The Welfare Effects of Bank Liquidity and Capital Requirements

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Optimal Bank Liquidity Regulation

TCH/Columbia SIPA Research Conference

February 9, 2018

* *The views expressed here do not necessarily represent the views of the Federal Reserve Board or its staff.*

Introduction

Financial crisis spurred crucial regulatory reforms, including Basel III.

- Stronger capital requirements
- New liquidity requirements (LCR, NSFR)

Is it enough? There is an ongoing debate.

- Some favor much higher capital requirements; others argue they have risen too far.
- Others have argued for versions of "narrow banking" (e.g. Cochrane (2014), Milton Friedman (1960)).
    - Similar to a 100% liquidity requirement

Debate in large part reflects disagreement about the existence and magnitude of social costs of capital and liquidity requirements.

Introduction

Liquidity requirements – "promote the short-term resiliency of the liquidity risk profile of institutions" (LCR)

Capital requirements– bank capital is loss absorbing and can limit the moral hazard involved with deposit insurance, or there may be externalities associated with bank failures.

Why not set capital and/or liquidity requirements = 100%?

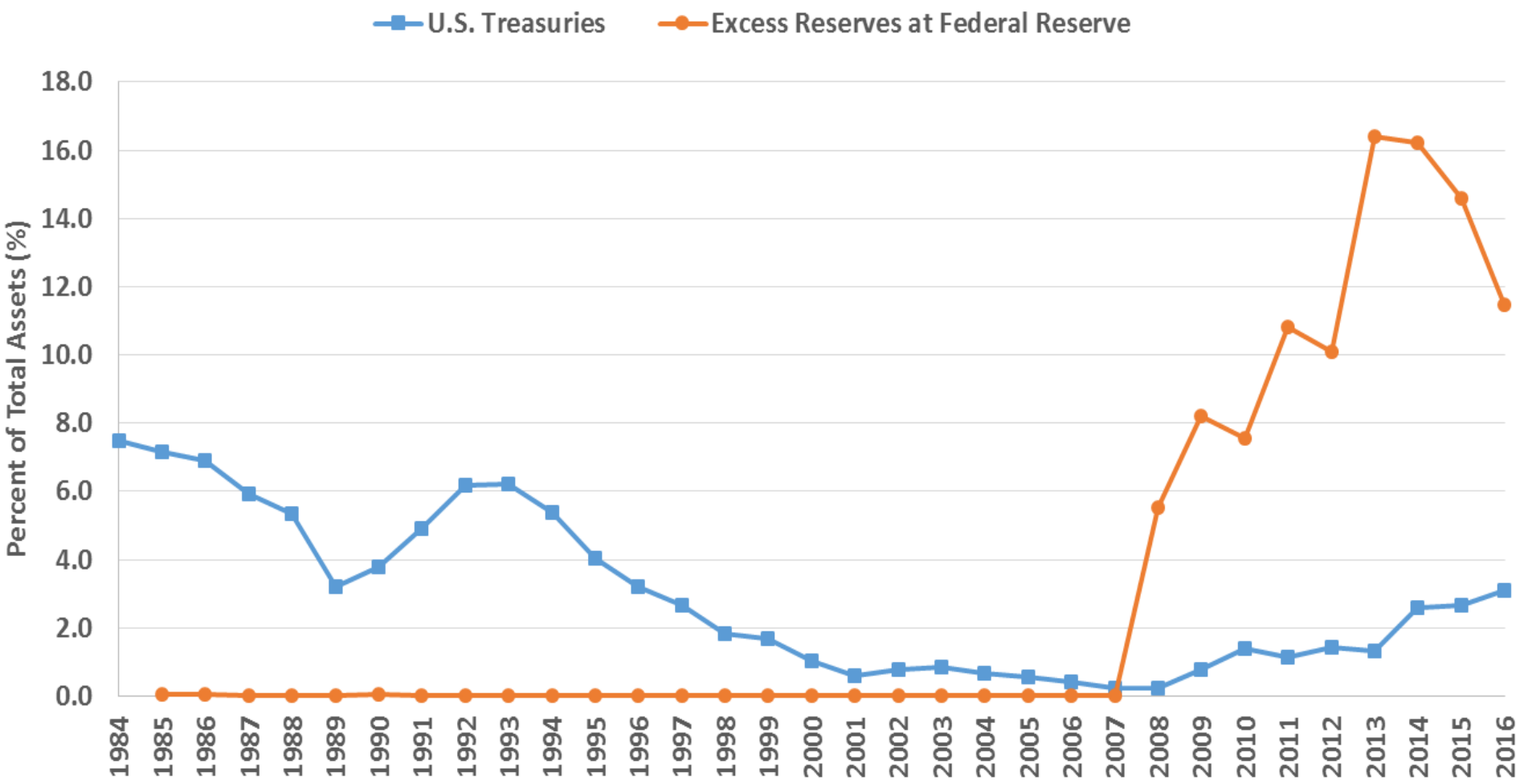
Possible cost – reduced (net) liquidity creation.

Key idea: High-quality liquid assets are in limited supply and may have important alternative uses.

- E.g. Krishnamurthy and Vissing-Jorgenson (2012), Greenwood, Hanson and Stein (2015).

U.S. Treasuries and Excess Reserves held by U.S. Depository Institutions

(Share of Total Assets, 1984-2016)



Note: For years 1984-1988, U.S. Treasuries data is for commercial banks only. Starting in 1989, U.S. Treasuries series includes both commercial banks and savings institutions.

Source: FDIC Historical Statistics on Banking and Federal Reserve H.3 Release.

Introduction

This paper –

- Examines the macroeconomic costs and benefits of:
  - bank liquidity requirements and
  - bank capital requirements
- Quantifies their macroeconomic welfare costs.

Quantitative general equilibrium analysis

- Extends previous work on capital requirements (Van den Heuvel (2008))

1. Basic Model: Households

Households value liquidity:

$$u(c, d, b)$$

- Derived utility function; Feenstra (1985).
- Assumed to be increasing and concave
- Flexibility will let the data speak

Households

No aggregate uncertainty → Perfect foresight problem.

$$\max_{\{c_t,d_t,e_t,b_t\}_{t=0}^{\infty}} \sum_{t=0}^{\infty} \beta^t u(c_t,d_t,b_t)$$

$$\text{s.t.} \quad d_{t+1}+b_{t+1}+e_{t+1}+c_t = w_t 1+R_t^D d_t+R_t^B b_t+R_t^E e_t-T_t$$

(*d*) $$R_t^E - R_t^D = \frac{u_d(c_t,d_t,b_t)}{u_c(c_t,d_t,b_t)}$$: convenience yield on deposits

(*b*) $$R_t^E - R_t^B = \frac{u_b(c_t,d_t,b_t)}{u_c(c_t,d_t,b_t)}$$: convenience yield on Treasuries

Banks

L_t Loans	D_t Deposits
B_t Bonds	E_t Equity

Liquidity Requirement: $B_t \geq \lambda D_t$

Capital Requirement: $E_t \geq \gamma L_t$ *(risk-based)*

Bank maximizes shareholder value.

- Competitive banking: R^L, R^B, R^D, R^E given

Banks: Moral Hazard and Benefits of Regulation

Additional assumptions to generate benefits of regulation:

Deposit Insurance / government guarantees

→ Moral hazard of excessive risk taking. Two risk choices:

1. Credit risk: excessively risky lending practices

2. Liquidity risk: insufficient liquid assets

Banks: Moral Hazard and Benefits of Regulation

Deposit Insurance / government guarantees

→ Moral hazard of excessive risk taking. Two risk choices:

1. ***Credit risk***: excessively risky lending practices

   Capital requirement solves this, together with bank supervision, through "skin-in-the-game".

$$\gamma \geq \phi_{\varepsilon} \bar{\sigma} / R^{E} \qquad \text{(IC1)}$$

   - $\bar{\sigma}$: ability of banks to hide excessively risky loans from supervision
   - Liquidity regulation does not ameliorate this problem.
     - Bank size is not fixed so increase in B does not imply a decrease in L.

Banks: Moral Hazard and Benefits of Regulation

Deposit Insurance / government guarantees

→ Moral hazard of excessive risk taking. Two risk choices:

2. ***Liquidity risk***: insufficient liquid assets
   - Risk of liquidity stress: fraction w of depositors withdraw early.
   - Government bonds can be used to service these withdrawals.
     - Bank may not voluntarily hold enough liquid assets if that is costly and leverage is high → inefficient bank failures
   - ***Liquidity requirement and capital requirement each*** mitigate the moral hazard of liquidity risk, but the liquidity requirement is more direct and efficient if w is known → *Division of Labor*:
     - Capital regulation for solvency risk
     - Liquidity regulation for liquidity risk: $\boxed{\lambda \geq w}$ (IC2)

Summary of Bank's Problem

L_t	Loans	D_t	Deposits
$B_t \geq \lambda D_t$	Bonds	$E_t \geq \gamma L_t$	Equity

All-in cost of funding loans with deposits:

$$\tilde{R}^D(\lambda) \equiv R^D + \frac{\lambda}{1-\lambda}(R^D - R^B)$$

With (IC1) and (IC2), solution's zero-profit condition:

$$\boxed{R^L = \gamma R^E + (1-\gamma)\tilde{R}^D(\lambda)}$$

A finite solution requires: $R^B \leq R^D \leq R^L \leq R^E$.

1. Liquidity requirements binds iff $R^B < R^D$ *(will be relaxed)*

2. Capital requirement binds iff $R^E > \tilde{R}^D(\lambda)$

Neoclassical Firms

K_t Physical Capital	L_t Loans
	E_t^F Firm Equity

Safe technology: $F(K,H)$, constant returns to scale

$$F_H(K,H) = w$$

$$F_K(K,H) + 1 - \delta = R^L$$

Firms use firm equity only if $R^E = R^L$.

Risky firms: $F(K,H) + \sigma_{RF}\varepsilon K$ → risky loans

Government - Regulator

Sets

γ: Capital adequacy regulation

λ: Liquidity regulation

$\bar{B}$: Fixed supply of government debt $= B_t + b_t$

Balanced budget, including any resolution costs:

- Excess losses covered by deposit insurance fund
- Direct resolution costs

Equilibrium (1): No liquidity requirement

With $\lambda = 0$ and the demand for bank liquidity not satiated:

- Deposit finance is cheaper than equity finance for banks.
- The capital requirement binds.
- Banks pass on the cheap deposit financing to firms in the form of a lower lending rate ($R^L = \gamma R^E + (1-\gamma) R^D$).
- Investment is affected by the capital requirement.

Equilibrium (2): Small liquidity requirement

Adding a *small* liquidity requirement (λ)→

- Liquidity requirement will bind only if banks were not voluntarily holding government bonds, i.e. only if $R^B < R^D$.
- In that case, banks pass on less cheap deposit financing to firms due to liquidity req. ($R^L = \gamma R^E + (1-\gamma)\tilde{R}^D(\lambda)$).
- Investment is affected by *both* liquidity requirement and the capital requirement.
- Government bonds will flow out of the nonbank sector, so their convenience yield $R^E - R^B$ will rise.

Equilibrium (3): Larger liquidity requirement

Adding a *larger* liquidity requirement (λ) →

- Deposit finance even less attractive for banks.
- Can lead to **disintermediation or non-bank intermediation**
    - More likely if the demand for safe, liquid assets is high relative to the supply.

2. Gross Welfare Cost of the Policy Tools

Welfare cost: most coherent summary measure of the overall macroeconomic costs: decline in investment, GDP, liquidity services, etc.

Thought experiment:

> How much would households be willing to give up of their consumption in order to live in a world with less stringent requirements, but the same financial stability? (*gross* cost)

Welfare Cost of the *Liquidity* Requirement

If the economy is in steady state in the current period and IC1 and IC2 hold, then the marginal welfare cost of a permanent increase in λ is:

$$\nu_{LIQ} = \frac{d}{c}\left(R^D - R^B\right)(1-\lambda)^{-1}$$

- As a first-order approximation, the welfare loss from $\Delta\lambda$ is equivalent to a permanent relative loss in consumption of $\nu_{LIQ}\Delta\lambda$.
- Takes into account gains and losses associated with move to a new steady state.
- Revealed preference logic + competitive banking.

Welfare Cost of the *Capital* Requirement

Under the same assumptions, the marginal welfare cost of a permanent increase in γ is:

$$\nu_{CAP} = \frac{L}{c}\left(R^E - \tilde{R}^D(\lambda)\right)$$

Recall $\tilde{R}^D(\lambda) \equiv R^D + \frac{\lambda}{1-\lambda}(R^D - R^B)$

3. Costly Financial Intermediation

So far we have assumed that no resource costs are involved with financial intermediation.

- For 86-13, net noninterest costs are 1.3% of total assets.

Before measuring costs, extend model:

Bank pays noninterest cost: $g(D, L)$

g is increasing, convex, constant returns to scale.

Dividends = $\max(0, (R_t^L + \sigma_t \varepsilon) L_t + R_t^B B_t - R_t^D D_t - g(D_t, L_t))$

Welfare Costs with Costly Intermediation

Marginal welfare costs of increasing λ and γ with costly financial intermediation:

$$\nu_{LIQ} = \frac{d}{c}\left(R^D + g_D(d,L) - R^B\right)(1-\lambda)^{-1}$$

$$\nu_{CAP} = \frac{L}{c}\left(R^E - \tilde{R}^D(\lambda) - (1-\lambda)^{-1} g_D(d,L)\right)$$

4. Measurement of the Welfare Cost

Historical Statistics on Banking - U.S. commercial banks
Sample 1986 – 2013 (annual).

- From 1986-2000, Treasuries/Assets exceed 1 percent → Use this period to estimate g_D through the condition:

$$R^B = R^D + g_D \rightarrow g_D = 1.22\%$$

- Use 2001-2007 to estimate average returns and ratios.
  - Treasuries < 1% of assets
  - Provides an estimate of the cost of a liquidity requirement for a period when it would likely have been binding.
  - May not be reflective of the *immediate* economic costs in the current environment, with bank reserves still very large.

Measurement of the Welfare Cost: Liquidity

d = Total Deposits — $d/c = 0.67$

c = Personal Consumption Expenditures

R^D = (Interest on Total Deposits) / (Total Deposits) $= 2.04\%$

Including marginal noninterest cost: $R^D + g_D$ $= 3.26\%$

R^B = 3-month Treasury yield $= 2.80\%$

λ = liquidity requirement $= 0$

$$\nu_{LIQ} = \frac{d}{c}\left(R^D + g_D - R^B\right)(1-\lambda)^{-1}$$

$$= 0.67 \times (0.0326 - 0.0280) \times 1 = \boxed{0.0031}$$

Measurement of the Welfare Cost: Liquidity

Interpretation of $\nu_{LIQ} = 0.003$.

- The gross welfare cost of imposing a 10 percent liquidity requirement is equivalent to a **permanent loss in consumption of** $\nu_{LIQ} \times 0.1 \times 100\% = \mathbf{0.03\%}$.

- About $3.5 billion per year.

Measurement of the Welfare Cost: Capital

A risk-adjusted measure of the required return on equity is needed.

I use the required return on **subordinated bank debt**.

- Sub-debt counts towards regulatory capital, within certain limits.
- Defaults on bank sub-debt have been rare.

Limits:

- Part of tier 2 capital
- Until recently, limited to at most 50% of tier 1 capital.
- Same tax treatment as deposits

The required return on sub-debt may be less than the risk-adjusted pre-tax required return on regular bank equity.

→ conservative measure.

Measurement of the Welfare Cost: Capital

Sample: 1993-2010

L = Total Assets – (Treasuries + Ex. Reserves) $L/c = 0.96$

c = Personal Consumption Expenditures

R^E = (Interest on Subordinated debt) / (Sub-debt) $= 5.45\%$

R^D = (Interest on Total Deposits) / (Total Deposits) $= 2.43\%$

Including marginal noninterest cost: $R^D + g_D$ $= 3.65\%$

$$\nu_{CAP} = \frac{L}{c}\left(R^E - (R^D + g_D)\right)(1-\lambda)^{-1}$$

$$= 0.96 \times 0.0180 \times (1-0)^{-1} = \boxed{0.017}$$

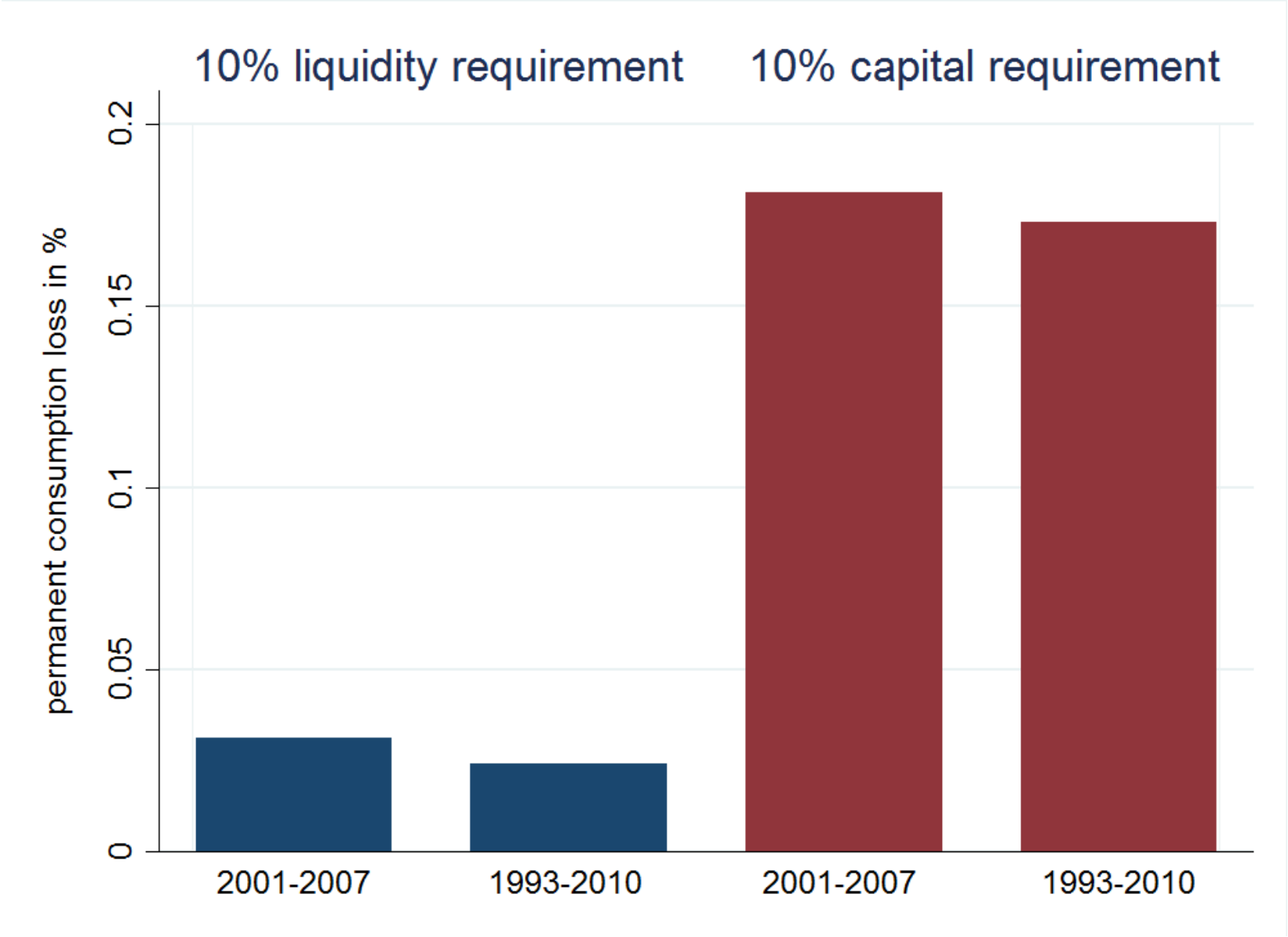
Measurement of the Welfare Cost: Capital

Interpretation of $\nu_{CAP} = 0.017$.

- The gross welfare cost of increasing capital requirements by 10 percentage points is equivalent to a **permanent loss in consumption of** $\nu \times 0.1 \times 100\% = \mathbf{0.17\%}$.

- About $20 billion per year.

Gross Welfare Costs of Liquidity and Capital Requirements



Conclusions

- Liquidity and capital requirements reduce the ability of banks to create net liquidity in equilibrium and impact investment and economic activity.

- Liquidity requirements are costly if high-quality liquid assets are in limited supply and have important alternative uses.

- Compared to capital requirements, liquidity requirements entail much lower social costs but their financial stability benefits are also narrower.