})}{\text{Financing gap}} + \underset{(\$5 \text{ million})}{\text{Liquid assets}} = \underset{(\$10 \text{ million})}{\text{Financing requirement}}$$

A widening financing gap can warn of future liquidity problems for a DI since it may indicate increased deposit withdrawals (core deposits falling below $20 million in Table 12–8) and increasing loans due to increased exercise of loan commitments (loans rising above $25 million). If the DI does not reduce its liquid assets—they stay at $5 million—the manager must resort to more money market borrowings. As these borrowings rise, sophisticated lenders in the money market may be concerned about the DI's creditworthiness. They may react by imposing higher risk premiums on borrowed funds or establishing stricter credit limits by not rolling over funds lent to the DI. If the DI's financing requirements exceed such limits, it may become insolvent. This possibility of insolvency also highlights the need for DI managers to engage in active liquidity planning to avoid such crises.

New Liquidity Risk Measures Implemented by the Bank for International Settlements

During the financial crisis, many DIs struggled to maintain adequate liquidity. Indeed, extraordinary levels of liquidity assistance were required from central banks in order to maintain the financial system. Even with this extensive support, a number of DIs failed or were forced into mergers. Recognizing the need for DIs to improve their liquidity risk management and control their liquidity risk exposures,

TABLE 12–8
Financing Requirement of a DI (in millions of dollars)

Assets		Liabilities	
Loans	$25	Core deposits	$20
Liquid assets	5	Financing requirement (borrowed funds)	10
Total	$30	Total	$30
		Financing gap	5

the Bank for International Settlement's Basel Committee on Banking Supervision developed two new regulatory standards for liquidity risk supervision. The standards are intended to "enhance tools, metrics, and benchmarks that supervisors can use to assess the resilience of banks' liquidity cushions and constrain any weakening in liquidity maturity profiles, diversity of funding sources, and stress testing practices."[10] The two new liquidity ratios to be maintained by DIs are the liquidity coverage ratio (beginning in 2015 and to be fully implemented in 2019) and a net stable funds ratio (to be implemented in 2018).

Liquidity Coverage Ratio

The liquidity coverage ratio (LCR) aims to ensure that a DI maintains an adequate level of high-quality assets 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. The specified scenario incorporates both institution-specific and systemic shocks that are based on actual circumstances experienced in the global financial crisis. Thus, maintenance of the LCR is intended to ensure that DIs can survive a severe liquidity stress scenario for at least 30 days. The LCR will be reported to DI supervisors monthly starting in 2015.

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

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, 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)

- A minimum 15 percent "haircut" has to be applied to the value of each level 2 asset.

[10] International Framework for Liquidity Risk Measurement, Standards and Monitoring, Bank for International Settlements, December 2009, **www.bis.org**.

- Level 2B assets may not account for more than 15 percent of a bank's stock of high-quality liquid assets.
- Level 2 assets may not, in aggregate, account for more than 40 percent of a bank's stock of high-quality liquid assets.

Total net cash outflows (the denominator of the ratio) is defined as:

$$\text{Total } \textit{net} \text{ cash outflows over the next 30 calendar days} = \text{Outflows} - \text{Min (inflows; 75\% of outflows)}$$

where cash outflows and inflows are defined in Table 12–9. Appendix 12B to the chapter presents the template provided by the Bank for International Settlements used to calculate the LCR.

EXAMPLE 12–2 *Calculation of the Liquidity Coverage Ratio*

OneBank has the following balance sheet (in millions of dollars). Cash inflows over the next 30 days from the bank's performing assets are $5 million.

Assets		Liquidity Level	Liabilities and Equity		Run-off Factor
Cash	$ 10	Level 1	Stable retail deposits	$ 95	3%
Deposits at the Fed	15	Level 1	Less stable retail deposits	40	10
Treasury securities	100	Level 1	Unsecured wholesale funding from:		
GNMA securities	75	Level 2A	Stable small business deposits	100	5
Loans to A rated corporations	110	Level 2A	Less stable small business deposits	80	10
Loans to B rated corporations	85	Level 2B	Nonfinancial corporates	50	75
Premises	15		Equity	45	
Total	$410			$410	

The liquidity coverage ratio for OneBank is calculated as follows:

Level 1 assets = $10 + $15 + $100 =		$125
Level 2A assets = ($75 + $110) × 0.85 = $157.25	Capped at 40% of Level 1 = $125 × 0.40 =	50
Level 2B assets = $85 × 0.85 = $72.25	40% cap on Level 2 assets already met	
	Stock of highly liquid assets	$175

Cash outflows:		
Stable retail deposits	$ 95 × 0.03 =	$ 2.85
Less stable retail deposits	$ 40 × 0.10 =	4.00
Stable small business deposits	$100 × 0.05 =	5.00
Less stable small business deposits	$ 80 × 0.10 =	8.00
Nonfinancial corporates	$ 50 × 0.75 =	37.50
Total cash outflows over next 30 days		$57.35
Total cash inflows over next 30 days		5.00
Total net cash outflows over next 30 days		$52.35

Liquidity coverage ratio = $175m/$52.35m = 334.29%. The bank is in compliance with liquidity requirements based on the LCR.

TABLE 12–9 Cash Outflows and Inflows Used in the Liquidity Coverage Ratio

Cash outflows included in the LCR:

- Retail deposits = Stable + Less stable.
  Stable = Deposits covered by deposit insurance (receive a minimum run-off factor of 3%).
  Less stable = Deposits not covered by deposit insurance (receive a minimum run-off factor of 10%).
- Retail deposits with maturity > 30 days and no early withdrawal (0% run-off factor).
- All unsecured wholesale funds with < 30 days maturity (i.e., callable by funds provider) (100% run-off factor).
- Secured funds backed by Level 1 assets (0% run-off factor), backed by Level 2 assets (15% run-off factor).
- Loss of funding on commercial paper if maturity <30 days (100% run-off factor).
- All debt maturing within 30 days (100% run-off factor).
- Loan commitment (draw-down) factors:
  - 5% draw-downs on committed credit and liquidity facilities to retail and small business customers.
  - 10% draw-downs on committed credit facilities to nonfinancial corporate, sovereigns and central banks, public-sector entities, and multilateral development banks.
  - 30% draw-downs on committed liquidity facilities to nonfinancial corporate, sovereigns and central banks, public-sector entities, and multilateral development banks.
  - 40% draw-downs on committed credit and liquidity facilities to other legal entities. These entities include financial institutions (e.g., banks, securities firms, and insurance companies), conduits and special-purpose vehicles, and fiduciaries beneficiaries.
- Cash outflows related to operating costs (0% run-off factor).

Cash inflows included in the LCR:

- Only include inflows for sources where no default is expected in next 30 days.
- There is a 75% cap on inflows meeting outflows so DIs do not just rely of inflows for liquidity.
- Assume that no lines of credit on other banks can be drawn on (0% inflow).
- Assume 100% inflow received on wholesale loans and 50% inflow on retail loans from counterparties.
- 100% inflow on known derivative payments.

Net Stable Funding Ratio

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 NSFR ratio will be reported to DI supervisors quarterly starting in 2018.

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

TABLE 12–10 Components of Available Stable Funding and Associated ASF Factors

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 1 year or greater, taking into account any explicit or embedded options that would reduce the expected maturity to less than 1 year. • The total amount of secured and unsecured borrowings and liabilities (including term deposits) with effective remaining maturities of 1 year or greater, excluding any instruments with explicit or embedded options that would reduce the expected maturity to less than 1 year. Such options include those exercisable at the investor's discretion within the 1-year horizon.
90%	• "Stable" nonmaturity (demand) deposits and/or term deposits (as defined in the LCR) with residual maturities of less than 1 year provided by retail customers and small-business customers.
80%	• "Less stable" (as defined in the LCR) nonmaturity (demand) deposits and/or term deposits with residual maturities of less than 1 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 1 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.

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.

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 as presented in Table 12–10. The amount assigned to each category is multiplied by an ASF factor. The total ASF is the sum of the weighted amounts.

Required stable funding (the denominator of the ratio) is measured using supervisory assumptions on the characteristics of the liquidity risk profiles of a DI's assets, off-balance sheet exposures, and other selected activities. The required amount of stable funding is calculated as the sum of the value of the on-balance-sheet assets held and funded by the DI, multiplied by a specific required stable funding (RSF) factor assigned to each particular asset type, plus the amount of off-balance-sheet (OBS) activities (or potential liquidity exposure) multiplied by the associated RSF factor. The RSF factor applied to the reported values of each asset or OBS exposure is the amount of that item that supervisors believe should be supported with stable funding. The RSF factors assigned to various types of assets are intended to approximate the amount of a particular asset that could not be sold or used as collateral in a secured borrowing during a severe liquidity event lasting one year. Table 12–11 summarizes the specific types of assets to be assigned to each asset category and their associated RSF factor.

EXAMPLE 12–3 *Calculation of the Net Stable Funding Ratio*

OneBank has the following balance sheet (in millions of dollars):

Assets		Required Stable Funding Factor	Liabilities and Equity		Available Stable Funding Factor
Cash	$ 10	0%	Stable retail deposits	$ 95	90%
Deposits at the Fed	15	5	Less stable retail deposits	40	80
Treasury securities	100	5	Unsecured wholesale funding from:		
GNMA securities	75	20	Stable small business deposits	100	90
Loans to A rated corporations (maturity > 1 year)	110	65	Less stable small business deposits	80	80
			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 × 1.00 + ($95 + $100) × 0.90 + ($40 + $80) × 0.80 + $50 × 0.50 = $341.5m

Required amount of stable funding =
$10 × 0.00 + ($15 + $100) × 0.05 + $75 × 0.20 + $110 × 0.65 + $85 × 0.50 + $15 × 1.00 = $149.75m

Net stable funding ratio = $341.5m/$149.75m = 228.05%. The bank is in compliance with liquidity requirements based on the NSFR.

TABLE 12–11 Detailed Composition of Asset Categories and Associated RSF Factors

Components of RSF Category	RSF Factor
• Cash immediately available to meet obligations, not currently encumbered as collateral and not held for planned use (as contingent collateral, salary payments, or for other reasons). • Unencumbered short-term unsecured instruments and transactions with outstanding maturities of less than 1 year. • Unencumbered securities with slated remaining maturities of less than one year with no embedded options that would increase the expected maturity to more than 1 year. • Unencumbered securities held where the institution has an offsetting reverse repurchase transaction when the security on each transaction has the same unique identifier (e.g., ISN number or CUSIP). • Unencumbered loans to financial entities with effective maturity of less than 1 year that are not renewable and for which the lender has an irrevocable right to call.	0%
• Unencumbered marketable securities with residual maturities of 1 year or greater, representing claims on or claims guaranteed by sovereigns, central banks, BIS, IMF, EC, non-central government PSEs, or multilateral development banks that are assigned a 0% risk-weight under the Basel II standardized approach, provided that active repo or sale markets exist for these securities. • Off-balance-sheet exposures require little long-term funding. Thus, revocable and irrevocable credit and liquidity facilities to any client has an RSF ratio = 5%.	5%

continued

TABLE 12–11 *Continued*

Components of RSF Category	RSF Factor
• Unencumbered corporate bonds or covered bonds rated AA− or higher with residual maturities of 1 year or greater satisfying all of the conditions for level 2 assets in the LCR. • Unencumbered marketable securities with residual maturities of 1 year or greater representing claims on or claims guaranteed by sovereigns, central banks, or non-central government PSEs that are assigned a 20% risk-weight under the Basel II standardized approach, provided that they meet all of the conditions for Level 2 assets in the LCR.	20%
• Unencumbered gold. • Unencumbered equity securities, not issued by financial institutions or their affiliates, listed on a recognized exchange and included in a large cap market index. • Unencumbered corporate bonds and covered bonds that satisfy all of the following conditions: – Central bank eligibility to intraday liquidity needs and overnight liquidity shortages in relevant jurisdictions. – Not issued by financial institutions or their affiliates (except in the case of covered bonds). – Not issued by the respective firm itself or its affiliates. – Low credit risk: assets have a credit assessment by a recognized rating agency of A+ to BBB−, or do not have a credit assessment by a recognized rating agency and are internally rated as having a PD corresponding to a credit assessment of A+ to BBB−. – Traded in large, deep, and active markets characterized by a low level of concentration. • Unencumbered loans to nonfinancial corporate clients, sovereigns, central banks, and PSEs having a remaining maturity of less than 1 year.	50%
• Unencumbered residential mortgages of any maturity that would qualify for the 35% or lower risk weight under Basel II Standardized Approach for credit risk. • Other unencumbered loans, excluding loans to financial institutions, with a remaining maturity of 1 year or greater, that would qualify for the 35% or lower risk weight under Basel II Standardized Approach for credit risk.	65%
• Unencumbered loans to retail customers (i.e., natural persons) and small-business customers (as defined in the LCR) having a remaining maturity of less than 1 year (other than those that qualify for the 65% RSF).	85%
• All other assets not included in the preceding categories.	100%

Other Liquidity Risk Control Measures

In addition to the LCR and NSFR, regulators will monitor several additional DI and systemwide trends. These additional metrics capture specific information related to a bank's cash flows, balance sheet structure, available unencumbered collateral, and certain market indicators. The additional monitoring measures include the following:

Contractual maturity mismatch: Compare assets with liabilities in time bands based on maturity (e.g., overnight, 7 and 14 days, 1, 2, 3, 4, and 9 months, 1, 2, 3, 5 years, and beyond). Data on maturity mismatches are to be provided to DI supervisors on a frequent basis.

Concentration of funding: Identify those sources of wholesale funding that are of such significance that withdrawal of these funds could trigger liquidity problems.

Available unencumbered asset: Identify the quantity and key characteristics, including currency denomination and location, of banks' available unencumbered assets. These assets have the potential to be used as collateral to raise additional secured funding in secondary markets and/or are eligible at central banks and, as such, may potentially be additional sources of liquidity for the bank.

LCR by significant currency: Monitor the LCR in significant currencies. This will allow DIs and supervisors to track potential currency mismatch issues that could arise.

Market-related monitoring tools: Monitor high-frequency market data (including marketwide data and information on the financial sector) with little or no time lag. These measures can be used as early warning indicators in monitoring potential liquidity difficulties at banks.

Liquidity Risk, Unexpected Deposit Drains, and Bank Runs

Under normal conditions and with appropriate management planning, neither net deposit withdrawals nor the exercise of loan commitments poses significant liquidity problems for DIs because borrowed funds availability or excess cash reserves are adequate to meet anticipated needs. For example, even in December and the summer vacation season, when net deposit withdrawals are high, DIs anticipate these *seasonal* effects by holding larger than normal excess cash reserves or borrowing more than normal on the wholesale money markets.

Major liquidity problems can arise, however, if deposit drains are abnormally *large* and unexpected. Abnormal deposit drains (shocks) may occur for a number of reasons, including:

1. Concerns about a DI's solvency relative to those of other DIs.
2. Failure of a related DI leading to heightened depositor concerns about the solvency of other DIs (the contagion effect).
3. Sudden changes in investor preferences regarding holding nonbank financial assets (such as T-bills or mutual fund shares) relative to deposits.

In such cases, any sudden and unexpected surges in net deposit withdrawals risk triggering a **bank run** that could eventually force a bank into insolvency.

bank run
A sudden and unexpected increase in deposit withdrawals from a DI.

Deposit Drains and Bank Run Liquidity Risk

At the core of bank run liquidity risk is the fundamental and unique nature of the *demand deposit contract.* Specifically, demand deposit contracts are first-come, first-served contracts in the sense that a depositor's place in line determines the amount he or she will be able to withdraw from a DI. In particular, a depositor either gets paid in full or gets nothing.[11] Because demand deposit contracts pay in full only a certain proportion of depositors when a DI's assets are valued at less than its deposits—and because depositors realize this—any line outside a DI encourages other depositors to join the line immediately even if they do not need cash today for normal consumption purposes. Thus, even the DI's core depositors, who do not really need to withdraw deposits for consumption needs, rationally seek to withdraw their funds immediately when they observe a sudden increase in the lines at their DI.

As a bank run develops, the demand for net deposit withdrawals grows. The DI may initially meet this by decreasing its cash reserves, selling off liquid or readily marketable assets such as T-bills and T-bonds, and seeking to borrow in the money markets. As a bank run increases in intensity, more depositors join the withdrawal line, and a liquidity crisis develops. Specifically, the DI finds it

[11] We are assuming no deposit insurance exists that guarantees payments of deposits and no discount window borrowing is available to fund a temporary liquidity need for funds. The presence of deposit insurance and the discount window alters the incentives to engage in a bank run, as we describe later in this chapter and in Chapter 19.

difficult, if not impossible, to borrow in the money markets at virtually any price. Also, it has sold all its liquid assets, cash, and bonds as well as any salable loans (see Chapter 25). The DI is likely to have left only relatively illiquid loans on the asset side of the balance sheet to meet depositor claims for cash. However, these loans can be sold or liquidated only at very large discounts from face value. A DI needing to liquidate long-term assets at fire-sale prices to meet continuing deposit drains faces the strong possibility that the proceeds from such asset sales are insufficient to meet depositors' cash demands. The DI's liquidity problem then turns into a solvency problem; that is, the DI must close its doors.

The incentives for depositors to run first and ask questions later creates a fundamental instability in the banking system in that an otherwise sound DI can be pushed into insolvency and failure by unexpectedly large depositor drains and liquidity demands. This is especially so in periods of contagious runs, or **bank panics,** when depositors lose faith in the banking system as a whole and engage in a run on all DIs by not materially discriminating among them according to their asset qualities.

bank panic
A systemic or contagious run on the deposits of the banking industry as a whole.

Bank Runs, the Discount Window, and Deposit Insurance

Regulators have recognized the inherent instability of the banking system due to the all-or-nothing payoff features of the deposit contract. As a result, regulatory mechanisms are in place to ease DIs' liquidity problems and to deter bank runs and panics. The two major liquidity risk insulation devices are *deposit insurance* and the *discount window.* Because of the serious social welfare effects that a contagious run on DIs could have, government regulators of depository institutions have established guarantee programs offering deposit holders varying degrees of insurance protection to deter runs. For example, during the financial crisis of 2008–2009, in an attempt to provide stability to the U.S. banking system, the Troubled Asset Relief Program (or TARP) that gave the U.S. Treasury funds to buy "toxic" mortgages and other securities from financial institutions also called for the FDIC to increase deposit insurance to $250,000 from $100,000 per person per institution. If a deposit holder believes a claim is totally secure, even if the DI is in trouble, the holder has no incentive to run. The deposit holder's place in line no longer affects his or her ability to obtain the funds. Deposit insurance deters runs as well as contagious runs and panics. However, knowing that (because their deposits are insured) deposit holders are less likely to run or panic if there is a perceived bank solvency problem, deposit insurance creates a situation in which DIs are more likely to increase the liquidity risk on their balance sheets.

www.fdic.gov

Three lending programs are offered through the Fed's discount window. Primary credit is available to generally sound depository institutions on a very short-term basis, typically overnight, at a rate above the Federal Open Market Committee's (FOMC's) target rate for federal funds. Secondary credit is available to depository institutions that are not eligible for primary credit. It is extended on a very short-term basis, typically overnight, at a rate that is above the primary credit rate. The Federal Reserve's seasonal credit program is designed to assist small depository institutions in managing significant seasonal swings in their loans and deposits. Seasonal credit is available to depository institutions that can demonstrate a clear pattern of recurring intrayearly swings in funding needs. Eligible institutions are usually located in agricultural or tourist areas. We discuss these in detail in Chapter 19. As we describe there, deposit insurance has effectively deterred bank panics since 1933, although the provision of deposit insurance has not been without other costs.

www.federalreserve.gov

Concept Questions

1. List two benefits and two costs of using (a) purchased liquidity management and (b) stored liquidity management to meet a deposit drain.
2. What are the three major sources of DI liquidity? What are the two major uses?
3. What are the measures of liquidity risk used by FIs?

LIQUIDITY RISK AND LIFE INSURANCE COMPANIES

surrender value
The amount received by an insurance policyholder when cashing in a policy early.

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.[12] In the normal course of business, premium income and returns on an insurer's asset portfolio are sufficient to meet the cash outflows required when policyholders cash in or surrender their policies early. As with DIs, the distribution or pattern of premium income minus policyholder liquidations is normally predicable. When premium income is insufficient to meet surrenders, however, a life insurer can sell some of its relatively liquid assets, such as government bonds. In this case, bonds act as a buffer or reserve asset source of liquidity for the insurer.

Nevertheless, 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. To meet exceptional demands for cash, a life insurer could be forced to liquidate the other assets in its portfolio, such as commercial mortgage loans and other securities, potentially at fire-sale prices.[13] As with DIs, forced asset liquidations can push an insurer into insolvency.[14]

Concept Questions

1. What is likely to be a life insurance company's first source of liquidity when premium income is insufficient?
2. Can a life insurance company be subjected to a run? If so, why?

LIQUIDITY RISK AND PROPERTY–CASUALTY INSURERS

As discussed in Chapter 3, 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. With the help of mortality tables, claims on life

[12] A surrender value is usually some proportion or percent less than 100 percent of the face value of the insurance contract. The surrender value continues to grow as funds invested in the policy earn interest (returns). Earnings to the policyholder are taxed if and when the policy is actually surrendered or cashed in before the policy matures.

[13] Life insurers also provide a considerable amount of loan commitments, especially in the commercial property area. As a result, they face asset-side loan commitment liquidity risk in a fashion similar to that of DIs.

[14] State guaranty schemes deter policyholder runs. In general, the level of coverage and the value of the guarantees are less than deposit insurance. We discuss these guaranty schemes in Chapter 19.

insurance policies are generally predictable. PC claims (such as those associated with natural disasters), however, are virtually impossible to predict. As a result, PC insurers' assets tend to be shorter term and more liquid than those of life insurers. PC insurers' contracts and premium-setting intervals are usually relatively short term as well, so problems caused by policy surrenders are less severe. PC insurers' greatest liquidity exposure occurs when policyholders cancel or fail to renew policies with an insurer because of insolvency risk, pricing, or competitive reasons. This may cause an insurer's premium cash inflow, when added to its investment returns, to be insufficient to meet policyholders' claims.

Alternatively, large unexpected claims may materialize and exceed the flow of premium income and income returns from assets. Disasters such as Hurricane Andrew in 1991 and Hurricane Katrina in 2005 have caused severe liquidity crises and failures among smaller PC insurers.[15] More recent is the near failure of insurance giant AIG, which in late summer 2008 was hit by $18 billion in losses from guarantees (credit default swaps (CDS)) it wrote on mortgage derivatives. As the mortgage debt securities' values declined, AIG was forced to post more collateral to signal to CDS contract counterparties that it could pay off the mortgage guarantees it wrote. Despite these actions by AIG, Standard & Poor's announced that it would downgrade AIG's credit rating. The rating downgrade required AIG to post up to an additional $14.5 billion in collateral, funds which it did not have. AIG made an unprecedented approach to the Federal Reserve seeking $40 billion in short-term financing. The company announced that a financing entity—funded by the Federal Reserve Bank of New York and AIG—had purchased $46.1 billion in the complex debt securities insured by AIG. The deal also included a broader restructuring of the federal government's bailout of AIG, which originally included an $85 billion bridge loan and $37.8 billion in Fed financing.

Concept Questions

1. What is the greatest cause of liquidity exposure faced by property–casualty insurers?
2. Is the liquidity risk of property–casualty insurers in general greater or less than that of life insurers?

INVESTMENT FUNDS

closed-end fund
An investment fund that sells a fixed number of shares in the fund to outside investors.

open-end fund
An investment fund that sells an elastic or nonfixed number of shares in the fund to outside investors.

Investment funds such as mutual funds and hedge funds sell shares as liabilities to investors and invest the proceeds in assets such as bonds and equities. These funds are open-end or closed-end. **Closed-end funds** issue a fixed number of shares as liabilities. Unless the issuing fund chooses to repurchase them, the number of outstanding shares does not change. As discussed in Chapter 5, by far the majority of U.S. investment funds are **open-end funds;** that is, they can issue an unlimited supply of shares to investors. Open-end funds must also stand ready to buy back previously issued shares from investors at the current market price for the fund's shares. Thus, at a given market price, P, the supply of open-end fund shares is perfectly elastic. The price at which an open-end investment fund stands ready to sell new shares or redeem existing shares is the

[15] Also, claims may arise in long-tail lines where a contingency takes place during the policy period but a claim is not lodged until many years later. As mentioned in Chapter 6, one example is the claims regarding damage caused by asbestos contacts.

net asset value The price at which investment fund shares are sold (or can be redeemed). It equals the total market value of the assets of the fund divided by the number of shares in the funds.

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 banks, thrifts, and life insurance companies face when the number of withdrawals (or mutual fund shares cashed in) rises to abnormally and unexpectedly high levels. Indeed, investment funds can be subject to dramatic liquidity runs if investors become nervous about the NAV of the mutual funds' assets. However, the fundamental difference in the way investment fund contracts are valued compared with the valuation of DI deposit and insurance policy contracts mitigates the incentives for fund shareholders to engage in runs. Specifically, if an investment fund were to be liquidated, its assets would be distributed to fund shareholders on a pro rata basis rather than the first-come, first-served basis employed under deposit and insurance contracts.

To illustrate this difference, we can directly compare the incentives for investment fund investors to engage in a run with those of DI depositors. Table 12–12 shows a simple balance sheet of an open-end mutual fund and a DI. When they perceive that a DI's assets are valued below its liabilities, depositors have an incentive to engage in a run on the DI to be first in line to withdraw. In the example in Table 12–12, only the first 90 depositors would receive $1 back for each $1 deposited. The last 10 would receive nothing at all.

Now consider the mutual fund with 100 shareholders who invested $1 each for a total of $100, but whose assets are worth $90. If these shareholders tried to cash in their shares, *none* would receive $1. Instead, a mutual fund values its balance sheet liabilities on a market value basis; the price of any share liquidated by an investor is:

$$P = \frac{\text{Value of assets}}{\text{Shares outstanding}} = \text{NAV (net asset value)}$$

Thus, unlike deposit contracts that have fixed face values of $1, the value of a mutual fund's shares reflects the changing value of its assets divided by the number of shares outstanding.

In Table 12–12, the value of each shareholder's claim is:

$$P = \frac{\$90}{100} = \$0.90$$

That is, each mutual fund shareholder participates in the fund's loss of asset value on a *pro rata,* or proportional, basis. Technically, whether first or last in line, each mutual fund shareholder who cashes in shares on any given day receives the same net asset value per share of the mutual fund. In this case, it is 90 cents, representing a loss of 10 cents per share. All mutual fund shareholders realize this and know that investors share asset losses on a pro rata basis. Being the first in line to withdraw has no overall advantage as it has at DIs.

TABLE 12–12
Run Incentives of DI Depositors versus Investment Fund Investors

Depository Institution			Mutual Fund		
Assets		**Liabilities**	**Assets**		**Liabilities**
Assets	$90	$100 Deposits (100 depositors with $1 deposits)	Assets	$90	$100 Shares (100 shareholders with $1 shares)

This is not to say that mutual funds bear no liquidity risk. Money market mutual funds (MMMFs) experienced tremendous liquidity risk at the start of the financial crisis. On September 16, 2008 (one day after Lehman Brothers filed for bankruptcy), Reserve Primary Fund, the oldest money market fund in the United States saw its shares fall to 97 cents (below the $1.00 book value) after writing off debt issued by Lehman Brothers. Resulting investor anxiety about Reserve Primary Fund spread to other funds, and investors industrywide liquidated their MMMF shares. In just one week investors liquidated $170 billion of the industry total $4 trillion invested in MMMFs. In response, on September 19 the federal government took steps to restore confidence in the MMMF industry. Specifically, the Department of Treasury opened the Temporary Guarantee Program for MMMFs, which provided up to $50 billion in coverage to MMMF shareholders for amounts they held in the funds as of close of business that day. The guarantee was triggered if a participating fund's net asset value fell below $0.995. The program was designed to address the severe liquidity strains in the industry and immediately stabilized the industry and stopped the outflows.

Some of the biggest liquidity crises experienced by FIs recently have occurred with hedge funds, which are highly specialized investment funds with a limited number of wealthy investors, usually 100 or less. For example, in the summer of 2007, two Bear Stearns hedge funds suffered heavy losses on investments in the subprime mortgage market. The two funds filed for bankruptcy in the fall of 2007. Bear Stearns' market value was hurt badly from these losses. The losses became so great that by March 2008 Bear Stearns was struggling to finance its day-to-day operations. Rumors of Bear Stearns' liquidity crisis became a reality as investors began quickly selling off their stock and draining what little liquid assets the firm had left; the first major run on a U.S. FI since the Great Depression. Bear Stearns had no choice but to basically sell themselves to the highest bidder to avoid declaring bankruptcy or completely closing down and leaving investors totally empty handed. J.P. Morgan Chase purchased the company for $236 million; Bear Stearns' skyscraper in New York was worth over $2 billion alone.

Despite these recent crises, the incentives for mutual fund shareholders to engage in runs that produce the extreme form of liquidity problems faced by DIs and life insurance companies are generally absent. This situation has led some academics to argue for deposit contracts to be restructured in a form more similar to mutual fund or equity contracts. This might also obviate the need for deposit insurance to deter bank runs.[16]

Concept Questions

1. What would be the impact on their liquidity needs if DIs offered deposit contracts of an open-end mutual fund type rather than the traditional all-or-nothing demand deposit contract?
2. How do the incentives of mutual fund investors to engage in runs compare with the incentives of DI depositors?

[16] A common argument against this is that since deposits are money and money is the unit of account in the economy, equity-type contracts could pose a problem if the value of a deposit were to fluctuate from day to day. However, note that money market mutual funds offer depositlike contracts as well. As their NAV varies, they solve the fluctuating share value problem by setting the value of each share at $1 but allowing the number of shares an individual holds to fluctuate so that the value of the individual's overall holdings moves in line with asset values, while the price of each money market mutual fund share remains at $1. A similar policy could be adopted for deposits at DIs.

Summary

Liquidity risk, as a result of heavier-than-anticipated liability withdrawals or loan commitment exercise, is a common problem faced by FI managers. Well-developed policies for holding liquid assets or having access to markets for purchased funds are normally adequate to meet liability withdrawals. However, very large withdrawals can cause asset liquidity problems that can be compounded by incentives for liability claim holders to engage in runs at the first sign of a liquidity problem. These incentives for depositors and life insurance policyholders to engage in runs can push normally sound FIs into insolvency. Mutual funds are generally able to avoid runs because liabilities are marked to market so that losses are shared equally among liability holders. Since such insolvencies have costs to society as well as to private shareholders, regulators have developed mechanisms such as deposit insurance and the discount window to alleviate liquidity problems. We discuss these mechanisms in detail in Chapter 19.

Questions and Problems

1. How does the degree of liquidity risk differ for different types of financial institutions?
2. What are the two reasons liquidity risk arises? How does liquidity risk arising from the liability side of the balance sheet differ from liquidity risk arising from the asset side of the balance sheet? What is meant by fire-sale prices?
3. What are core deposits? What role do core deposits play in predicting the probability distribution of net deposit drains?
4. The probability distribution of the net deposit drains of a DI has been estimated to have a mean of 2 percent and a standard deviation of 1 percent. Is this DI increasing or decreasing in size? Explain.
5. How is a DI's distribution pattern of net deposit drains affected by the following?
   a. The holiday season.
   b. Summer vacations.
   c. A severe economic recession.
   d. Double-digit inflation.
6. What are two ways a DI can offset the liquidity effects of a net deposit drain of funds? How do the two methods differ? What are the operational benefits and costs of each method?
7. What are two ways a DI can offset the effects of asset-side liquidity risk such as the drawing down of a loan commitment?
8. A DI with the following balance sheet (in millions) expects a net deposit drain of $15 million.

Assets		Liabilities and Equity	
Cash	$10	Deposits	$68
Loans	50	Equity	7
Securities	15		
Total assets	$75	Total liabilities and equity	$75

Show the DI's balance sheet if the following conditions occur:
   a. The DI purchases liabilities to offset this expected drain.
   b. The stored liquidity management method is used to meet the expected drain.

9. AllStarBank has the following balance sheet (in millions):

Assets		Liabilities and Equity	
Cash	$ 30	Deposits	$110
Loans	90	Borrowed funds	40
Securities	50	Equity	20
Total assets	$170	Total liabilities and equity	$170

AllStarBank's largest customer decides to exercise a $15 million loan commitment. How will the new balance sheet appear if AllStar uses the following liquidity risk strategies?
   a. Stored liquidity management.
   b. Purchased liquidity management.
10. A DI has assets of $10 million consisting of $1 million in cash and $9 million in loans. The DI has core deposits of $6 million, subordinated debt of $2 million, and equity of $2 million. Increases in interest rates are expected to cause a net drain of $2 million in core deposits over the year.
   a. The average cost of deposits is 6 percent and the average yield on loans is 8 percent. The DI decides to reduce its loan portfolio to offset this expected decline in deposits. What will be the effect on net interest income and the size of the DI after the implementation of this strategy?
   b. If the interest cost of issuing new short-term debt is expected to be 7.5 percent, what would be the effect on net interest income of offsetting the expected deposit drain with an increase in interest-bearing liabilities?
   c. What will be the size of the DI after the drain if the DI uses this strategy?
   d. What dynamic aspects of DI management would support a strategy of replacing the deposit drain with interest-bearing liabilities?
11. Define each of the following four measures of liquidity risk. Explain how each measure would be implemented and utilized by a DI.
   a. Sources and uses of liquidity.
   b. Peer group ratio comparisons.
   c. Liquidity index.
   d. Financing gap and financing requirement.
12. A DI has $10 million in T-bills, a $5 million line of credit to borrow in the repo market, and $5 million in excess cash reserves (above reserve requirements) with the Fed. The DI currently has borrowed $6 million in fed funds and $2 million from the Fed's discount window to meet seasonal demands.
   a. What is the DI's total available (sources of) liquidity?
   b. What is the DI's current total uses of liquidity?
   c. What is the net liquidity of the DI?
   d. What conclusions can you derive from the result?
13. A DI has the following assets in its portfolio: $10 million in cash reserves with the Fed, $25 million in T-bills, and $65 million in mortgage loans. If the DI has to liquidate the assets today, it will receive only $98 per $100 of face value of the T-bills and $90 per $100 of face value of the mortgage loans. Liquidation at the end of one month (closer to maturity) will produce $100 per $100 of face value of the T-bills and $97 per $100 of face value of the mortgage. Calculate the one-month liquidity index for this DI using the preceding information.
14. A DI has the following assets in its portfolio: $20 million in cash reserves with the Fed, $20 million in T-bills, and $50 million in mortgage loans. If the assets

need to be liquidated at short notice, the DI will receive only 99 percent of the fair market value of the T-bills and 90 percent of the fair market value of the mortgage loans. Liquidation at the end of one month (closer to maturity) will produce $100 per $100 of face value of the T-bills and the mortgage loans. Calculate the liquidity index using the above information.

15. Conglomerate Corporation has acquired Acme Corporation. To help finance the takeover, Conglomerate will liquidate the overfunded portion of Acme's pension fund. The face values and current and one-year future liquidation values of the assets that will be liquidated are given below.

	Liquidation Values		
Asset	**Face Value**	***t* = 0**	***t* = 1 year**
IBM stock	$10,000	$9,900	$10,500
GE bonds	5,000	4,000	4,500
Treasury securities	15,000	13,000	14,000

Calculate the one-year liquidity index for these securities.

16. Plainbank has $10 million in cash and equivalents, $30 million in loans, and $15 million in core deposits.
    a. Calculate the financing gap.
    b. What is the financing requirement?
    c. How can the financing gap be used in the day-to-day liquidity management of the bank?
17. How can an FI's liquidity plan help reduce the effects of liquidity shortages? What are the components of a liquidity plan?
18. Central Bank has the following balance sheet (in millions of dollars).

Assets		**Liabilities and Equity**	
Cash	$ 20	Stable retail deposits	$ 190
Deposits at the Fed	30	Less stable retail deposits	70
Treasury bonds	145	CDs maturing in 6 months	100
Qualifying marketable securities	50	Unsecured wholesale funding from:	
GNMA bonds	60	Stable small business deposits	125
Loans to AA− rated corporations	540	Less stable small business deposits	100
Mortgages	285	Nonfinancial corporates	450
Premises	35	Equity	130
Total	$1,165	Total	$1,165

Cash inflows over the next 30 days from the bank's performing assets are $7.5 million. Calculate the LCR for Central Bank.

19. WallsFarther Bank has the following balance sheet (in millions of dollars).

Assets		**Liabilities and Equity**	
Cash	$ 12	Stable retail deposits	$ 55
Deposits at the Fed	19	Less stable retail deposits	20
Treasury securities	125	Unsecured wholesale funding from:	
GNMA securities	94	Stable small business deposits	80
Loans to AA rated corporations	138	Less stable small business deposits	49
Loans to BB rated corporations	106	Nonfinancial corporates	250
Premises	20	Equity	60
Total	$514	Total	$514

Cash inflows over the next 30 days from the bank's performing assets are $5.5 million. Calculate the LCR for WallsFarther Bank.

20. FirstBank has the following balance sheet (in millions of dollars).

Assets		Liabilities and Equity	
Cash	$ 12	Stable retail deposits	$ 55
Deposits at the Fed	19	Less stable retail deposits	20
Treasury securities	125	Unsecured wholesale funding from:	
GNMA securities	94	Stable small business deposits	80
Loans to A rated corporations (maturity > 1 year)	138	Less stable small business deposits	49
		Nonfinancial corporates	250
Loans to B rated corporations (maturity < 1 year)	106	Equity	60
		Total	$514
Premises	20		
Total	$514		

Calculate the NSFR for FirstBank.

21. BancTwo has the following balance sheet (in millions of dollars).

Assets		Liabilities and Equity	
Cash	$ 20	Stable retail deposits	$ 190
Deposits at the Fed	30	Less stable retail deposits	70
Treasury bonds	145	CDs maturing in 6 months	100
Qualifying marketable securities (maturity < 1 year)	50	Unsecured wholesale funding from:	
		Stable small business deposits	125
FNMA bonds	60	Less stable small business deposits	100
Loans to AA− rated corporations (maturity > 1 year)	540	Nonfinancial corporates	450
		Equity	130
Mortgages (unencumbered)	285	Total	$1,165
Premises	35		
Total	$1,165		

Calculate the NSFR for BancTwo.

22. What is a bank run? What are some possible withdrawal shocks that could initiate a bank run? What feature of the demand deposit contract provides deposit withdrawal momentum that can result in a bank run?

23. The following is the balance sheet of a DI (in millions):

Assets		Liabilities and Equity	
Cash	$ 2	Demand deposits	$50
Loans	50		
Premises and equipment	3	Equity	5
Total	$55	Total	$55

The asset–liability management committee has estimated that the loans, whose average interest rate is 6 percent and whose average life is three years, will have to be discounted at 10 percent if they are to be sold in less than two days. If they

can be sold in four days, they will have to be discounted at 8 percent. If they can be sold later than a week, the DI will receive the full market value. Loans are not amortized; that is, the principal is paid at maturity.

a. What will be the price received by the DI for the loans if they have to be sold in two days? In four days?
b. In a crisis, if depositors all demand payment on the first day, what amount will they receive? What will they receive if they demand to be paid within the week? Assume no deposit insurance.

24. What government safeguards are in place to reduce liquidity risk for DIs?
25. What are the levels of defense against liquidity risk for a life insurance company? How does liquidity risk for a property–casualty insurer differ from that for a life insurance company?
26. How is the liquidity problem faced by investment funds different from that faced by DIs and insurance companies? How does the liquidity risk of an open-end mutual fund compare with that of a closed-end fund?
27. A mutual fund has the following assets in its portfolio: $40 million in fixed-income securities and $40 million in stocks at current market values. In the event of a liquidity crisis, the fund can sell the assets at 96 percent of market value if they are disposed of in two days. The fund will receive 98 percent if the assets are disposed of in four days. Two shareholders, A and B, own 5 percent and 7 percent of equity (shares), respectively.
    a. Market uncertainty has caused shareholders to sell their shares back to the fund. What will the two shareholders receive if the mutual fund must sell all the assets in two days? In four days?
    b. How does this situation differ from a bank run? How have bank regulators mitigated the problem of bank runs?
28. A mutual fund has $1 million in cash and $9 million invested in securities. It currently has 1 million shares outstanding.
    a. What is the net asset value (NAV) of this fund?
    b. Assume that some of the shareholders decide to cash in their shares of the fund. How many shares at its current NAV can the fund take back without resorting to a sale of assets?
    c. As a result of anticipated heavy withdrawals, the fund sells 10,000 shares of IBM stock currently valued at $40. Unfortunately, it receives only $35 per share. What is the net asset value after the sale? What are the cash assets of the fund after the sale?
    d. Assume that after the sale of IBM shares, 100,000 shares are sold back to the fund. What is the current NAV? Is there a need to sell more securities to meet this redemption?

Web Question

29. Go to the Federal Deposit Insurance Corporation's website (**www.fdic.gov**) and Click on "Analysts." Click on "Statistics on Banking." Click on "Assets and Liabilities," and then "Run Report." Using information in this file update Table 12–1. How have the assets and liabilities of U.S. banks increased since March 2012?

Integrated Mini Case

MEASURING LIQUIDITY RISK

A DI has the following balance sheet (in millions):

Assets		Liabilities and Equity	
Cash	$ 9	Deposits	$ 75
Loans	95	Purchased funds	40
Securities	26	Equity	15
Total assets	$130	Total liabilities and equity	$130

The DI's securities portfolio includes $16 million in T-bills and $10 million in GNMA securities. The DI has a $20 million line of credit to borrow in the repo market and $5 million in excess cash reserves (above reserve requirements) with the Fed. The DI currently has borrowed $22 million in Fed funds and $18 million from the Fed discount window to meet seasonal demands.

1. What is the DI's total available (sources of) liquidity?
2. What is the DI's current total uses of liquidity?
3. What is the net liquidity of the DI?
4. Calculate the financing gap.
5. What is the financing requirement?
6. The DI expects a net deposit drain of $20 million. Show the DI's balance sheet if the following conditions occur:
   a. The DI purchases liabilities to offset this expected drain.
   b. The stored liquidity management method is used to meet the expected drain (the DI does not want the cash balance to fall below $5 million, and securities can be sold at their fair value).
7. In the event of an unexpected and severe drain on deposits in the next 3 days, and 10 days, the DI will liquidate assets in the following manner:

Liquidation Values ($ millions)			
Asset	**Fair Value**	***t* = 3 days**	***t* = 10 days**
Cash	$ 9	$ 9	$ 9
Treasury bills	16	14	15.5
GNMAs	10	8	9
Loans	95	65	75

Calculate the 3-day and 10-day liquidity index for the DI.

Appendix 12A: Sources and Uses of Funds Statement, Bank of America, March 2012

View Appendix 12A at the website for this textbook (**www.mhhe.com/saunders8e**).

Appendix 12B

Illustrative Template for the LCR

Item	Factor (to be multiplied against total amount)
Stock of High-Quality Liquid Assets	
A. Level 1 Assets:	
Cash	100%
Qualifying marketable securities from sovereigns, central banks, public-sector entities, and multilateral development banks	100%
Qualifying central bank reserves	100%
Domestic sovereign or central bank debt in domestic currency	100%
Domestic sovereign debt for non-0% risk-weighted sovereigns, issued in foreign currency	100%
B. Level 2 Assets:	
Sovereign, central bank, and PSE assets qualifying for 20% risk weighting	85%
Qualifying corporate bonds rated AA- or higher	85%
Qualifying covered bonds rated AA- or higher	85%
Calculation of 40% cap of liquid assets	Maximum of 2/3 of adjusted Level 1 assets that would exist after an unwind of all secured funding transactions.
Total value of stock of highly liquid assets	
Cash Outflows	
A. Retail Deposits:	
Demand deposit and qualifying term deposits with residual maturity or notice period within 30 days	
• Stable deposits	Minimum 5% (additional categories to be determined by jurisdiction)
• Less stable retail deposits	Minimum 10% (additional categories to be determined by jurisdiction)
Term deposit with residual maturity greater than 30 days with a withdrawal with a significant penalty, or no legal right to withdraw	0% (or higher rate to be determined by jurisdictions)
B. Unsecured Wholesale Funding:	
Funding from:	
Stable small-business customers	Minimum 5% (additional categories to be determined by jursidiction)
Less stable small-business customers	Minimum 10% (additional categories to be determined by jurisdiction)
Legal entities with operational relationships	25% of deposits needed for operational purposes

Item	Factor (to be multiplied against total amount)
• Portion of corporate deposits with operational relationships covered by deposit insurance—same treatment as for retail demand deposits	
Cooperative banks in an institutional network	25% of the qualifying deposits with the centralized institution
Nonfinancial corporates, sovereigns, central banks, and PSEs	75%
Other legal entity customers	100%
C. Secured Funding:	
Secured funding transactions backed by Level 1 assets, with any counterparty	0%
Secured funding transactions backed by Level 2 assets, with any counterparty	15%
Secured funding transactions backed by assets that are not eligible for the stock of highly liquid assets, with domestic sovereigns, domestic central banks, or domestic public-sector entities as a counterparty	25%
All other secured funding transactions	100%
D. Additional Requirements:	
Liabilities related to derivative collateral calls related to a downgrade of up to 3 notches	100% of collateral that would be required to cover the contracts in case of up to a 3-notch downgrade
Market valuation changes on derivatives transactions	Treatment determined by supervisors in each jurisdiction
Valuation changes on posted collateral securing derivative transactions that is comprised of non-level 1 assets	20%
ABCP, SIVs, conduits, etc.:	
Liabilities from maturing ABCP, SIVs, SPVs, etc.	100% of maturing amounts and 100% of returnable assets
Asset-backed securities (including covered bonds)	100% of maturing amounts
Currently undrawn portion of committed credit and liquidity facilities to:	
• Retail and small-business clients	5% of outstanding credit and liquidity lines
• Nonfinancial corporates, sovereigns and central banks, and PSEs; credit facilities	10% of outstanding credit lines
• Nonfinancial corporates, sovereigns and central banks, and PSEs; liquidity facilities	100% of outstanding liquidity lines
• Other legal entity customers, credit and liquidity facilites	100% of outstanding credit and liquidity lines
Other contingent funding liabilities (such as guarantees, letters of credit, revocable credit and liquidity facilities, derivative valuations)	Treatment determined by supervisors in each jurisdiction
Any additional contractual outflows	100%
Net derivative payables	100%
Any other contractual cash outflows	100%
Total Cash Outflows	

Item	Factor (to be multiplied against total amount)
Cash Inflows	
Reverse repos and securities borrowing, with the following as collateral:	
• Level 1 assets	0%
• Level 2 assets	15%
• All other assets	100%
Credit or liquidity facilities	0%
Operational deposits held at other financial institutions	0%
• Deposits held at centralized insitution of a network of cooperative banks	0% of the qualifying deposits with the centralized insitution
Other inflows by counterparty:	
• Amounts receivable from retail counterparties	50%
• Amounts receivable from nonfinancial wholesale counterparties, from transactions other than those listed in the inflow categories	50%
• Amounts receivable from financial institutions, from transactions other than those listed in the inflow categories	100%
Net derivative receivables	100%
Other contractual cash inflows	Treatment determined by supervisors in each jurisdiction
Total Cash Inflows	
Total net cash outflows = Total cash outflows − Min [Total cash inflows, 75% of gross outflows]	
LCR (= Total value of stock of high-quality liquid assets/ Net cash outflows)	