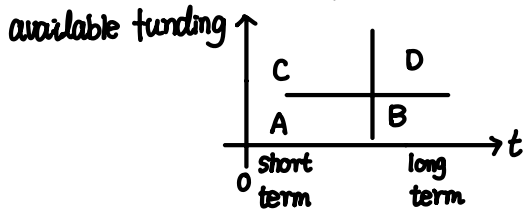
Liquidtity and Treasury Risk Management

Part 1: Identify and understand liquidity

1. Defination of liquidity risks:
   - liquidity risk : receive < Expected
   - funding cost risk: > rf
   - new definition: ± cash flow different from some expected level.
     ① inability to raise funds
     ② cost 太大
     ③ ability to invest excess liquidity only at rates below expected
   - utilize liquidity for four purposes:



A - operational
B - strategic.
C - contigent
D - restricted

2. Liquidity trading risk: adversely 买→贵. 越卖越便宜
   ↓ moving the price of an asset adversely
   - quick. cheap good substatute for cash
   - cost of search for a counterparty
     → inventory (bid-ask spread)
     → cost of trading process
     → aduerse selection
     → difference of opinion. "correct" price.

- characteristics of market liquidity: tight : bid-ask ↓ . broker's commission
  depth. : market adversely ↑
  resiliency: length of time ↑ → ↑
  lumpy order moves the market away from.

→ lack of liquidity:
1) slippage arises:
2) aduerse price impact → 2VaR = VaR × $\sqrt{f(t)}$
3) bid-ask spread to widen: $\frac{(\text{bid-ask})}{\frac{1}{2}(\text{bid+ask})}$ → dollar value

trading liquidity {
Normal time 2VaR = VaR + $\sum \frac{S_i Q_i}{2}$
Stress time 2VaR = VaR + $\sum \frac{(\mu_i + \alpha\sigma_i) Q_i}{2}$
}

• bid-ask spread is exogenous (由市场决定) & endogenous (内生的)

→ Spread = $\frac{(ask - bid)}{\frac{1}{2}(ask + bid)}$

→ Measure cost of liquidation : = $\sum \frac{S_i \cdot a_i}{2}$ → dollar value ($) [normal time]

$= \sum \frac{(\mu_i + \alpha\sigma_i) \cdot a_i}{2}$ [stress time]

• Liquidity-adjusted VaR:

→ LVaR = VaR + $\sum \frac{S_i \cdot a_i}{2}$

→ LVaR = VaR + $\sum \frac{(\mu_i + \alpha\sigma_i) \cdot a_i}{2}$

• Measure Risk of Aduerse Price:

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

→ T required days for liquidation;

3. Liquidity funding risk: ability to meet its cash needs:

•predict cash needs

(2) maturity transformation: maturity mismatch. 借短投长

→ roll-over risk / cliff-risk

(3) liquidity transformation: use B/S to create asset.

(4) liquidity coverage ratio: (30 days)

$$LCR = \frac{\text{high-quality liquidity assets}}{\text{Net cash outflow 30 day}} \geq 100\%$$

(haircut.)

→ under stress scenario

→ haircut

(5) Net Stable Funding Ratio (NSFR): 1yr

$$NSFR = \frac{\text{Amount of stable funding}}{\text{Required amount of stable funding}}$$

Amount of stable funding → cash 来源 D+E × ASF factor (available stable funding)

Required amount of stable funding → cash 去处 × RSF (required)

4. Markets for collateral ↓ funding liquidity risk

(1) haircut $V_{fund} = V_{collateral} \times (1 - haircut)$

① Forms of collateral market

1) margin loans:

→ replege risk & margin call

② repurchase agreements: spot sale and forward repurchase.
- collateral quality ↓
- repo create a liability

③ Security lending:
- rebate (借券的费用)
- two typical pattern: custodian / "street name" 保管人.
  earn spread between less and more-risky bond.

(2) risks in markets for collateral.
- systemic risk: remargin

5. Motivations of repos

→ repurchase price = borrowed money × $(1 + \frac{\text{repo rate} \times t}{360})$ → $\begin{cases} 30/360 \\ \text{actual}/360 \end{cases}$

borrowed money = $V_{collateral} \times (1 - \text{haircut})$

→ reverse repo: borrow a bond. [special trade].

6. General and Special Repo rate:

→ GC and SC

special Spread = GC rate - SC rate.

→ Special Spread:
- on-the-run (OTR): most recently issued bond.
- off-the-run (OFR): old issue, double-old issue

→ The fed funds-GC spread ↑ → decrease supply of treasury collateral.

7. Leverage:

① $L = \frac{A}{E} = 1 + \frac{D}{E}$

② $Re = L \times \underbrace{ROA}_{\text{Return on Asset}} - (L-1) \times \text{cost of debt}$

③ $L = 1/\text{haircut}$

$L = 1/\text{down payment} = 1/\text{首付率}$

8. Reserve Requirement:

- (transaction deposit) $\begin{cases} < 10.7m, & (0\%) \text{ reserve requirement.} \\ 10.7m \sim 58.8m & (3\%) \\ > 58.8m & (10\%) \end{cases}$

- 豁免项: 1) non-personal time deposit.
  2) Eurocurrency liability.
  3) CDs

9. Net interest margin. $= \frac{\text{Interest income - Interest expense.}}{\text{Total earning assets.}}$

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

→ Interest-sensitive gap: = Interest-sensitive Asset - Interest-sensitive liability.

→ Dollar IS gap = ISA - ISL

→ relative IS gap = $\frac{\text{Dollar IS gap}}{\text{Size of financial institute}}$

→ Interest-sensitive ratio = $\frac{\text{ISA}}{\text{ISL.}}$

10. Duration gap: = Dollar-weighted duration of Asset - Dollar-weighted duration of Liability.

Leveraged-adjusted Duration gap:

= Dollar-weighted duration of Asset Portfolio - $\frac{\text{Total Liability}}{\text{Total Asset}}$ x Dollar-weighted duration of Liability. Portfolio

$= D_A - \frac{L}{A} D_L = 0$

- Δinterest > 0. (interest rate↑), duration gap < 0

  Δ interest < 0, duration gap > 0

- ΔNet worth = ΔA - ΔL

  $= (-1) \times D_A \times A \times \Delta int - [(-1) \times D_L \times L \times \Delta int]$

11. Covered Interest Parity, CIP:

$\frac{F}{S} = \frac{\text{Forward exchange rate}}{\text{Spot exchange rate of US}} = \frac{1+r_{\$}}{1+r_{외국}}$

- CIP Failure: $\frac{F}{S} > \frac{1+r_{\$}}{1+r_{외국}} \Rightarrow \frac{F-S}{S} > \frac{1+r_{\$}}{1+r_{외국}} - 1$ (forward point = F-S)

- cross-currency basis swap: $\frac{F}{S} = \frac{1+r_{\$}+b}{1+r_{외국}}$ ($\underbrace{b>0}_{\text{basis}}$)

- factors that affect cross-currency swap basis (b):

  → risk premium

  → three sources of hedging demand