Liquidity and Treasury Risk Measurement and Management

FRM二级培训讲义-强化班

讲师：Mikey Chow

Topic Weightings in FRM Part II

Session NO.	Contents	%
Session 1	Market Risk Measurement and Management	20
Session 2	Credit Risk Measurement and Management	20
Session 3	Operational Risk and Resiliency	20
Session 4	Liquidity and Treasury Risk Measurement and Management	15
Session 5	Risk Management and Investment Management	15
Session 6	Current Issues in Financial Market	10

Framework

Part 1: Identify and Measure Liquidity

1. Liquidity Trading Risk
2. Liquidity Funding Risk
3. Markets for Collateral
4. Motivations of Repos
5. General and Special Repo Rates
6. Leverage
7. Liquidity Black Holes
8. Liquidity and System Risk
9. Failure Mechanics of Dealer Bank

(CH1,CH2,CH8,CH14)

1.Liquidity Trading Risk

- **Liquidity Trading Risk:** Risk of moving the price of an asset adversely in the act of buying or selling it.
  - Transaction liquidity risk is low if assets can be liquidated or a position can be covered quickly, cheaply, and without moving the price too much.
  - An asset is liquid if it is "near" or a good substitute for cash.
  - An asset is said to have a liquidity premium if its price is lower and expected return higher because it isn't perfectly liquid.
  - A market is said to be liquid if market participants can put on or unwind positions quickly, without excessive transactions costs and without excessive price deterioration.

1.Liquidity Trading Risk

- **Transaction liquidity risk is ultimately due to the cost of searching for a counterparty**
  - Cost of trade processing.
  - Inventory management by dealers.
    - ✓ The role of dealers is to provide trade immediacy to other market participants, including other dealers, by holding long or short inventories of the asset.
  - Adverse selection
    - ✓ Some traders may be better informed than others, that is, better situated to forecast the equilibrium price.
  - Differences of opinion.
    - ✓ Investors generally disagree about the " correct" price of an asset

1.Liquidity Trading Risk

Characteristics of Market Liquidity

- A standard set of characteristics of market liquidity, focusing primarily on asset liquidity, helps to understand the causes of illiquidity:
  - ✓ **Tightness** refers to the cost of a round-trip transaction, and is typically measured by the bid-ask spread and brokers' commissions.
  - ✓ **Depth** describes how large an order it takes to move the market adversely.
  - ✓ **Resiliency** is the length of time for which a lumpy order moves the market away from the equilibrium price.
- Lack of liquidity manifests itself in these observable:
  - ✓ Bid-ask spread to widen.
  - ✓ Adverse price impact arises.
  - ✓ Slippage arises
    - ◆the deterioration in the market price induced by the amount of time it takes to get a trade done.

1.Liquidity Trading Risk

- **Bid-Offer Spread as a Measure of Liquidity**
  - Higher **OFFER** Price: price at which a trader sells.
  - Lower **BID** Price: price at which trader buys.
  - The difference between the bid and ask prices is a cost of liquidity.
- **The bid-offer spread is exogenous**
  - If our position is small, relative to the size of the market, then our trading should have a negligible impact on the market price.
- **The bid-offer spread is to some extent endogenous**
  - If our position is large relative to the market, our activities can affect both the market price and the bid-ask spread.
    - ✓ For example, if we suddenly unload a large position, we should expect the 'market' price to fall and the bid-offer spread to widen.

1.Liquidity Trading Risk

- **Bid-offer spread**
  - p=offer price-bid price
  - $s=\frac{(\text{offer price}-\text{bid price})}{\text{mid-market price}}=\frac{(\text{offer price}-\text{bid price})}{(\text{offer price}+\text{bid price})/2}$
- **Cost of liquidation(Normal market)**

$$\text{cost of liquidation}=\sum_{i=1}^{n}\frac{s_i a_i}{2}$$

Where:

s_i =spread for i-th instrument

a_i =dollar value of the i-th instrument position

1.Liquidity Trading Risk

- **Cost of liquidation(Stressed market)**

$$\text{cost of liquidation} = \sum_{i=1}^{n} \frac{(\mu_i + \alpha\sigma_i)a_i}{2}$$

Where:

μ_i = mean of s_i

σ_i = standard deviation of s_i

α = confidence parameter

1.Liquidity Trading Risk

- **Liquidity-adjusted VaR**

$$\text{LVaR} = \text{VaR} + \sum_{i=1}^{n} \frac{s_i a_i}{2}$$

or

$$\text{LVaR} = \text{VaR} + \sum_{i=1}^{n} \frac{(\mu_i + \alpha\sigma_i)a_i}{2}$$

1.Liquidity Trading Risk

➢ Measuring Transactions Liquidity Risk

- Measuring the Risk of Adverse Price Impact with given liquidation period.

$$LVaR = VaR \times \sqrt{\frac{(1+T)\times(1+2T)}{6T}}$$

◆T is the required for the orderly liquidation of a position.

2.Liquidity Funding Risk

Liquidity Funding Risk

- This is the financial institution's **ability to meet its cash needs** as they arise.
- Liquidity funding problems at a financial institution can be caused by:
  - ✓ Liquidity stresses in the economy.
  - ✓ Overly aggressive funding decisions.
  - ✓ A poor financial performance, leading to a lack of confidence.
- The key to managing funding liquidity risk is predicting cash needs and ensuring that they can be met in adverse scenarios.

2.Liquidity Funding Risk

- **Maturity Transformation**
  - **Maturity mismatch:** borrow at short term to finance investments that require a longer time to become profitable.
  - Intermediaries engage in maturity mismatch because it is generally profitable.
  - Funding long-term assets with short-term debt exposes an intermediary to rollover-risk or even cliff-risk.
- **Liquidity Transformation**
  - The process by which financial intermediaries use their balance sheets to create assets that can be used as money.
  - Market participants hold money to conduct liquidity transactions and for speculative reasons such as risk preferences.
    - ✓ The demand for money-"liquidity preference", has become particularly pertinent during the subprime crisis.

2.Liquidity Funding Risk

Liquidity Coverage Ratio

- The ratio of the stock of high-quality liquid assets to the net cash outflows over 30 days must be greater than 100%. It allow the bank to convert assets into cash to meet liquidity needs under a stress scenario.

$$\text{LCR} = \frac{\text{High} - \text{Quality Liquid Assets}}{\text{Net Cash outflows in } 30 - \text{day period}} \geq 100\%$$

2.Liquidity Funding Risk

➢ Net Stable Funding Ratio (NSFR)

- NSFR focuses on liquidity management over a period of one year i.e. long-term financial resources must exceed long-term commitments.

$$\text{NSFR} = \frac{\text{Amount of Stable Funding}}{\text{Required Amount of Stable Funding}} \geq 100\%$$

- **Stable funding** broadly comprises of:
  - ✓ Equity and any liability maturing after one year.
  - ✓ Retail deposits & deposits from non-financial corporates and public entities.
- **For the numerator**, depending on the type of funding source, each category of funding is multiplies by an available stable funding (ASF) factor, reflecting their stability.
- **For the denominator**, each category of these is multiplied by a required stable funding (RSF) factor.

3.Markets for Collateral

Markets for Collateral

- **Markets for collateral** are formed when securities are used as collateral to obtain secured loans of cash or other securities.
  - ✓ Firms can borrow or lend collateral against cash or other securities. **A haircut** ensures that the full value of the collateral is not lent.
- Major forms of collateral market
  - ✓ Margin loans
  - ✓ Repurchase agreements
  - ✓ Securities lending

3.Markets for Collateral

- **Margin loans**
  - Lending for the purpose of financing a security transaction in which the loan is collateralized by the security.
  - **Purpose:** The simplest form of a market for collateral, is primarily used by investors wishing to take leveraged long positions in securities, most often equities.
  - **Major risks**
    - ✓ **Repledge:**
      - In practice, the broker is likely to use the customer's collateral **to borrow money in the secured money market to obtain the funds it lends to margin customers.** Collateral may also **be repledged in order to borrow another security** rather than cash collateral.
    - ✓ **Margin call**
      - If the market value of long position declines, the broker loses the protection the collateral provides against the customer defaulting on the margin loan, so he will issue a margin call to the customer.

3.Markets for Collateral

- **Repurchase agreements**
  - Are matched pairs of the **spot sale and forward repurchase** of security. The collateralization of the loan is achieved by selling the security temporarily to the lender.
  - **Purpose:** Reverse repo transactions are similar, in that they are often used to finance long positions in securities, typically bonds. Repo transactions, in contrast, are usually intended to borrow cash by owners of bonds.
  - **Major risk**
    - ✓ A few decades ago, repo began to encompass high-yield bonds and whole loans, and more recently, structured credit products.
    - ✓ The mechanics of repo lending are similar to margin loans. Like margin lending, repo creates a straightforward **liability** on the economic balance sheet.

3.Markets for Collateral

- **Securities lending**
  - One party lends a security to another in exchange for a fee, generally called a **rebate**. The security lender continues to receive dividend and interest cash flows from the security.
  - **There are two typical patterns of securities lending**
    - ✓ The investor makes the equities available for lending by holding them at the custodian or prime broker in "**street name**", so that they can be **rehypothecated** to a trader who wishes to sell the securities short.
    - ✓ **A typical fixed-income securities lending transaction aims to earn a spread between less and more-risky bonds**.
  - **Purpose**: Securities lending has typically been focused on the securities rather than the cash collateral, typically to establish short positions. In recent years, the focus of their use has shifted to borrowing cash collateral.

3.Markets for Collateral

- **Economic Function of Markets for Collateral**
  - First, they create the ability to establish leveraged long and short positions in securities.
  - Second, collateral markets enhance the ability of firms to borrow money.
- **Risks in Markets for Collateral**
  - The risks in markets for collateral are similar to those of other leveraged positions. They comprise market, credit, and counterparty risks.
  - The size and structure of collateral markets also contributes to systemic risk.
    - ✓ Drastic remargin

4.Motivations of Repos

- **Repurchase Agreement**
  - A repurchase agreement or repo is a contract in which a security is traded at some initial price with the understanding that the trade will be reversed at some future date at some fixed price.
  - Calculate the settlement price of a repo(see examples)

$$\text{Repurchase price} = \text{borrowed money} \times \left(1 + \frac{\text{repo rate} \times \text{t}}{360}\right)$$

- There are three reasons to do repo
  ① to lend funds short-term on a secured basis
  ② finance along position in a security
  ③ to borrow a security in order to sell it short.

4.Motivations of Repos

① Repos and Cash Management(repo investors)

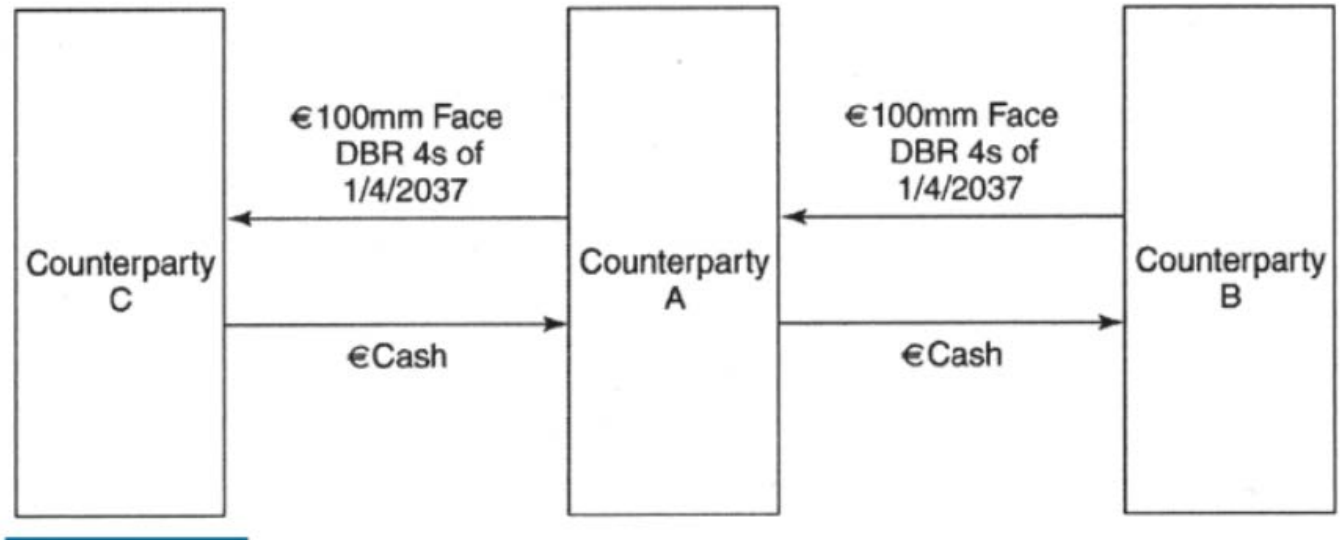
- In summary, relative to super-safe and liquid non-interest-bearing bank deposits, repo investments pay a short-term rate without sacrificing much liquidity or incurring significant default risk.
- Major participants of repo investors
  - ✓ **money market fund**
  - ✓ **Municipalities** constitute another significant category of repo investors with tax revenues
  - ✓ Other institutions with similar cash management issues that choose to invest in repo are **mutual funds, insurance companies, pension funds, and some nonfinancial corporations.**
- Repo investors tend to lend overnight, rather than for term.
- Since safety is the other key consideration of investors in repo, only securities of the highest credit quality are typically accepted as collateral.

4.Motivations of Repos

② Repos and Long Financing(repo borrowers)

- Financial institutions are the typical borrowers of cash in repo markets.
- Financial institution used the repo market to finance its inventory for purpose of making markets.

✓ **Back-to-back repo trades**



4.Motivations of Repos

③ Reverse Repos and Short Positions

- Reverse repos are initiated to borrow a bond.
- While repo investors are willing to accept general collateral, reverses require the delivery of a particular bond.
- Repo transactions that require the delivery of a particular bond are called **special trades** and they take place at special collateral rates.

5.General and Special Repo Rates

General and Special Repo Rates

- Repo trades can be divided into those using general collateral (GC) and those using special collateral (SC) or specials.
  - ✓ With GC, the lender of cash is willing to take any particular security.
  - ✓ With SC, the lender of cash initiates the repo in order to take possession of a particular security.
- Differences between the GC rate and the SC rates for particular securities and terms are called **special spreads**.

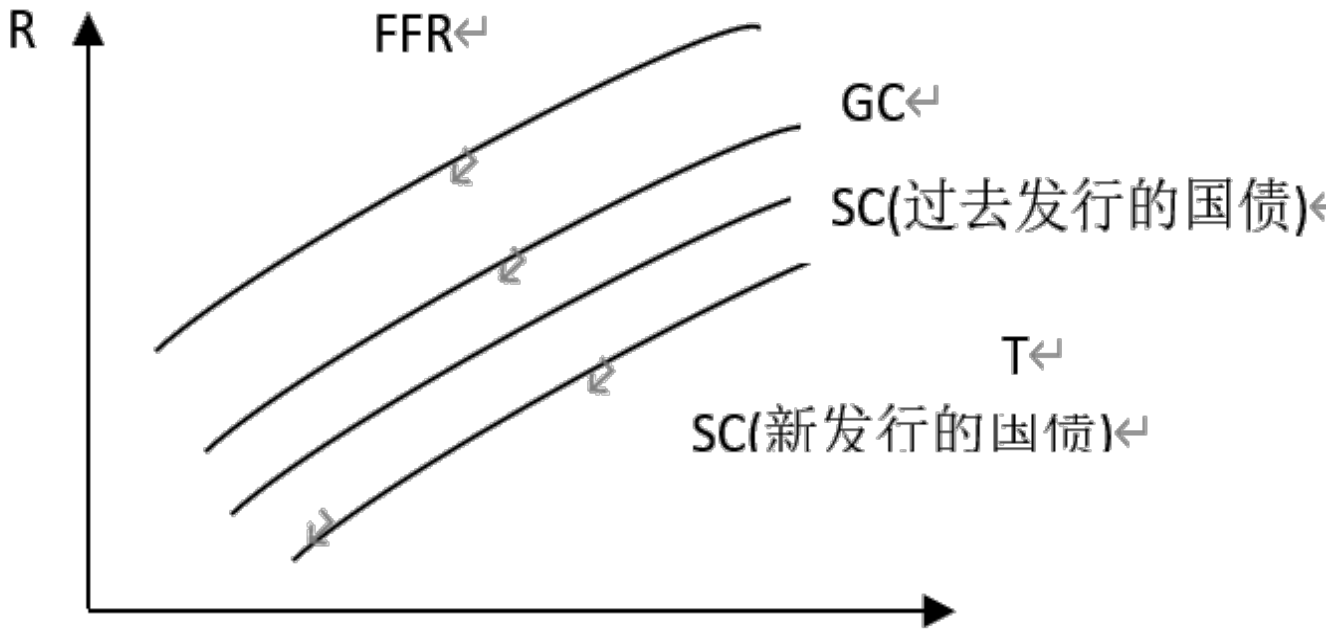
5.General and Special Repo Rates

Special Spreads

- the most recently issued bonds of each maturity trade special, which will widen the special spread
  - ✓ On-the-run (OTR): The most recently issued bond of a given maturity. Current issues tend to be the most liquid.
  - ✓ Off-the-run (OFR): All other issues despite OTR bond
    - ◆ The second most recently issued bond of a given maturity does have its own designation as the old issue
    - ◆ The third most recent as the double-old issue, etc.
  - ✓ As a general rule, at each maturity, the OTR trades the most special, followed by the old, followed by the double-old, etc.

5.General and Special Repo Rates

- **Different curves of repo rates**
  - **The fed funds – GC spread** widened to reflect the decreasing supply of Treasury collateral.
  - In the United States the GC rate is typically close to, but below, the federal funds rate.



6.Leverage

- **Leverage ratio is defined as**

$$L = \frac{A}{E} = 1 + \frac{D}{E}$$

- **Leverage effect**: Leverage is important because it provides an opportunity to increase returns to equity investors.
  - The leverage effect is the increase in equity returns that results from increasing leverage and is equal to the difference between the returns on the assets and cost of funding.

$$R_e = L \times R_a - (L - 1) \times R_d$$

6.Leverage

- **Two forms of leveraged return**
  - Haircut and repo transaction
    - ✓ The leverage is equal to $\frac{1}{h}$
  - Leveraged returns to housing
    - ✓ The leverage is equal to $\frac{1}{Down\ payment}$

6.Leverage

- **Impact of different types of transactions on a firm's leverage and balance sheet.**
  - Margin loans
  - Short positions
    - ✓ If short positions play a hedging role in the portfolio, leverage will overstate the risk, since adding the short positions increases leverage, but reduces market risk.
    - ✓ **Gross leverage & Net leverage**
  - Derivatives
    - ✓ Each side of a derivatives contract is synthetically long or short an asset

6.Leverage

- **Leverage and Structured Credit**
  - Structured credit also provides embedded leverage.
    - ✓ The bond tranches take losses only in more extreme default and correlation scenarios.
    - ✓ The equity note bears most of the risk of loss.
- **Asset Volatility and Leverage**
  - Investing in assets with a higher return volatility is economically quite similar to leverage.
    - ✓ An asset with more volatile returns provides a higher probability of higher leveraged returns to the investor, but also a higher probability of losses to the provider of credit.

7.Liquidity Black Holes

- A liquidity black hole describes a situation where **liquidity has dried up in a particular market** because everyone wants to sell and no one wants to buy, or vice versa. It is sometimes also referred to as a **"crowded exit."**
  - Circuit Breaker
- A liquidity black hole is created when a price decline causes more market participants to want to sell, driving prices well below where they will eventually settle.
  - Liquidity black holes tend to be associated with price decreases, but it is in theory also possible for them to occur when there are price increases.

7.Liquidity Black Holes

- **Negative feedback** traders buy when prices fall and sell when prices rise.
  - In liquid markets, negative feedback traders dominate the trading .
- **Positive feedback** traders sell when prices fall and buy when prices rise.
  - When positive feedback traders dominate the trading, market prices are liable to be unstable and the market may become one-sided and illiquid.
  - There are a number of reasons why positive feedback trading exists. For example:
    - ✓ Trend trading
    - ✓ Stop-loss rules
    - ✓ Dynamic hedging.
    - ✓ Creating options synthetically
    - ✓ Margins
    - ✓ Predatory trading
    - ✓ LTCM: short liquid bond and long illiquid bond

8.Liquidity and System Risk

- **Systemic risk,** the risk of severe, widespread financial stress and intermediary failure, possibly including disruption of payment systems, is a function among other things of economy-wide liquidity.
  - Funding Liquidity and Solvency
    - ✓ But a firm can be insolvent, yet able to continue for some time to roll over its debts, or may funded largely by long-term debt, and thus not face illiquidity.
    - ✓ lliquidity can become insolvency if it is extreme enough
  - Funding and Market Liquidity
    - ✓ A key mechanism linking funding and market liquidity is leverage.
  - Systemic Risk and the "Plumbing"
    - ✓ Disruptions in the payments, clearing, and settlements systems, often called the " plumbing" of the financial system, finally leads liquidity risk events become systemic risk events.

9.Failure Mechanics of Dealer Bank

- **Introduction**
  - Dealer banks V.S. traditional commercial banks
  - Dealer banks are typically parts of large financial organizations that operate other financial businesses, and many large dealer-banks have conventional commercial banking operations, including deposit taking as well as lending to corporations and consumers.
- **Major Functions of Large Dealer Banks**
  - intermediation of the markets for securities, securities lending, repurchase agreements, and derivatives
  - prime brokerage for hedge funds
  - asset management for institutional and wealthy individual investors
  - proprietary trading
    - ✓ that is, speculation on their own accounts

9.Failure Mechanics of Dealer Bank

Introduction

- Dealer banks are typically parts of large financial organizations that operate other financial businesses, and many large dealer-banks have conventional commercial banking operations, including deposit taking as well as lending to corporations and consumers.

Failure Mechanics of Dealer Bank

- The relationships between a dealer bank and its derivatives counterparties, prime-brokerage clients, potential debt and equity investors, clearing bank, and other clients can change rapidly if the solvency of the dealer bank is threatened.
  - ✓ The Flight of Short-Term Creditors
  - ✓ The Flight of Prime Brokerage Clients
  - ✓ When Derivatives Counterparties Duck for Cover
  - ✓ Loss of Cash Settlement Privileges

9.Failure Mechanics of Dealer Bank

- **Policy responses** for dealer banks
  - higher capital requirements(GSIBs)
  - lender-of-last-resort financing by central banks
  - the problems of short-term tri-party repos can be solved by central bank insurance of tri-party repo transactions and an "emergency bank," to be financed by repo market participants, that could manage the orderly unwinds of repo positions of weakened dealers.
  - the flight of OTC derivatives counterparties can be lowered by central clearing.
  - Dealer banks could be given regulatory incentives or requirements to issue forms of debt(COCOs) that, contingent on stipulated distress triggers, convert to equity.

Framework

Part 2: Manage Liquidity Risk

1. Net Liquidity Position
2. Strategies for Liquidity Management
3. Estimating Liquidity Needs
4. Calculating Legal Reserves
5. LTP Introduction
6. Three Approaches to LTP
7. Contingent Liquidity Risk Pricing
8. Liquidity Stress Testing
9. Contingency Funding Planning
10. Framework and Building Blocks

(CH5,CH9,CH11,CH15)

1.Net Liquidity Position

- **Net liquidity position (L) at time t is:**

Supplies of Liquidity Flowing into the Financial Firm

A financial firm's net liquidity Position(L_t) = Incoming deposits (inflows) + Revenues from the sale of nondeposit services + Customer loan repayments + Sales of assets + Borrowings from the money market

-Demands on the Financial Firm for Liquidity

- Deposit withdrawals (outflows) - Volume of acceptable loan requests - Repayments of borrowings - Other operating expenses - Dividend payments to stockholders

1.Net Liquidity Position

- **Liquidity has a critical time dimension**
  - Some liquidity has near-term pressure: large CDs due to maturity tomorrow
  - Longer-term liquidity demands arise from seasonal, cyclical, and trend factors
  - Most liquidity problems arise from outside the financial firm as a result of the activities of customers.
- **The essence of liquidity management problems for financial institutions may be described in two succinct statements:**
  - **Rarely are** demands for liquidity **equal to** the supply of liquidity at any particular moment in time.
    - ✓ continually either a liquidity deficit or a liquidity surplus
  - There is a trade-off between liquidity and profitability.

2.Strategies for Liquidity Management

- A financial firm is liquid only if it has access, at reasonable cost, to liquid funds in exactly the amounts required at precisely the time they are needed.
- **Experienced liquidity managers have developed several strategies for dealing with liquidity problems:**
  - ① providing liquidity from assets (asset liquidity management)
  - ② relying on borrowed liquidity to meet cash demands (liability management)
  - ③ balanced (asset and liability) liquidity management.

2.Strategies for Liquidity Management

① Asset Liquidity Management (or Asset Conversion) Strategies

- The oldest approach
- When liquidity is needed, selected assets are converted into cash until all demands for cash are met
- used mainly by smaller financial institutions that find it a less risky approach to liquidity management than relying on borrowings. However, it is not a costless approach.
  - ✓ First, selling assets means loss of future earnings those assets would have generated had they not been sold off
  - ✓ Second, weaken the appearance of the balance sheet by selling low-risk securities
  - ✓ Finally, liquid assets generally carry the lowest rates of return of all assets.

2.Strategies for Liquidity Management

② Borrowed Liquidity (Liability) Management Strategies

- The largest financial institutions around the world have chosen to raise more of their liquid funds through borrowings in the money market.
- Advantages:
  - ✓ A financial firm can choose to borrow only when it actually needs funds
  - ✓ using borrowed funds permits a financial institution to leave the volume and composition of its asset portfolio unchanged.
  - ✓ liability management comes with its own control lever-the interest rate offered to borrow funds.
- Disadvantages:
  - ✓ Borrowing liquidity is the most risky approach to solving liquidity problems (but also carries the highest expected return).
  - ✓ Borrowing cost is always uncertain, which adds greater uncertainty to earnings.

2.Strategies for Liquidity Management

③ Balanced Liquidity Management Strategies

- Most financial firms compromise by using both asset and liability management.
- Liquidity treatment
  - ✓ some of the expected demands for liquidity are stored in assets (principally holdings of marketable securities)
  - ✓ other anticipated liquidity needs are backstopped by advance arrangements for lines of credit from potential suppliers of funds
  - ✓ Unexpected cash needs are typically met from near-term borrowings.
  - ✓ Longer-term liquidity needs can be planned for and the funds to meet these needs can be parked in short-term and medium-term assets that will provide cash as those liquidity needs arise

3.Estimating Liquidity Needs

- Four methods to estimating liquidity needs, with each method resting on specific assumptions and yields only an approximation of actual liquidity requirements
  - ① **the sources and uses of funds approach**
  - ② **the structure of funds approach**
  - ③ **the liquidity indicator approach**
  - ④ the market signals (or discipline) approach
- In fact, most financial firms make sure their liquidity reserves include **both a planned component, and a protective component.**

① The sources and uses of funds approach

- **Two simple facts:**
  - liquidity rises as deposits increase and loans decrease.
  - liquidity declines when deposits decrease and loans increase.
- **The key steps are:**
  - Loans and deposits must be forecast for a given planning period.
    - ✓ Change in loan=F_{loan}(GDP, corporate earnings, money supply…)
    - ✓ Change in deposits=$F_{deposits}$(personal income, inflation…)
  - The estimated change in loans and deposits must be calculated.
    - ✓ Estimated change in deposits-Estimated change in loans
  - The liquidity manager must estimate the net liquid funds' surplus or deficit(liquidity gap) for the planning period by comparing the estimated change in loans (or other uses of funds) to the estimated change in deposits (or other funds sources).

② The structure of funds approach

- **In the first step:**
  - deposits and other funds sources are divided into categories based upon their estimated probability of being withdrawn(similar to NSFR) and, therefore, lost to the financial firm.
  - As an illustration, we might divide a bank's deposit and nondeposit liabilities into three categories:
    - ✓ **"Hot money" liabilities** (often called volatile liabilities) deposits and other borrowed funds (such as federal funds borrowings) that are very interest sensitive or that management is sure will be withdrawn during the current period.
    - ✓ **Vulnerable funds-customer deposits** of which a substantial portion, perhaps 25 to 30 percent, will probably be withdrawn sometime during the current time period.
    - ✓ **Stable funds** (often called core deposits or core liabilities)funds that management considers unlikely to be removed(except for a minor percentage of the total).

② The structure of funds approach

- **In the second step, calculate total liquidity requirement:**
  - As an illustration, we will use the **Reserve rules**
  - Total liquidity requirement = 0.95 × (Hot money funds - Required legal reserves) + 0.30 × (Vulnerable deposits and nondeposit funds - Required legal reserves) + 0.15 × (Stable deposits and nondeposit funds - Required legal reserves) + 1.00 × (Potential loans outstanding - Actual loans outstanding)
    - ✓ Required legal reserves is usually 3% of the total amount

② The structure of funds approach

- **In the last step:**
  - A scenario analysis is applied to have a more holistic view of of the liquidity needs, usually three scenarios are included
    - ✓ Best possible liquidity position (maximum deposits, minimum loans)
    - ✓ Liquidity position bearing the highest probability
    - ✓ Worst possible liquidity position (minimum deposits, maximum loans)
  - Expected liquidity requirement =Probability of Outcome A × (Estimated liquidity surplus or deficit in Outcome A) + Probability of Outcome B × (Estimated liquidity surplus or deficit in Outcome A) + ……

③ Liquidity indicator approach

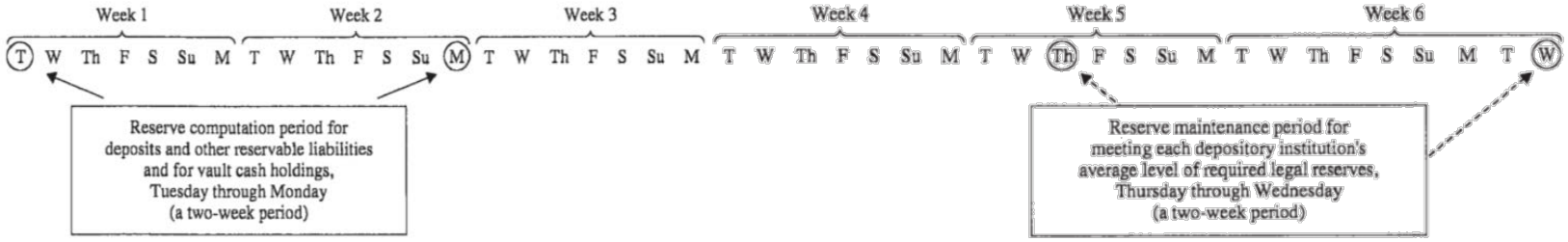
- Many financial-service institutions estimate their liquidity needs based upon experience and industry averages with liquidity indicators. Such as
  - Cash position indicator=Cash and deposits due from depository institutions/total asset

	1985	1989	1993	1996	2001	2003	2007	2010*
Cash position indicator	12.5%	10.6%	6.3%	7.3%	6.0%	4.6%	4.3%	7.7%

- Tips to remind
  - These indicators tend to be highly sensitive to the season of the year and stage of the business cycle. Liquidity managers must stay abreast of what's happening in the financial marketplace all the time.
  - Using industrywide averages for each liquidity indicator can be misleading. Each financial institution's liquidity position must be judged relative to peer institutions of similar size operating in similar markets.
  - Moreover, liquidity managers usually focus on changes in their institution's liquidity indicators rather than on the level of each indicator.

4.Calculating Legal Reserves

- **Reserve computation: lagged reserve accounting (LRA)**
  - Reserve computation period: the daily average amount of deposits and other reservable liabilities are computed using information gathered over **a two week period** [stretching from a Tuesday through a Monday two weeks later].
  - Reserve maintenance period: Banks must maintain that required legal reserve on deposit with the Federal Reserve bank in the region, on average, **over a 14-day period** [stretching from a Thursday through a Wednesday].
    - ✓ **this period begins 30 days** after the beginning of the reserve computation period for deposits and other reservable liabilities



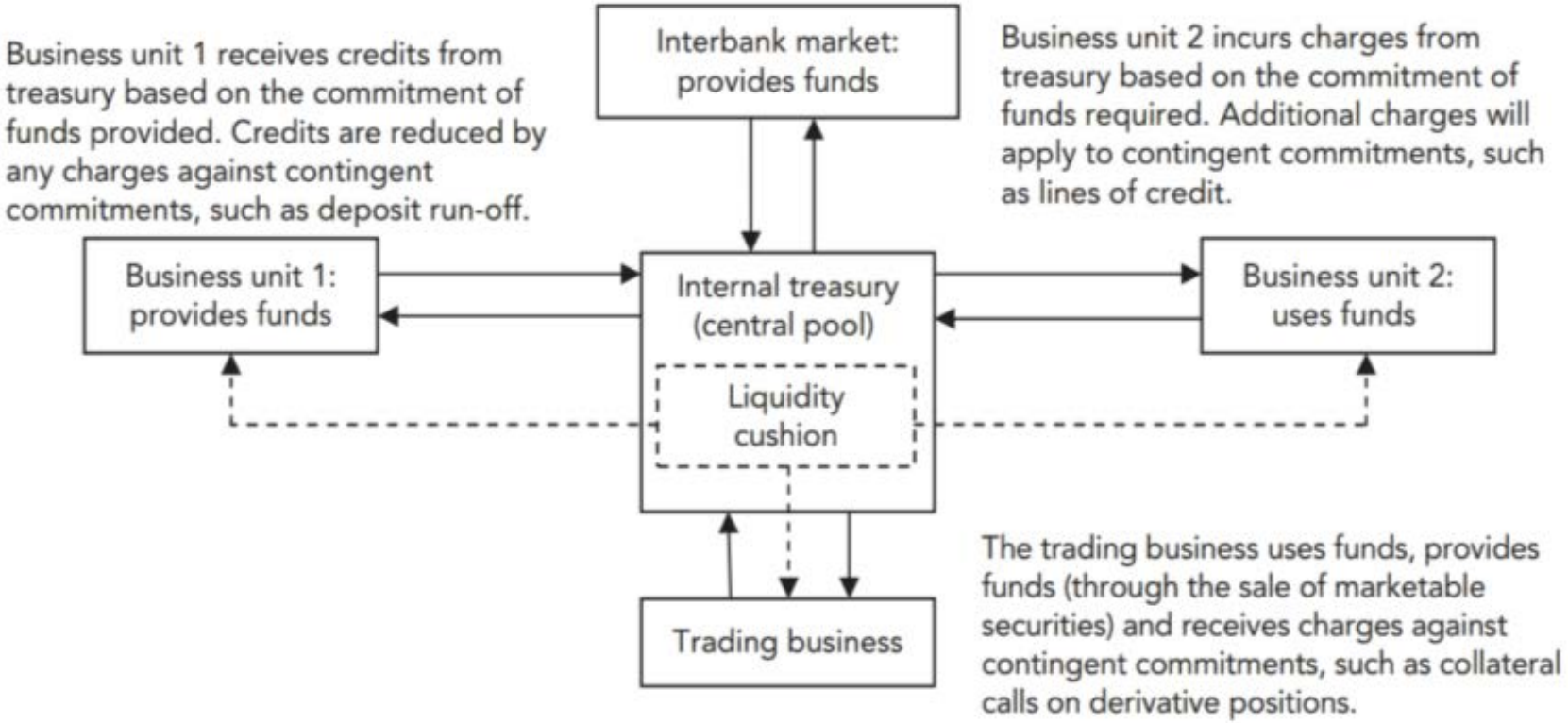
4.Calculating Legal Reserves

- **Reserve computation: required reserve**
  - How much money must be held in legal reserves?
    - ✓ It depends on the volume and mix of each institution's deposits and also on the particular time period, because the amount of deposits subject to legal reserve requirements changes each year.
    - ✓ It depends on the rules and regulations set by the nation
  - The reserve requirement
    - ✓ **3 percent** of the end-of-the-day daily average amount held over a two-week period, from $10.7 million to $58.8 million.
    - ✓ Transaction deposits over $58.8 million held by the same depository institution carried a **10 percent** legal reserve requirement.
    - ✓ Nontransaction reservable liabilities (including nonpersonal time deposit s and Eurocurrency liabilities) are subject to a 0 percent reserve requirement.

5.LTP Introduction

- **LTP is a process that attributes the costs, benefits and risks of liquidity to respective business units within a bank.**
  - The purpose of LTP is to transfer liquidity costs and benefits from business units to a centrally managed pool.
  - To achieve this, LTP
    - ✓ charges users of funds (assets/ loans) for the cost of liquidity
    - ✓ credits providers of funds (liabilities/deposits) for the benefit of liquidity.

5.LTP Introduction



How LTP works?

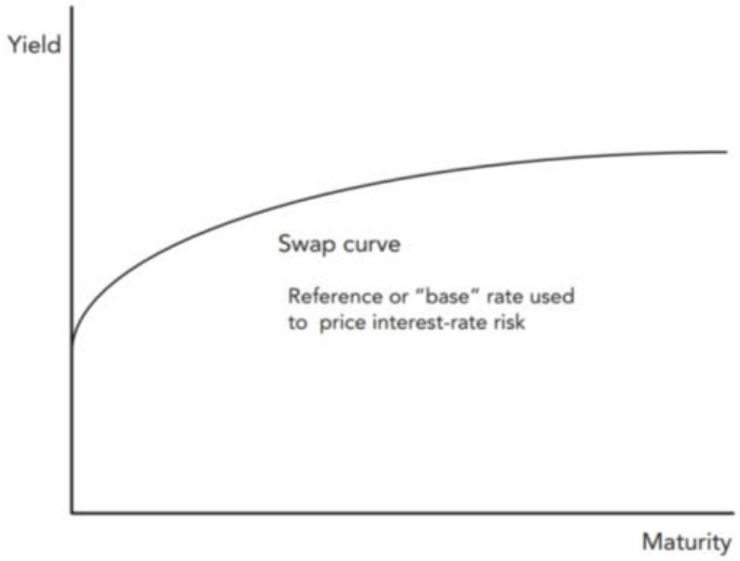
6.Three Approaches to LTP

- The international survey identified many poor LTP practices, which reflected weaknesses in the LTP methods/approaches that were used to manage funding liquidity risk. These are discussed in more detail below.
  - ① "Zero" Cost of Funds Approach
  - ② Pooled "Average" Cost of Funds Approach
  - ③ Matched-Maturity Marginal Cost of Funds Approach

6.Three Approaches to LTP

① "Zero" Cost of Funds Approach

- Some banks came to view funding liquidity as essentially free, and funding liquidity risk as essentially zero.



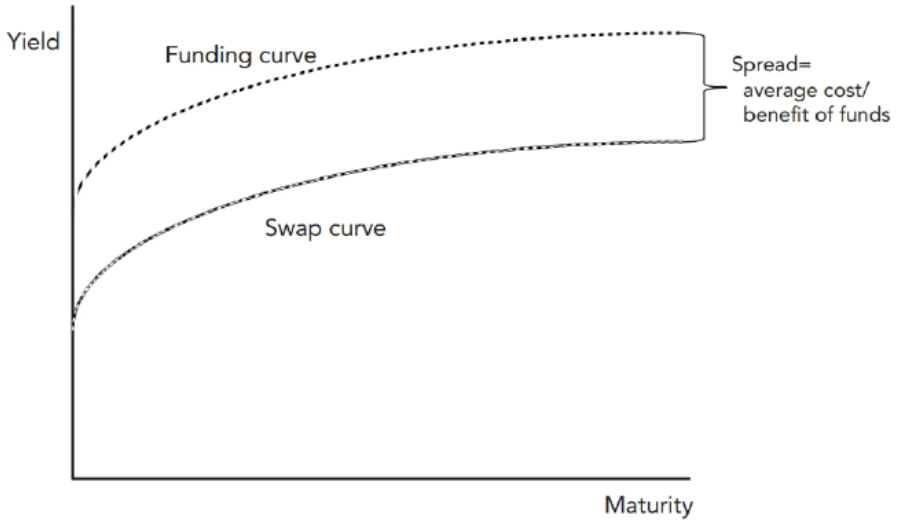
6.Three Approaches to LTP

② Pooled "Average" Cost of Funds Approach

- An average rate was calculated based on the interest expense (cost of funds) across all existing funding sources.
- Problems with this approach:
  - ✓ First, it ignores the heightened liquidity risk embedded in longer-term assets.
  - ✓ Second, if this "average" rate is also used to credit fund providers, then an incentive to write loans will be met with a direct disincentive to gather deposits.

6.Three Approaches to LTP

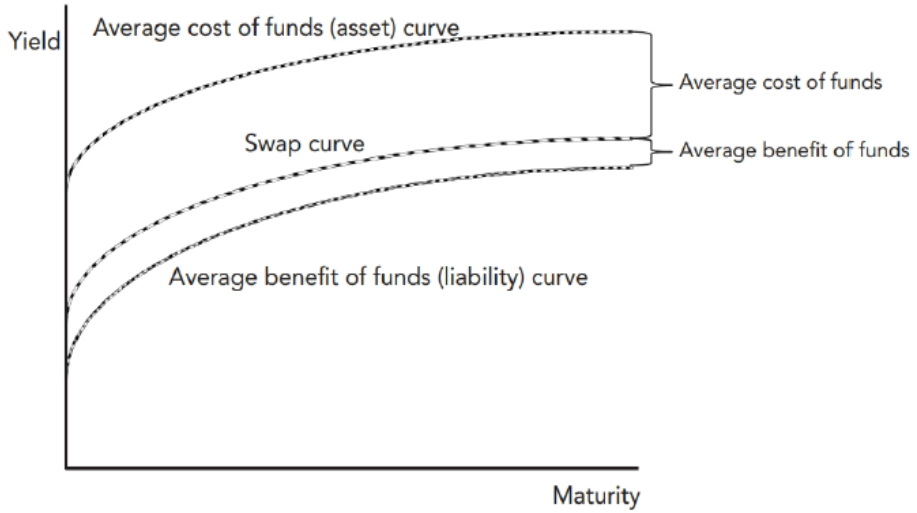
Single average for the cost and benefit of funds



Term in years	1	2	3	4	5
Loan/deposit principal	$1 million	$1 million	$1 million	$1 million	$1 million
Average cost of funds (bps)	10	10	10	10	10
Charge for use of funds	$1,000	$1,000	$1,000	$1,000	$1,000
Credit for benefit of funds	$1,000	$1,000	$1,000	$1,000	$1,000

6.Three Approaches to LTP

Separate averages for the cost and benefit of funds



Term in years	1	2	3	4	5
Loan/deposit principal	$1 million	$1 million	$1 million	$1 million	$1 million
Average cost of funds (bps)	10	10	10	10	10
Average benefit of funds	4	4	4	4	4
Charge for use of funds	$1,000	$1,000	$1,000	$1,000	$1,000
Credit for benefit of funds	$400	$400	$400	$400	$400

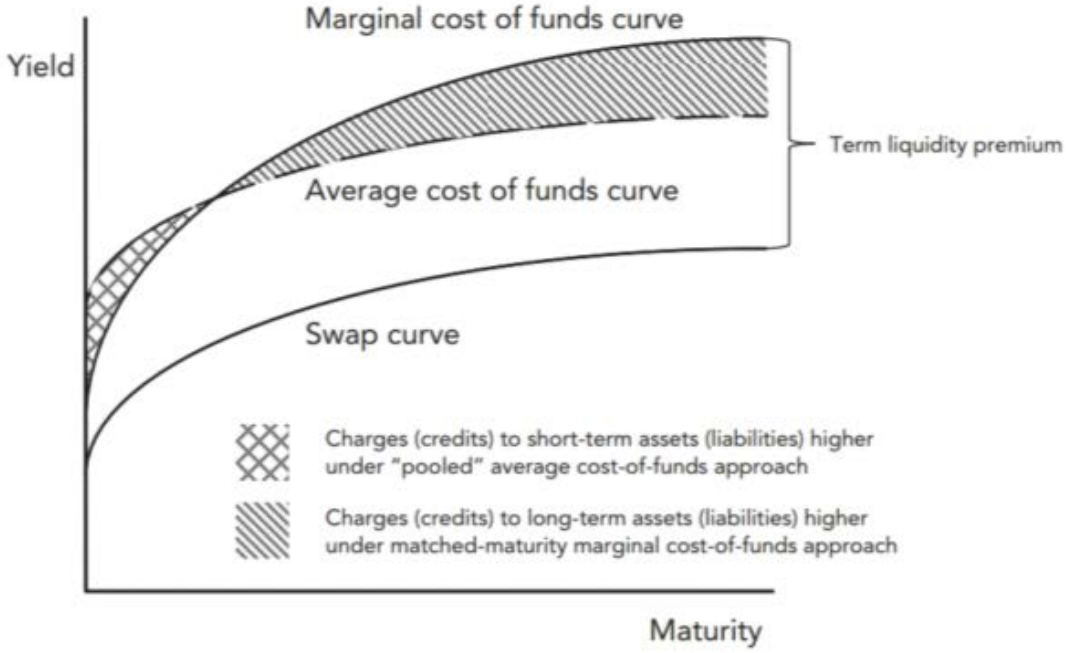
6.Three Approaches to LTP

- **Implications of Pooled "Average" Cost of Funds Approach**
  - Promotes Maturity Transformation.
    - ✓ Business units will be unduly encouraged to write long term assets because they do not receive higher charges for their use of funds over a longer period.
    - ✓ Conversely, business units will be discouraged from raising long-term liabilities because there is no premium credited to liabilities that provide funding for longer periods of time.
  - Distorts Profit Assessment
    - ✓ The average cost of funds **lags** changes in banks' actual market cost of funds, especially in volatile markets.

6.Three Approaches to LTP

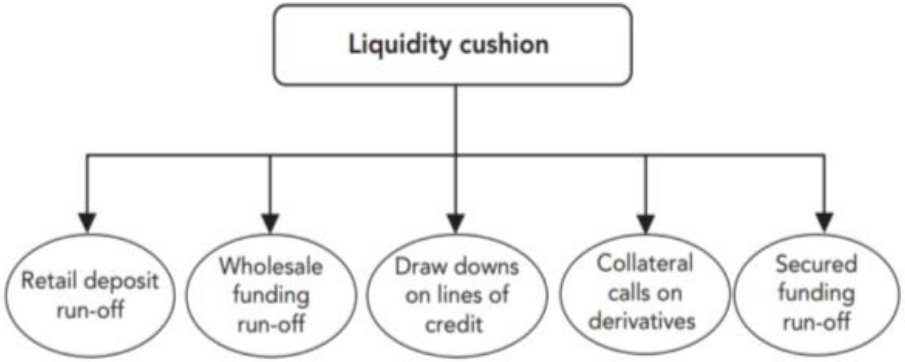
③ Matched-Maturity Marginal Cost of Funds Approach

- Under this approach, rates charged for the use of funds and, conversely, rates credited for the benefit of funds are based on the term liquidity premiums corresponding to the maturity of the transaction.



7.Contingent Liquidity Risk Pricing

- Calculating the charge for using, or the credit for providing, funding liquidity about **contingent commitments** such as lines of credit, collateral postings for derivatives and other financial contracts, is quite difficult.
  - In these cases, the best approach is to impose a scenario model
  - Banks carry **a liquidity cushion**, or a " buffer" to help them survive periods of unexpected funding outflows.



Unexpected funding outflows and the need for a liquidity cushion

7.Contingent Liquidity Risk Pricing

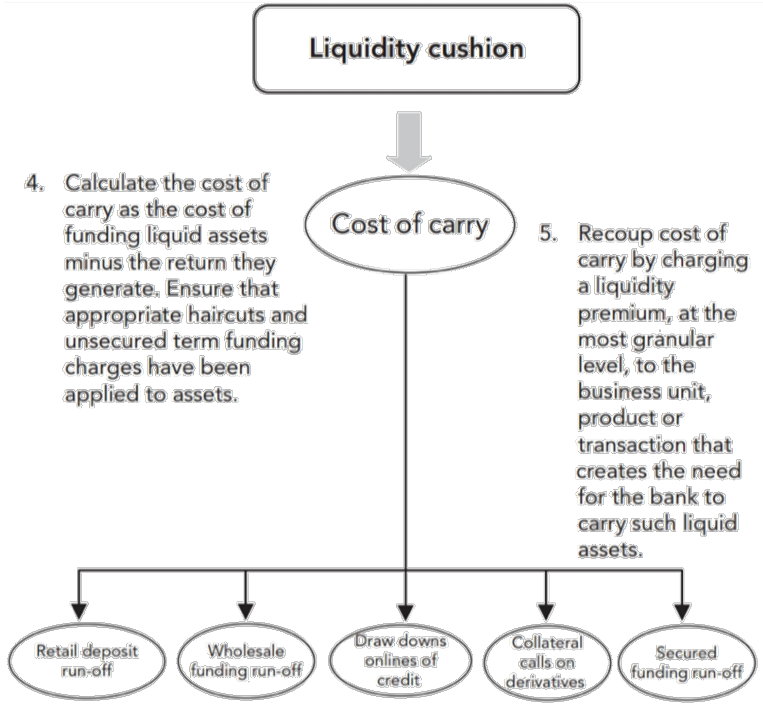
➢ The Process of contingent liquidity risk management

1. Identify contingent commitments that are likely to create unexpected

2. Perform stress tests under various scenarios to approximate the funding that might be required.

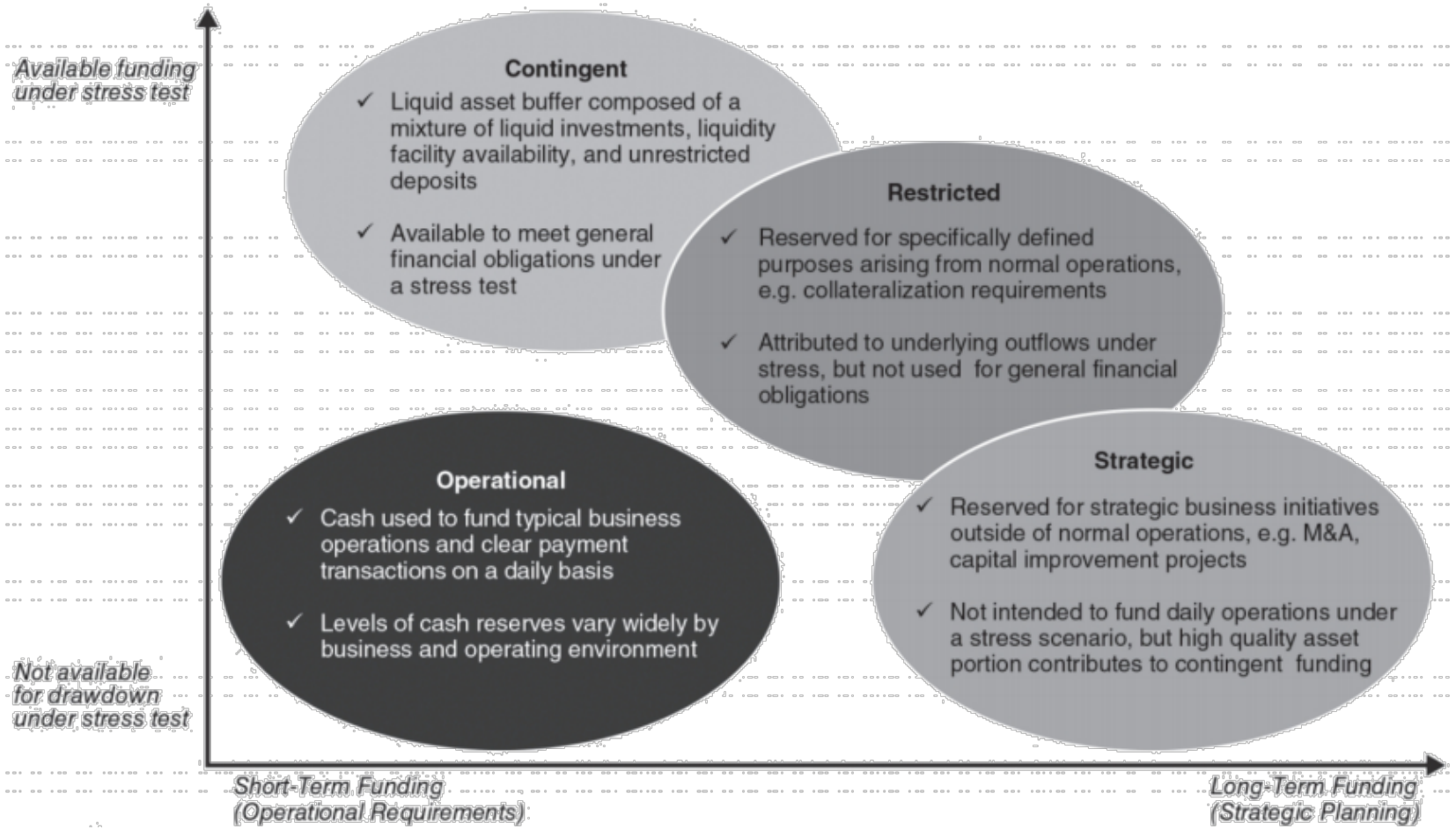
3. Net approximations from above against inflows generated, for example, through the sale of marketable securities to derive the size of the liquidity cushion.

Liquidity cushion



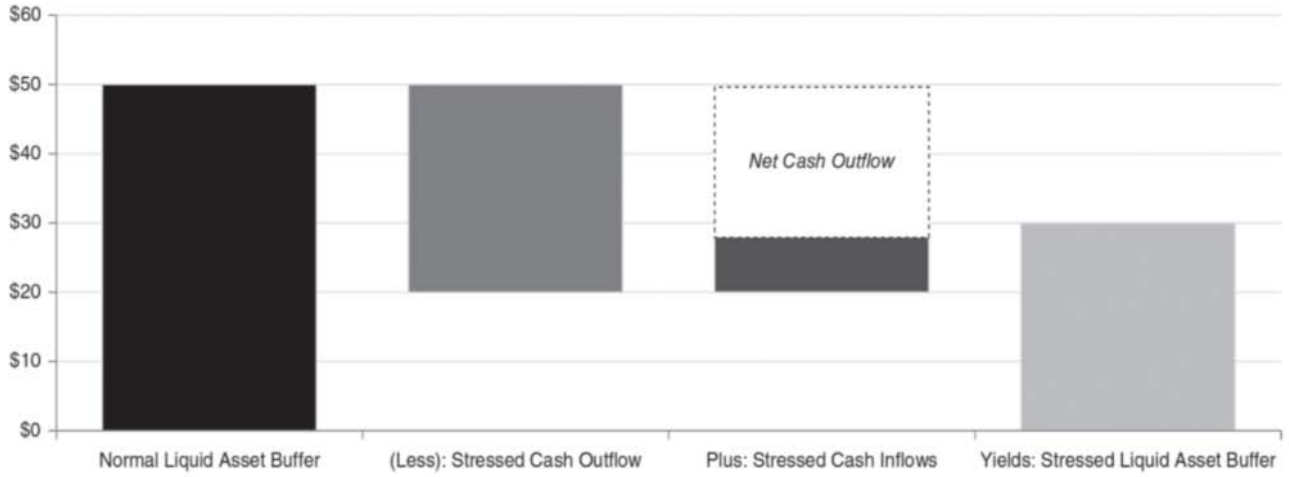
8.Liquidity Stress Testing

- Utilize liquidity for four purposes: **operational, restricted, contingent, and strategic.**



8.Liquidity Stress Testing

- **The model should accurately measures the following components:**
  - Liquidity asset buffer
  - Stressed inflows/outflows
  - Stressed liquid asset buffer



8.Liquidity Stress Testing

- **The design of the model should consider following factors:**
  - Organizational scope
    - ✓ conversion of foreign currency
  - Scenario development
    - ✓ Baseline scenario
    - ✓ Scenario development
      - ◆historical scenarios
      - ◆forward-looking (hypothetical) scenarios
  - Assumptions of the outcome of the stress test
  - Outputs
  - Governance
  - Integration with other risk models.

8.Liquidity Stress Testing

- **Governance and control**
  - **Asset-liability committee (ALCO).**
    - ✓ The ALCO, consistent with its board, management risk committee, and executive management delegated oversight of managing liquidity risk, typically has overall responsibility for the liquidity stress testing framework.
  - Three lines of defense
    - ✓ The **treasury** unit, as the first line of defense, typically has ownership of the liquidity stress test modeling process.
    - ✓ The **independent risk management function**, as the second line of defense, is responsible for providing independent oversight of liquidity.
    - ✓ **Internal audit**, as the third line of defense, should periodically review the liquidity stress testing framework, procedures, and controls to ensure compliance with policy, regulatory, and control requirements.
  - Model risk management:
    - ✓ Responsible for providing independent validation

9.Contingency Funding Planning

- **A contingency funding plan (CFP)** serves as a logical connection to its companion, the liquidity stress testing framework, by linking the stress test results and other related information **as inputs** to the CFP governance, menu of contingent liquidity actions, and decision framework.
  - Institutions manage the low-impact, high-probability events as part of their business-as-usual (BAU) funding and liquidity risk management activities.
  - Institutions use CFPs to address the other end of the spectrum associated with high-impact low-probability events.

10.Framework and Building Blocks

- **With these key design considerations in mind, institutions can develop their CFPs using an integrated framework**
  - ① Governance and oversight
  - ② Scenarios and liquidity gap analysis
    - ✓ Institutions should align their CFP stress scenarios to those in its liquidity stress testing framework, as well as to other frameworks such as the recovery and resolution plans.
  - ③ Contingent actions
    - ✓ A list of actions such as selling business or business units, curtailing discretionary spending and expenses, etc..
  - ④ Monitoring and escalation
  - ⑤ Data and reporting
    - ✓ CFP requires updating on a regular basis.

10.Framework and Building Blocks

① Governance and oversight

- Stakeholder Involvement, Roles, and Responsibilities
  - ✓ Corporate treasury.
  - ✓ **Liquidity crisis team.** The LCT serves as the central point of contact and is responsible for the continuous monitoring of the institution's liquidity profile. Generally, the LCT is responsible for designing the CFP and submitting it to the senior management group for review and approval.
  - ✓ Management committee.
  - ✓ Board of directors.

10.Framework and Building Blocks

④ Monitoring and escalation

- Monitor both the current liquidity profile and the anticipated effects of potential liquidity events.
  - ✓ Market and business measures (external and internal)
  - ✓ **Liquidity health measures (internal)**
    - ◆Overnight borrowings to total assets
    - ◆Short-term liabilities to total assets
    - ◆Funding sources concentration…
  - ✓ Represent factors that affect-directly or indirectly-the institution's liquidity position.
- **Escalation levels**—— three to five escalation levels are common industry practice

Framework

Part 3: Asset Management and Liability Management

1. Invest Instruments
2. Investment Maturity Strategies
3. The Source of Illiquidity Market Imperfections
4. Biases on Returns for Illiquid Assets
5. Collect Illiquidity Risk Premiums
6. Pricing Different Types of Deposits
7. Challenges of Deposit Offering
8. Sources of Nondeposits
9. Chooses of Nondeposits
10. Costs of Nondeposits

(CH4,CH12~13,CH19)

1.Invest Instruments

- **Money market instruments**
  - which reach maturity within one yea r and are noted for their low risk and ready marketability
- **Capital market instruments**
  - which have remaining maturities beyond one year and are generally noted for their higher expected rate of return and capital gains potential.

1.Invest Instruments

➢ Key advantages and disadvantages of Money market Instruments

	Money market Instruments			
	Treasury Bills	Short-Term Treasury Notes and Bonds	Federal Agency Securities	Certificates Securities of Deposit
Key advantages	Safety and high liquidity Good collateral for borrowing Can pledge behind government deposits	Safety Good resale market Good collateral for borrowing Offer yields usually higher than T-bill yields	Safety Good to average resale market Good collateral for borrowing Higher yields than on U.S. government securities	Insured to at least $100,000 Yields higher than on T-bills Large denominations often marketable through dealers
Key disadvantages	Low yields relative to other financial instruments Taxable income	More price risk than T-bills Taxable gains and income	Less marketable than Treasury securities Taxable gains and income	Limited resale market on longer-term CDs Taxable income

1.Invest Instruments

➢ Key advantages and disadvantages of Money market Instruments

	Money market Instruments			
	International Euro currency Deposits	Bankers' Acceptances	Commercial Paper	Short-Term Municipal Obligations
Key advantages	Low risk Higher yields than on many domestic CDs	Low risk due to multiple credit guarantees	Low risk due to high quality of borrowers	Tax-exempt interest income
Key disadvantages	Volatile interest rates Taxable income	Limited availability at specific maturities Issued in odd denominations Taxable income	Volatile market Poor resale market Taxable income	Limited resale market Taxable capital gains

1.Invest Instruments

➢ Key advantages and disadvantages of Capital market Instruments

	Capital market Instruments			
	Treasury Notes and Bonds	**Municipal (State and Local Government) Bonds**	**Corporate Notes and Bonds**	**Asset-Backed Securities**
Key advantages	Safety Good resale market Good collateral for borrowing May be pledged behind government deposits	Tax-exempt interest income High credit quality Liquidity and marketability of selected securities	Higher pretax yields than on government securities Aid in locking in higher long-term rates of return	Higher pretax yields than on Treasury securities Collateral for borrowing additional funds
Key disadvantages	Low yields relative to long-term private securities Taxable gains and income Limited supply of longest-term issues	Volatile market Some issues have limited resale potential Taxable capital gains	Limited resale market Inflexible terms Taxable gains and income	Less marketable and more unstable in price than Treasury securities May carry substantial default risk Taxable gains and income

1.Invest Instruments

- **Three main types of Securitized Assets**
  - **Pass-through securities,** repayments of principal and interest on the calendar dates promised may be guaranteed
    - ✓ Ginnie Mae and Fannie Mae
  - **Collateralized mortgage obligations (CMOs).**
    - ✓ The Federal Home Loan Mortgage Corporation (Freddie Mac)
    - ✓ multiple classes (tranches), each with a different level of risk exposure.
  - **Mortgage-backed bonds.** The mortgage loans backing them stay on the issuer's balance sheet.
- **Stripped securities**
  - PO (principal-only) securities and IO (interest-only) securities.
  - Both PO and IO bond strips are really zero coupon bonds with no periodic interest payments(each is sold at a discount from par); they therefore carry zero reinvestment risk.

2.Investment Maturity Strategies

- **Five different investment maturity strategies**
  - No opinion no money
    - ✓ The Ladder, or Spaced-Maturity Policy
  - Liquidity matters
    - ✓ The Front-End Load Maturity Policy
  - Return matters
    - ✓ The Back-End Load Maturity Policy
  - Both liquidity and return matter
    - ✓ The Barbell Strategy
  - Money and ideas
    - ✓ The Rate Expectations Approach

3.The Source of Illiquidity Market Imperfections

① **Clientele effects or Participation Cost**

- Entering markets can be costly; investors often must spend money, time or energy to learn their way and gain the necessary skills.

② **Transaction Cost**

③ **Search Frictions**

- For many illiquid assets, you need to search to find an appropriate buyer or seller. Therefore, need to wait a long time to transact.

④ **Asymmetric Information**

- Markets can be illiquid because one investor has superior knowledge compared with other investors. Fearing they'll be fleeced, investors become reluctant to trade.

⑤ **Price Impact**

⑥ **Funding Constraints**

- Many of the investment vehicles used to invest in illiquid assets are highly leveraged. If access to credit is impaired, investors cannot transact in illiquid asset markets.

4.Biases on Returns for Illiquid Assets

- **Illiquid asset reported returns are not returns**
  - Three key biases cause people to overstate expected returns and under state the risk of illiquid asset:
    - ✓ Survivorship bias
      - ◆Overestimate return
    - ✓ Selection bias
      - ◆Overestimate return
      - ◆Underestimate risk
    - ✓ Infrequent sampling(smoothing)
      - ◆Underestimate risk
      - ◆Overestimate autocorrelation
      - ◆Require unsmoothing

5.Collect Illiquidity Risk Premiums

- **There are four ways to collect Illiquidity Risk Premiums**
  - Holding passive allocations to illiquid asset classes
  - Holding less liquid securities within asset classes
  - Market making at the individual security level
  - Dynamic rebalancing at the aggregate level: **the simplest** to implement and has the greatest impact on portfolio returns.

5.Collect Illiquidity Risk Premiums

- Large illiquidity risk premiums exist **within asset classes** but not across asset classes
  - Limited integration across asset classes
    - ✓ Switching capital and investment strategies is significantly constrained.
  - Illiquidity across asset class might be smaller
    - ✓ Investors overpay for illiquid asset across asset classes and thus drives the illiquidity risk premium down.
  - Illiquidity within asset class might be larger
    - ✓ Illiquidity-shy investor overpay for liquidity asset within asset class and thus drives the risk premium up.

6.Pricing Different Types of Deposits

- **Transaction (Payments or Demand) Deposits**
  - Noninterest-Bearing Transaction (Demand) Deposits
  - Interest-Bearing Transaction Deposits
    - ✓ NOW, MMDA and SNOW
  - Mobile Apps-Impact on Transaction Deposits and Potential Customers
- **Nontransaction (Savings or Thrift) Deposits**
  - Passbook savings deposits
  - Statement savings deposits
  - Time deposits
    - ✓ The most popular of all time deposits are CDs-certificates of deposit.
- **Retirement Savings Deposits**
  - Allowing individuals to make annual tax-deductible contributions to their retirement accounts and families for retirement and education needs in the future.(IRA)

6.Pricing Different Types of Deposits

- How should depository institutions price their deposit services in order to attract new funds and make a profit?
- There are four approaches to price deposit
  - ① **cost plus profit margin**
  - ② **marginal cost**
  - ③ **conditional pricing**
  - ④ based on total customer relationship and choosing a depository

6.Pricing Different Types of Deposits

① Cost plus profit margin

Unit price charged the customer for each deposit service	=	**Operating expense** per unit of deposit service	+	**Estimated overhead expense** allocated to the deposit-service function	+	**Planned profit margin** from each service unit sold

- Above equation has encouraged deposit providers to match prices and costs more closely and eliminate many formerly free services.

6.Pricing Different Types of Deposits

② Marginal cost

- Marginal cost: the added cost of bringing in new fund
- Marginal cost = Change in total cost = New interest rate × Total funds raised at new rate - Old interest rate × Total funds raised at old rate
- **Marginal cost rate** $= \frac{\text{Change in total cost}}{\text{Additional funds raised}}$

Example

Calculate marginal cost rate

Expected amounts of new deposits ($)	Average interest of new funds (%)	Total interest cost of new funds($)	Marginal cost of new deposit ($)	Marginal cost rate (%)	Expected marginal revenue (%)	Expected marginal profit (%)	Total profits earned ($)
25	7.0	1.75	1.75	7.0	10.0	+3	0.75
50	7.5	3.75	2.00	8.0	10.0	+2	1.25
75	8.0	6.00	2.25	9.0	10.0	+1	1.50
100	8.5	8.50	2.50	10.0	10.0	+0	1.50
125	9.0	11.25	2.75	11.0	10.0	-1	1.25

Breakeven Point

6.Pricing Different Types of Deposits

③ **Conditional pricing** techniques vary deposit prices based on one or more of these factors **:**

- The number of transactions passing through the account
  - ✓ number of checks written
  - ✓ deposits made
  - ✓ wire transfers
  - ✓ stop payment orders
  - ✓ notices of insufficient funds issued
- The average balance held in the account over a designated period (usually per month).
- The maturity of the deposit in days, weeks, months, or years.

6.Pricing Different Types of Deposits

③ Three broad categories of **conditional pricing:**

- flat-rate pricing
  - ✓ The depositor's cost is a fixed charge per check, per time period, or both. Thus, there may be a monthly account maintenance fee of $2, and each check written or charge drawn against that account may cost the customer 10 cents, regardless of the level of account activity.
- free pricing
- conditionally free pricing
  - ✓ Conditionally free pricing favors large-denomination deposits because services are free if the account balance stays above some minimum figure.
  - ✓ Customer, not the offering institution, chooses which deposit plan is preferable.

6.Pricing Different Types of Deposits

④ **Pricing based on total customer relationship and choosing a depository**

- **Factors** play when customers choose a depository institution to hold their accounts
  - ✓ In choosing a financial firm to hold their checking (transaction) accounts
    - ◆ Convenient location
  - ✓ In choosing a financial firm to hold their savings deposits
    - ◆ Familiarity
  - ✓ In choosing a financial firm to supply their deposits and other services,
    - ◆ Financial health of lending institution
- Related to the idea of targeting the best customers for special treatment is the notion of pricing deposits according to the number of services the customer uses.
- In theory at least, relationship pricing promotes greater customer loyalty and makes the customer less sensitive to the prices posted on services offered by competing financial firms.

7.Challenges of Deposit Offering

- **Challenges faced by banks to offer deposit services**
  - Deposit insurance(FDIC)
  - Disclosure
    - ✓ the minimum balance required to open the account
    - ✓ how much must be kept on deposit to avoid paying fees or obtain the promised yield
    - ✓ when interest actually begins to accrue
    - ✓ any penalties for early withdrawal
    - ✓ …
  - Overdraft Protection
  - Basic (lifeline) banking
    - ✓ Depository institutions have been asked in several states to offer low-cost financial services, especially deposits and loans, for those customers unable to afford conventional services.

8.Sources of Nondeposits

- **Various sources** of non-deposit liabilities at a bank
  - ① Federal Funds Market ("Fed Funds")
  - ② Repurchase Agreements as a Source of Funds
  - ③ Borrowing from Federal Reserve Banks
  - ④ Advances from Federal Home Loan Banks
  - ⑤ Development and Sale of Large Negotiable CDs
  - ⑥ The Eurocurrency Deposit Market
  - ⑦ Commercial Paper Market
  - ⑧ Long-Term Nondeposit Funds Sources

8.Sources of Nondeposits

⑤ Development and Sale of Large Negotiable CDs

- This funding source is really **a hybrid account**: legally, it is a deposit, but, the negotiable CD is just another form of IOU(I owe you) in practice.
- There are four main types of negotiable CDs today:
  - ✓ **Domestic CDs** are issued by U.S. institutions inside the territory of the United States.
  - ✓ **Dollar-denominated CDs** issued by banks outside the United States are known as EuroCDs.
  - ✓ The largest foreign banks active in the United States (such as Deutsche Bank and HSBC) sell CDs through their U.S. branches, called **Yankee CDs**.
  - ✓ Finally, nonbank savings institutions sell **thrift CDs**.
- In the United States at least, legal reserve requirements are currently **zero for CDs.**

9.Chooses of Nondeposits

- With so many different nondeposit funds sources to draw upon, managers of financia l firms mu st make choices among them . In using nondeposit funds, funds managers must answer the following key questions:
  - ① How much in total must be borrowed from these sources to meet funding needs?
    - ✓ **Available funds gap(AFG)=**Current and projected loans and investments the lending institution desires to make - Current and expected deposit inflows and other available funds
  - ② Which nondeposit sources are best, given the borrowing institution's goals, at any moment in time?
    - ✓ The relative costs of raising funds from each source.
    - ✓ The risk (volatility and dependability) of each funding source.
    - ✓ The length of time (maturity or term) for which funds are needed.
    - ✓ The size of the institution that requires more funds.
    - ✓ Regulations limiting the use of alternative funds sources.

10.Costs of Nondeposits

- The cost of funding that brings together all the sources of funding normally in use

① The Historical Average Cost Approach

- ✓ This approach for determining how much funds cost looks at the past.

② The Pooled-funds Approach

- ✓ This method of costing borrowed funds looks at the future.

Framework

Part 4: Monitor Liquidity Risk

1. Early Warning Indicator
2. Uses and Sources of Intraday Liquidity
3. Measurement of Intraday Liquidity
4. New Definition of Liquidity Risk
5. Monitoring Liquidity
6. Liquidity Risk Reporting

(CH3,CH6,CH7,CH10)

1.Early Warning Indicator

- **Sound Early Warning Indicators (EWI) measures**
  - One of the critical aspects of a bank's LRM involves first devising and then monitoring a set of indicators to enable the risk identification process to spot the emergence of new or increasing vulnerabilities.
  - Why EWI is important?
    - ✓ EWIs may be viewed as analogous to warning lights on an automobile **dashboard**. The turning signals, low oil, and check engine lights alert the driver of driving conditions.
    - ✓ Holding liquid assets to ensure a bank can meet its financial obligations is ultimately a cost-benefit decision.
      - ◆Increasing buffers before times of stress with the help of EWI is cost-effective.

2.Uses and Sources of Intraday Liquidity

- **Who will face the challenge to manage intraday liquidity?**
  - The Bank itself
  - **Financial Market Utility(FMU):** An organization whose purpose is to process and settle payments and securities transactions; these entities are also referred to as Financial Market Infrastructure (FMI) or Value Transfer Networks (VTNs). This includes:
    - ✓ Wholesale payments systems, such as wire transfer networks, also referred to as Large Value Payment Systems (LVPSs)
    - ✓ Retail payment systems, typically low value transfer networks settling large numbers of transactions such as automated
    - ✓ Clearinghouses and credit card networks
    - ✓ Trade execution facilities, such as exchanges
    - ✓ Securities settlement networks (SSNs), including clearing and settlement networks
    - ✓ Central securities depositories (CSDs) that hold book-entry issued assets

2.Uses and Sources of Intraday Liquidity

- **Why do banks face a shortage of liquidity during the day?**
  - First, certain market conventions and behaviors that have been engrained over decades serve to institutionalize intraday overdrafts.
    - ✓ A bank that is a net borrower of fed funds may **overdraft** its Federal Reserve account during the middle of the day after returning borrowed funds from the previous day.
    - ✓ The settlement of positions at financial market utilities (FMUs): T+N settlement rules V.S. T+0 wishes from participants
  - The second type of behavior that generates daylight overdrafts is the provision of intraday credit to clients
- With all of this occurring, the funds management group of a large bank's treasury has a **difficult task in managing intraday liquidity**

2.Uses and Sources of Intraday Liquidity

- **Use of intraday liquidity**
  - **Outgoing wire transfers**
    - ✓ Outgoing wire payments, on behalf of clients or the bank's own account, are typically the largest use of intraday liquidity.
  - **Settlements at Payment, Clearing and Settlement(PCS) Systems**
    - ✓ Most PCS systems have one settlement per day, with many occurring in the late afternoon timeframe.
  - **Funding of Nostro Accounts**
    - ✓ Cash transfer to a correspondent bank for services provided
  - **Collateral Pledging**
  - **Asset Purchases/Funding**

2.Uses and Sources of Intraday Liquidity

- **Sources of intraday liquidity**
  - **Cash Balances**
    - ✓ Deposits at the central bank and at correspondent bank nostro accounts
  - **Incoming Funds Flow**
    - ✓ Incoming flows from payments and FMU settlements are the largest source of intraday funding in periods of normal market function.
  - **Intraday Credit**
    - ✓ Credit line or overdraft permitted during business hours and covered by close of business.
    - ✓ Lines are often uncommitted and provided without interest charges.
    - ✓ Central banks serve as a large source of intraday credit for the banking system.
  - **Liquid Assets**
  - **Overnight Borrowings**
    - ✓ Fed Funds, Eurodollar borrowing, overnight deposits
  - **Other Term Funding**
    - ✓ the bank would only do this if it has the appetite for longer-term funding (one week, one month, etc.).

3.Measurement of Intraday Liquidity

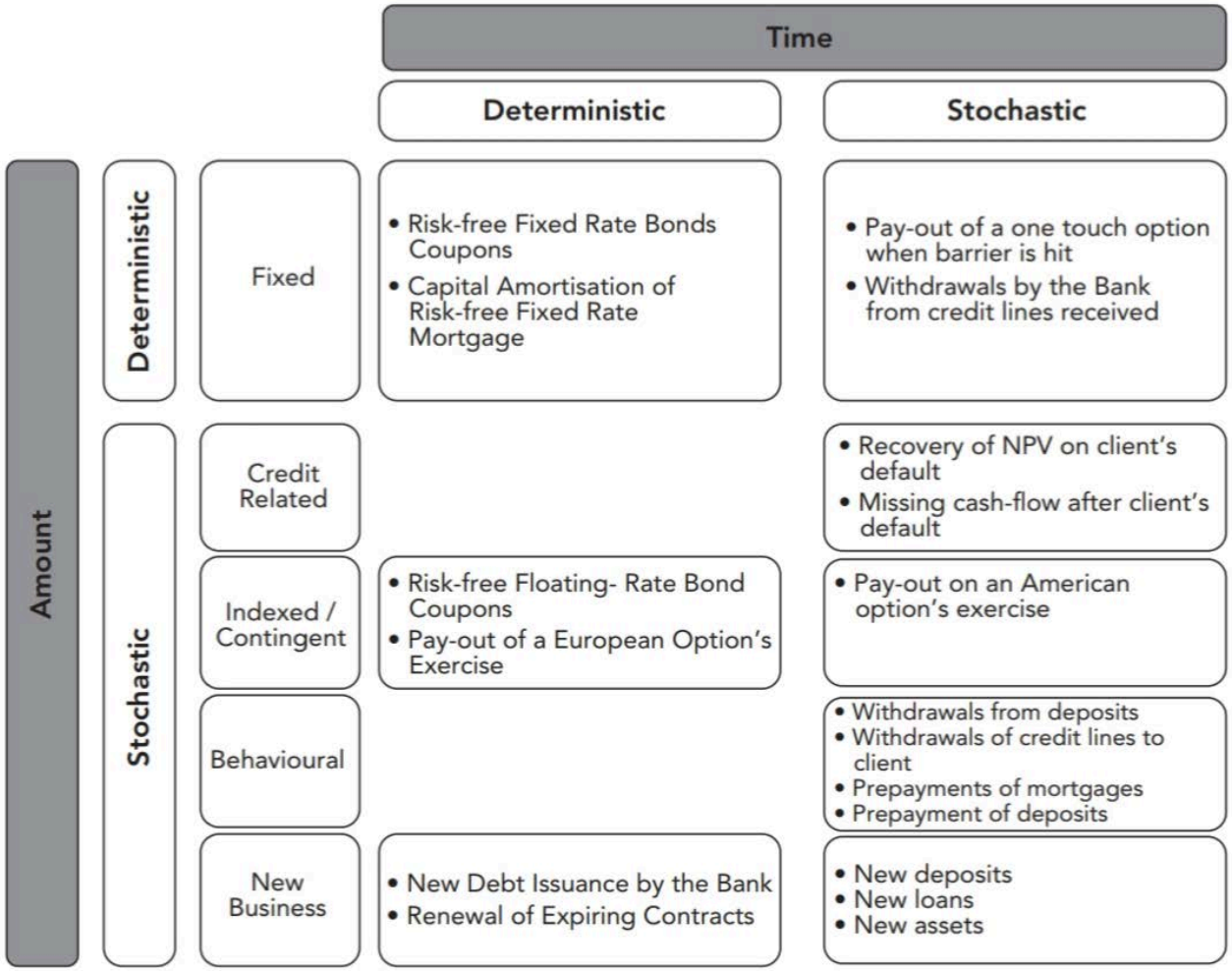
Measures for Understanding Intraday Flows

- **Total payments**
  - ✓ maintain statistics concerning the amount of payments it makes on all electronic payments systems in which it participates.
- **Other cash transactions**
  - ✓ track its intraday and end-of-day settlement positions at all FMUs in which it participates, including collateral position in SSN.
- **Settlement positions**
  - ✓ If complete data to reconstruct account positions at any time of day is not available, at a minimum a bank should maintain data on its settlement positions with all its FMUs.
- Time sensitive obligations
  - ✓ Similar to settlement positions, these transactions require completion at a specific time during the day.
- Total Intraday Credit Lines to Clients and Counterparties
- Total Bank Intraday Credit Lines Available and Usage

3.Measurement of Intraday Liquidity

- **Measures for Quantifying and Monitoring Risk Levels**
  - **Daily Maximum Intraday Liquidity Usage**
    - ✓ The measure is the ratio of the day's largest net negative balance relative to the size of the committed or uncommitted credit line.
  - **Intraday Credit Relative to Tier 1 Capital**
  - **Client Intraday Credit Usage**
    - ✓ This measure is derived by comparing a client's peak daily intraday overdraft to the established (committed or uncommitted) credit line.
  - **Payment Throughput**
    - ✓ These measures track the percentage of outgoing payment activity relative to time of day.

4.New Definition of Liquidity Risk



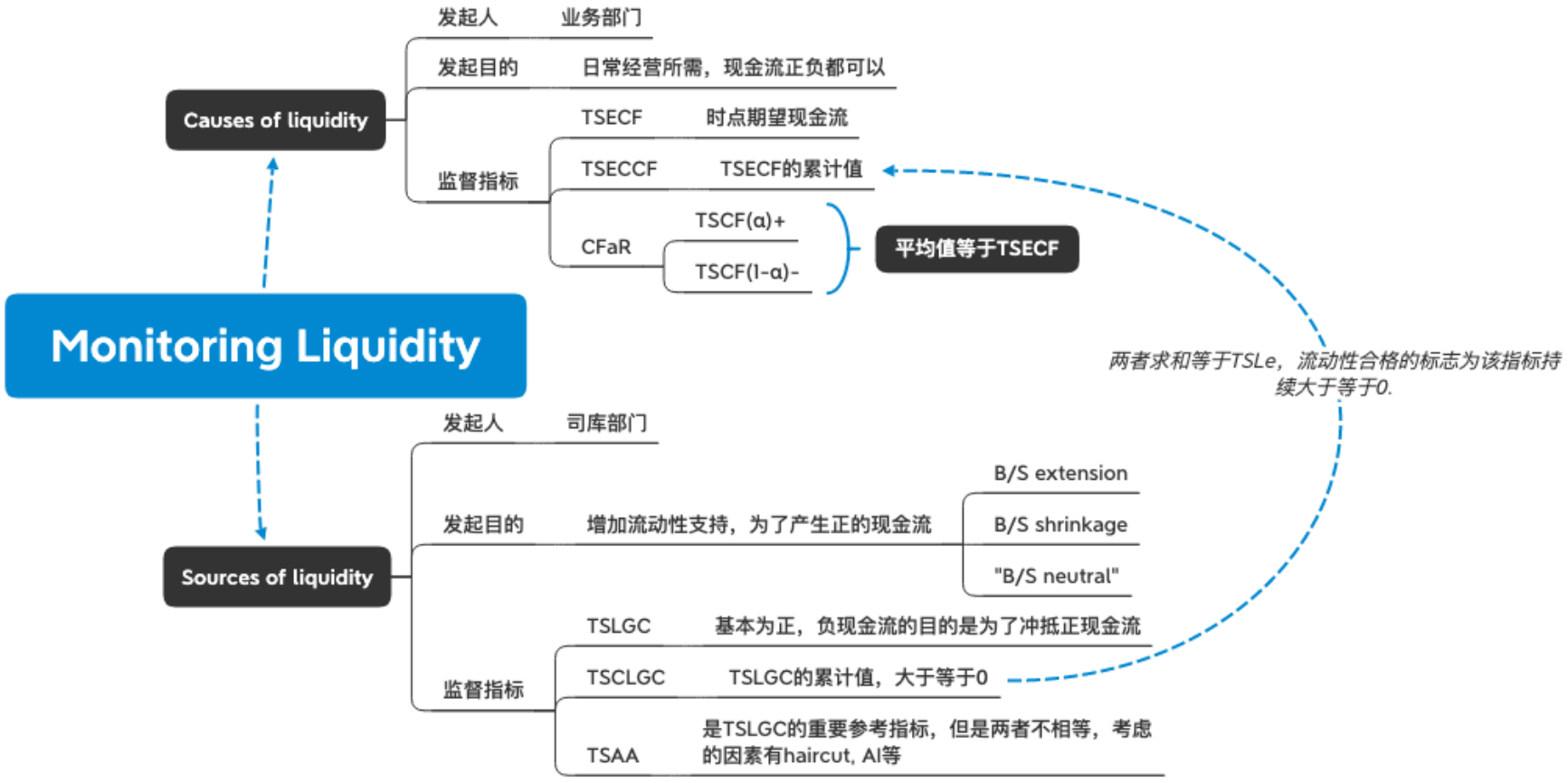
4.New Definition of Liquidity Risk

- **Liquidity Option**
  - a liquidity option can be defined as the right of a holder to receive cash from, or to give cash to, the bank at predefined times and terms.
- **Compared with standard options usually traded in financial markets**
  - Standard options are exercised when there is a profit
  - Liquidity option is exercised because of the cash flows produced after exercise, even if it makes loss, for example
    - ✓ customer withdraw its unused credit line even if the credit spread shrinks and it would be cheaper for the obligor to get new funds in the market with a new loan
    - ✓ the bank's clients can typically withdraw all or part of the deposited amount with no or short notice
    - ✓ client has the right to repay the funds before the contract ends, usually under low interest rate environment

4.New Definition of Liquidity Risk

- **The extension of liquidity risk**
  - Funding cost risk: The event that in the future the bank has to pay greater than expected cost (spread) above the risk-free rate to receive funds from sources of liquidity that are available.
  - The new definition of Liquidity risk
    - ✓ The amount of economic losses due to the fact that on a given date the algebraic sum of positive and negative cash flows and of existing cash available at that date, is different from some (desired) expected level.
      - ① Inability to raise enough funds to meet payment obligations,
      - ② Ability to raise funds only at costs above those expected.
      - ③ Ability to invest excess liquidity only at rates below those expected

5.Monitoring Liquidity



5.Monitoring Liquidity

- The task of the Treasury Department is to monitor the TSECF and the TSECCF.
- The perfect condition is reached if the TSECCF is positive at all times. Although this is the ideal situation it cannot be verified for two reasons:
  - Many of the cash flows belong to categories that are **stochastic** in the amount and/or the time dimension
  - The negative periods may be accepted if
    - ✓ they are short and
    - ✓ can be managed effectively with the liquidity generation capicity.
- **In conclusion, if TSL_e is always positive, the treasury department has done a good job!**

5.Monitoring Liquidity

- **The impact on TSECF, TSECCF, TSAA and TSLGC of several transactions operated by treasury department**
  - ① Repo and reverse repo
  - ② Buy/ sellback and sell/buyback
  - ③ Lend and borrow

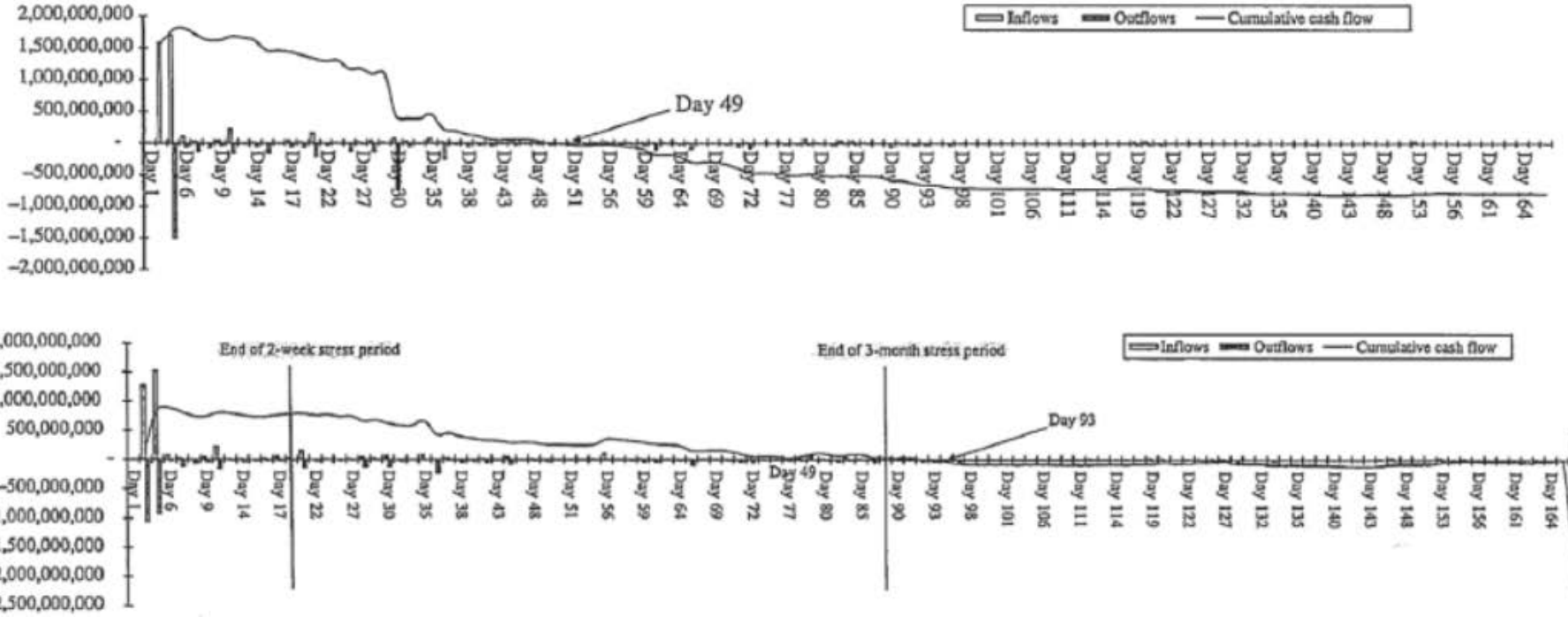
Type	Ownership	Possession	Changes to		
			TSECF/TSECCF	TSAA	TSLGC
Buy	Bank	Bank	Yes	Yes	No/Possible
Sell	Counterparty	Counterparty	Yes	Yes	Yes
Repo	Bank	Counterparty	No	Yes	Yes
Reverse repo	Counterparty	Bank	Yes	Yes	No/Possible
Sell/buyback	Counterparty	Counterparty	Yes	Yes	Yes
Buy/sellback	Bank	Bank	Yes	Yes	No/Possible
Security lending	Bank	Counterparty	Yes	Yes	No
Security borrowing	Counterparty	Bank	Yes	Yes	No/Possible

6.Liquidity Risk Reporting

① Deposit Tracker Report
② Daily Liquidity Report
③ Funding Maturity Gap ("Mismatch") Report
④ Funding Concentration Report
⑤ Undrawn Commitment Report
⑥ Liability Profile
⑦ Wholesale Pricing and Volume
⑧ Summary and Qualitative Reports
⑨ Frequency of Reporting

6.Liquidity Risk Reporting

- The purpose of **liquidity stress testing** is to ascertain the extent of funding difficulties for the bank in the event of idiosyncratic or market-wide stress
  - The primary stress test output is the **cash flow survival report**



6.Liquidity Risk Reporting

- **A line-by-line stress test result report** should be produced
  - reduction in liquid assets;
  - decrease in liabilities;
  - FX mismatch;
  - combined shocks.

Stress Tests – Individual Shocks			Sight – 8 Day	Sight – 1 Month	Probability	Impact
Reduction in Liquid Assets						
Change in repo criteria	Light	Rating category 1 notch downgrade	8.46%	1.35%	50%	30
	Moderate	Rating category 2 notch downgrade	2.34%	0.12%	20%	70
	Severe	Rating category 3 notch downgrade	−15.2%	−18.2%	1%	90
Mark-to-market reduction in value of assets	Light		8.46%	1.35%	60%	20
	Moderate		2.34%	0.12%	40%	30
	Severe		−15.2%	−18.2%	5%	70
Increased haircut on assets	Light		8.46%	1.35%	70%	25
	Moderate		2.34%	0.12%	30%	45
	Severe		−15.2%	−18.2%	8%	80
Unavailability of repo facilities	Severe	Treat all marketable securities as illiquid (i.e., allocate to final legal maturity time buckets)	−15.2%	−18.2%	5%	100

Framework

Part 5: Interest Risk and Liquidity Risk

1. CIP Violations
2. The US Dollar Shortage
3. Asset-liability Management Strategies
4. Interest-sensitive Gap Management
5. Duration Gap Management

(CH16~CH18)

113-132

1.CIP Violations

- **The difference between FX swap and cross-currency swap**
  - In an FX swap, one party borrows one currency from, and simultaneously lends another currency to, a second party.
    - ✓ The borrowed amounts are exchanged at the spot rate and then repaid at the pre-agreed forward rate at maturity.
  - A cross-currency swap is a longer-term instrument, typically above one year, in which the two parties also simultaneously borrow and lend an equivalent amount of funds in two different currencies.
    - ✓ At maturity, the borrowed amounts are exchanged back at the initial spot rate, but during the life of the swap the counterparties also periodically exchange interest payments.

1.CIP Violations

Covered Interest Parity, CIP

- no-arbitrage condition according to which interest rates on two otherwise identical assets in two different currencies should be equal once the foreign currency risk is hedged:

$$\frac{F}{S} = \frac{1+r}{1+r^*}$$

  - ✓ S is the spot exchange rate in units of US dollar per foreign currency
  - ✓ F is the corresponding forward exchange rate
  - ✓ r is the US dollar interest rate
  - ✓ r* is the foreign currency interest rate.

- In practice, the relationship between F and S is read off market transactions in FX instruments, notably FX swaps and cross-currency swaps.

1.CIP Violations

- **CIP failure and FX swap**
  - The implicit rate of return in an FX swap is determined by the difference between F and S, and the contract is typically quoted in forward points (F - S).
  - Typically, the US dollar has tended to command a premium in FX swaps:

$$\frac{\mathrm{F}-\mathrm{S}}{\mathrm{S}}>\frac{1+r}{1+r^{*}}-1$$

- **CIP failure and cross-currency swap**
  - In a **cross-currency basis swap**, the reference rates are the respective Libor rates plus the basis, b.

$$F-S=S\left(\frac{1+r+b}{1+r^{*}}-1\right)$$

1.CIP Violations

- Two factors that affect the cross-currency swap basis.
  - the risk premium for the underlying investment over the duration of the swap.
  - Three sources of hedging demand that are rather insensitive to the size of the basis, and, hence, exert sustained pressure on it even when it is non-zero:
    - ✓ demand from banks.
    - ✓ institutional investors.
    - ✓ non-financial firms.

1.CIP Violations

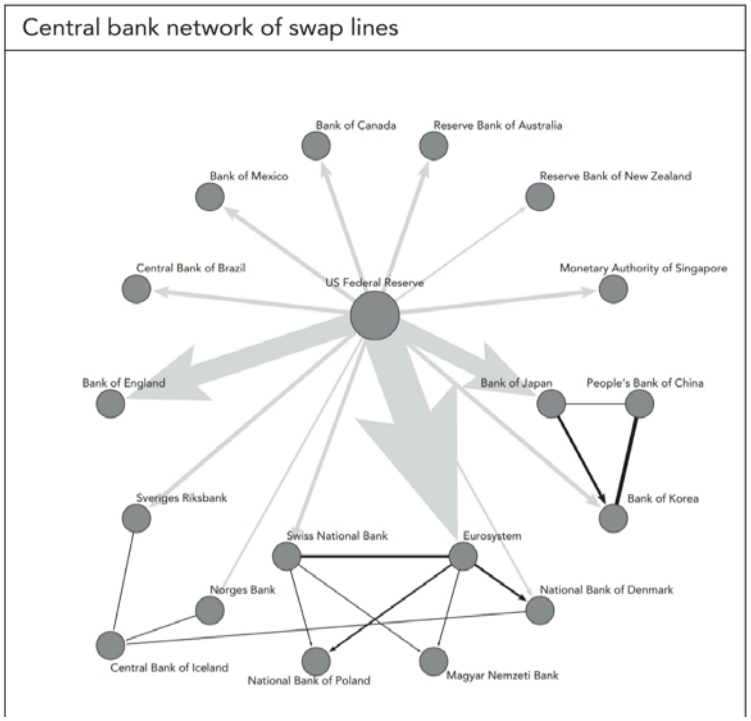
- **Limits to Arbitrage: Why the Basis Does Not Close**
  - Arbitrage become both costly and risky after crisis.
    - ✓ Emerging market with capital restriction
  - As a result of tighter management of risks and related balance sheet constraints, arbitrage now incurs a cost per unit of balance sheet.
    - ✓ Balance sheet deleverage
  - This cost is passed on to the pricing of FX swaps, introducing a premium.
  - Changes in regulation have reinforced market pressures for a tighter management of balance sheet risks.

2.The US Dollar Shortage

- **Causes of the US Dollar shortage during the Great Financial Crisis.**
  - ① The funding difficulties which arose during the crisis are directly linked to the remarkable expansion in banks' global balance sheets over the past decade.
  - ② The accumulation of US dollar assets saddled banks with significant funding requirements, which they scrambled to meet during the crisis.
    - ✓ cross-currency funding
    - ✓ banks' US dollar funding gap
  - ③ Events during the crisis led to severe disruptions in banks' sources of short-term funding. Interbank markets seized up, and dislocations in FX swap markets made it even more expensive to obtain US dollars via swaps.

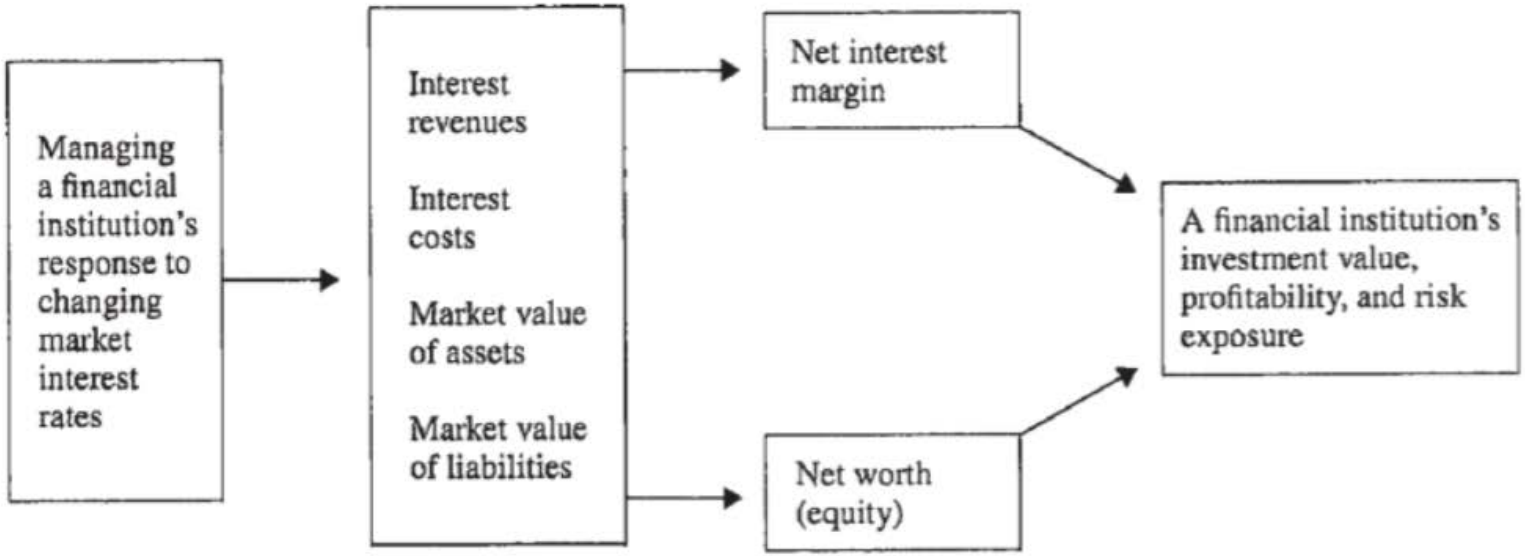
2.The US Dollar Shortage

- In response, central banks around the world adopted extraordinary policy measures, including international swap arrangements with the US Federal Reserve.
- In providing US dollars on a global scale, the Federal Reserve effectively engaged in international lending of last resort.



3.Asset-liability Management Strategies

- **Asset-liability management in banking and financial**



3.Asset-liability Management Strategies

➢ Forces Determining Interest Rates

- Whether financial firms are on the supply side or the demand side of the loanable funds (credit) market at any given moment, they cannot determine the level, or be sure about the trend, of market interest rates.
- Most financial managers must be price takers, not price makers, and must accept interest rate levels as a given and plan accordingly.
- Financial firms use asset-liability strategies to manage two major kinds of interest rate risk
  - ✓ **price risk**
  - ✓ **reinvestment risk**

4.Interest-sensitive Gap Management

- **Important goal is to insulate profits from the damaging effects of fluctuating interest rates.**
  - In order to protect profits against adverse interest rate changes, then, management seeks to hold fixed the financial firm's net interest margin (NIM)

$$\text{NIM} = \frac{\left(\begin{array}{c}\text{Interest income from}\\ \text{loans and investments}\end{array}\right) - \left(\begin{array}{c}\text{Interest expense on deposits}\\ \text{and other borrowed funds}\end{array}\right)}{\text{Total earning assets}}$$

$$= \frac{\text{Net interest income}}{\text{Total earning assets}}$$

4.Interest-sensitive Gap Management

- Among the most popular interest rate hedging strategies in use today is **interest-sensitive gap management.**
- **Calculate Interest-sensitive gap**
  - Interest-sensitive gap = Interest-sensitive assets - Interest-sensitive liabilities
    - ✓ Dollar IS gap = ISA - ISL
  - Relative IS gap = Dollar IS gap/Size of financial institution
  - Interest Sensitivity Ratio (ISR) = ISA/ISL

An Asset-Sensitive Financial Firm Has	A Liability-Sensitive Financial Firm Has:
Positive Dollar IS GAP	Negative Dollar IS GAP
Positive Relative IS GAP	Negative Relative IS GAP
Interest Sensitivity Ratio greater than one	Interest Sensitivity Ratio less than one

4.Interest-sensitive Gap Management

- **Two approaches of IS gap management**

① Defensive gap management

- ✓ The goal of defensive gap management is to set interest-sensitive GAP as close to zero as possible to reduce the expected volatility of net interest income.
- ✓ **A zero gap** does not eliminate all interest rate risk because the interest rates attached to assets and liabilities are not perfectly correlated in the real world.

② Aggressive gap management

Expected changes in interest rates	Best interest-sensitive GAP position	Aggressive management's most likely action
Rising market interest rates	Positive IS GAP	Increase interest sensitive assets Decrease interest sensitive liabilities

125-132

4.Interest-sensitive Gap Management

➢ Problems with Interest-Sensitive GAP Management

- Dealing with basis risk——The interest rates attached to assets of various kinds often change by different amounts and at different speeds than many of the interest rates attached to liabilities.
- Moreover, the point at which certain assets and liabilities can be repriced is not always easy to identify. For example, checkable deposits and savings accounts.
- Finally, interest-sensitive gap management does not consider the impact of changing interest rates on the owners' (stockholders') position in the financial firm as represented by the institution's net worth.

5.Duration Gap Management

- Unfortunately, changing interest rates can also do serious damage to another aspect of a financial firm's performance—**its net worth**, the value of the stockholders' investment in the institution.
- For most companies net worth is more important than their net interest margin.
- This requires the application of yet another managerial tool—**duration gap management.**

5.Duration Gap Management

- A financial-service provider interested in fully hedging against interest rate fluctuations wants to set the duration gap is as close to zero as possible
  - Duration gap=(Dollar-weighted duration of asset Portfolio) – (Dollar-weighted duration of liability portfolio)
- Because the dollar volume of assets usually exceeds the dollar volume of liabilities (otherwise the financial firm would be insolvent), a financial institution seeking to minimize the effects of interest rate fluctuations would need to **adjust for leverage**
  - **Leverage adjusted duration Gap**=(Dollar-weighted duration of asset Portfolio)-(Dollar-weighted duration of liabilities Portfolio)×(Total liabilities/Total assets)

5.Duration Gap Management

- **Two approaches of duration gap management**
  - ① Defensive gap management
    - ✓ **The goal of duration gap management is to set the leverage adjusted duration gap to zero!**
  - ② Aggressive gap management

Expected Change in Interest Rates	Management Action	Possible Outcome
Rates will rise	Reduce D_A and increase D_L (moving closer to a negative duration gap).	Net worth increases (if management's rate forecast is correct).

5.Duration Gap Management

Limitations

- Finding assets and liabilities of the same duration that fit into a financial-service institution 's portfolio is often a frustrating task.
- Duration gap analysis tends to be reasonably effective at handling interest rate risk problems if the yield curve (i.e., the maturity structure of interest rates) changes by relatively small amounts and moves in parallel steps with short term and long-term interest rates changing by about the same proportion over time.
- Add convexity concept into calculation to get more precise result for large interest rate movements.
- Duration itself can shift as market interest rates move.

It's not the end but just beginning.

If you have people you love, allow them to be free beings. Give and don't expect. Advise, but don't order. Ask, but never demand. It might sound simple, but it is a lesson that may take a lifetime to truly practice. It is the secret to true Love. To truly practice it, you must sincerely feel no expectations from those who you love, and yet an unconditional caring.

如果你有爱的人，允许他们自由随意的存在。给予而不指望；建议而不命令；请求而不要求；可能听起来简单，但这需要一辈子去实践。这就是真爱的秘诀。真正去实践它，你必须对那些你爱的人没有期望，并给予无条件的关爱。

问题反馈

- 如果您认为金程**课程讲义/题库/视频**或其他资料中**存在错误，欢迎您告诉我们**，所有提交的内容我们会在最快时间内核查并给与答复。
- **如何告诉我们？**
  - 将您发现的问题通过电子邮件告知我们，具体的内容包含：
    - ✓ 您的姓名或网校账号
    - ✓ 所在班级（eg.2005FRM一级长线无忧班）
    - ✓ 问题所在科目（若未知科目，请提供章节、知识点）和页码
    - ✓ 您对问题的详细描述和您的见解
  - 请发送电子邮件至：academic.support@gfedu.net
- **非常感谢您对金程教育的支持，您的每一次反馈都是我们成长的动力。**后续我们也将开通其他问题反馈渠道（如微信等）。