The Welfare Effects of Bank Liquidity and Capital Requirements

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

Introduction

Global financial crisis spurred crucial regulatory reforms, including Basel III.

- Stronger capital requirements
- New liquidity requirements

Goal: Make banks and the financial system safer.

Is it enough? Too much? There is an ongoing debate. E.g.

- Some favor much higher capital requirements (e.g. Admati and Hellwig, Kashkari)
- Others have argued for versions of "narrow banking" (e.g. Friedman, Cochrane)
  - Similar to a 100% liquidity requirement

Introduction

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

This paper –

- Examines the welfare costs and benefits of:
  - bank liquidity requirements and
  - bank capital requirements
- Quantifies their welfare costs through a sufficient statistics approach.

Quantitative general equilibrium analysis to quantify benefits and optimal policy

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

Main Findings

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

- Welfare cost of ***capital*** requirement: ***convenience yield on bank deposits***
- Welfare cost of ***liquidity*** requirement: ***difference in the convenience yields on HQLA assets and on bank deposits*** (adjusted for non-interest costs)

Quantitative results:

- Welfare costs of liquidity requirements are modest and much lower than the costs of similarly sized capital requirements.
- Optimal policy relies on both requirements and is found to be close to Basel III levels.
- Capital regulation addresses credit risk; liquidity regulation addresses liquidity risk.

Outline

1. Most basic model – no risk, no noninterest costs
2. Formulas for welfare costs of liquidity and capital requirements
3. Adding non-interest costs
4. Measurement of the gross welfare costs
5. Bank risks, the benefits of regulation, and optimal policy
6. Conclusion

1. Basic model

Households

Households value liquidity:

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

- Derived utility function a la Feenstra (1985).
- Increasing and concave
- Flexibility will let the data speak

Households

Infinite horizon, no aggregate uncertainty → Perfect foresight problem.

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

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

(*c*) $$R_t^E = \left(\beta u_c(c_t,d_t,b_t)/u_c(c_{t-1},d_{t-1},b_{t-1})\right)^{-1}$$

(*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 and are competitive: R^L, R^B, R^D, R^E given

In equilibrium:

1. Liquidity requirement binds if and only if $R^B < R^D$ *(*may or may not bind*)*

2. Capital requirement binds if and only if $R^E > \tilde{R}^D(\lambda)$ (typically binds due to convenience yield on deposits), where $\tilde{R}^D(\lambda) \overset{\text{def}}{=} R^D + \frac{\lambda}{1-\lambda}(R^D - R^B)$

Nonfinancial Firms

K_t	Physical capital	L_t	Bank loans
		L_t^{NB}	Nonbank loans

Bank and nonbank credit are perfect substitutes for the firm.

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

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

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

Nonbank Financial Intermediaries (NBFIs)

L_t^{NB}	Nonbank loans	$E_t^{NB} \geq 0$	Equity

Origination cost = $\varphi \geq 0$ per unit lent

- $\varphi > 0$ allows for bank loans to have a productivity advantage.

Two possibilities:

- If $R^L = R^E + \varphi \rightarrow$ NBFIs operate and compete with banks.
- If $R^L < R^E + \varphi \rightarrow$ NBFIs do not operate.

2. Welfare Cost of the Policy Tools

Gross Welfare Cost of the Policy Tools

Derived via a constrained social planner's problem that replicates the decentralized equilibrium:

$$
\begin{aligned}
V_0(\lambda, \gamma, K_0) \quad = \quad & \max_{\{c_t, d_t, b_t, B_t, L_t, K_{t+1}\}_{t=0}^{\infty}} \sum_{t=0}^{\infty} \beta^t u(c_t, d_t, b_t) \\
& \text{s.t.} \quad K_{t+1} = F(K_t, 1) + (1-\delta)K_t - c_t - \varphi(K_t - L_t) \\
& \qquad B_t \geq \lambda d_t \\
& \qquad d_t \leq (1-\gamma)L_t + B_t \\
& \qquad B_t + b_t = \bar{B} \\
& \qquad K_t \geq L_t
\end{aligned}
$$

Welfare Cost of Requirements

If the economy is in steady state in the current period, then the marginal welfare cost of a permanent increase in λ (liquidity req.) is:

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

The marginal welfare cost of a permanent increase in γ (capital req.) is:

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

- Takes into account gains and losses associated with move to a new steady state.

- Valid whether bank loans are 'special' or not and for any derived utility function.

3. Costly Bank Intermediation

So far, no resource costs are involved with financial intermediation.

- For 86-19, net **noninterest** costs are 1.3% of total assets.

Before measuring costs, extend model: Bank pays non-interest cost: $g(D,L)$

g is increasing, convex, constant returns to scale.

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

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

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

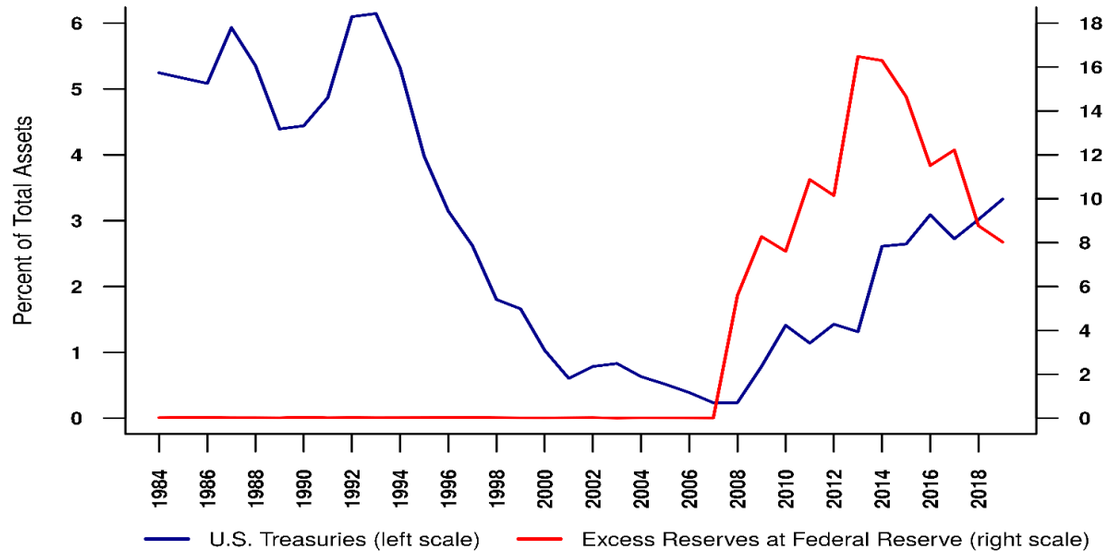
4. Measurement of the Welfare Cost

Measurement of the Welfare Cost

Historical Statistics on Banking - U.S. commercial banks (1986 – 2019).

1. From 1986-2000, Treasuries/Assets exceed 1 percent → Use this period to estimate g_D through the condition: $R^B = R^D + g_D \rightarrow g_D = 1.22\%$

U.S. Treasuries and excess reserves held by U.S. depository institutions



2. Alternative estimate based on Hanson, Schleifer, Stein, Vishny (2015): $g_D = 0.81\%$

3. Alternative estimate based on Corbae and D'Erasmo (2021): $g_D = 0.90\%$

Measurement of the Welfare Cost: Liquidity

Two measurement periods for average returns and ratios:

1. Pre-Basel III: 2001-2006
   - Treasuries < 1% of assets → a liquidity requirement would likely have been binding.
   - $\lambda = 0$
2. Basel III: 2016-2019
   - LCR (mostly) implemented and judged binding for most banks.
   - $\lambda = 0.17$

Measurement of the Welfare Cost: Liquidity

		Basel III period
d	= Total Deposits	
c	= Personal Consumption Expenditures	$d/c = 0.94$
R^D	= (Interest on Total Deposits) / (Total Deposits)	$= 0.50\%$
	Including marginal non-interest cost: $R^D + g_D$	$= 1.72\%$
R^B	= 3-month Treasury yield	$= 1.31\%$
λ	= Liquidity requirement	$= 0.17$

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

$$= 0.94 \times 0.0041 \times \frac{1}{1-0.17} = \boxed{0.0046}$$

Measurement of the Welfare Cost: Liquidity

Interpretation of $\boldsymbol{\nu_{LIQ} = 0.0046}$.

- The gross welfare cost of raising the liquidity requirement by 10 p.p. is equivalent to a **permanent loss in consumption of** $\nu_{LIQ} \times 0.1 \times 100\% = 4.6$ bps.

- About $6.6 billion per year.

With HSSV-based estimate ($g_D = 0.81\%$): welfare cost = 0.1 bps.

Measurement of the Welfare Cost: Capital

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

We 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

Basel III period

L = Total Assets – (Treasuries + Reserves) $L/c = 1.07$

R^E = (Interest on Subordinated debt) / (Sub-debt) $= 3.86\%$

R^D = (Interest on Total Deposits) / (Total Deposits) $= 0.50\%$

Including marginal noninterest cost: $R^D + g_D$ $= 1.77\%$

$$\nu_{CAP} = \left(\frac{L}{c}\right)\left(R^E - \tilde{R}^D(\lambda) - (1-\lambda)^{-1} g_D(d, L)\right)$$
$$= 1.07 \times 0.0206 = 0.022$$

Measurement of the Welfare Cost: Capital

Interpretation of $\boldsymbol{\nu_{CAP} = 0.022}$.

- The gross welfare cost of increasing capital requirements by 10 percentage points is equivalent to a **permanent loss in consumption of** $\nu \times 0.1 \times 100\% = \mathbf{0.22\%}$.
- About $32 billion per year.
- With HSSV-based estimate ($g_D = 0.81\%$): welfare cost = **0.27%.**

Gross Welfare Costs of Liquidity and Capital Requirements

Welfare cost of:	Measurement period	
	Pre-Basel III	Basel III
10% LIQUIDITY requirement	0.022	0.019
	(0.011-0.038)	(0.001-0.046)
10% CAPITAL requirement	0.202	0.250
	(0.180-0.217)	(0.219-0.272)

Note: 'Pre-Basel III' means 2001-2006 for liquidity and 1993-2006 for capital. 'Basel III' means 2016-2019.

[Numbers in table are within 1 to 3 basis points of the corresponding exact number in the calibrated model economy.]

5. Bank Risk and the Benefits of Regulation

Bank Risk and Benefits of Regulation

Additional assumptions to generate benefits of regulation: Banks are exposed to idiosyncratic risks and fail with positive probability

Deposit Insurance / government guarantees → Moral hazard of excessive risk taking

Two sources of bank risk:

1. ***Credit risk***: Output from production is now assumed to be uncertain

   $F(K_t, H_t) + \epsilon_t K_t$, with *i.i.d.* sectoral shock $\epsilon \sim F_\epsilon$ with bounded support; without loss, ϵ has mean zero

2. ***Liquidity risk***: fraction w_t of depositors withdraw early

   $w \sim F_w$ is bank-specific and *i.i.d.* Bank fails if $B_t < w_t D_t$

Nests the baseline model by setting $\epsilon = 0$ and $w = 0$ with probability 1

Bank Risk and Benefits of Regulation

Bank's decision problem:

$$\pi^B = \max_{L,B,D,E} \mathbb{E}\left[1_{\{B \geq wD\}}\{(R^L + \varepsilon)L + R^B B - R^D D - g(D,L)\}^+\right]/R^E - E$$

where R^L is now defined as the *expected* loan return net of charge-offs (based on optimal loan contract).

Bank will fail and go into resolution:

- Due to liquidity stress if $w > \overline{w} \equiv B/D$
- Due to credit risk if $\epsilon < -r_L$ with $r_L \equiv R^L + R^B(B\ /\ L)\ - R^D(D\ /L)\ \ - g(D/L,\ 1)$

Bank Risk and Benefits of Regulation

Bank fails with probability:

$$p_F = 1 - F_w(\bar{w})\left(1 - F_\varepsilon(-r_L)\right) \in [0, 1)$$

Solution satisfies a distorted zero-profit condition:

$$R^L + \tau^L - g_L(D, L) = \gamma(R^E + \tau^E) + (1-\gamma)\left\{\tilde{R}^D(\bar{w}) + (1-\bar{w})^{-1} g_D(D, L)\right\}$$

Two distortions due to interplay of risk and deposit insurance:

$\tau^L \equiv \mathbb{E}\left[\varepsilon | \varepsilon > -r_L\right] \geq 0$ is a **risk-shifting distortion** → excessive lending (lower rate)
[*shareholders only care about returns outside bankruptcy*]

$\tau^E \equiv \left(\frac{p_F}{1-p_F}\right) R^E \geq 0$ is a **leverage distortion** → excessive leverage + less 'overlending'
[*skin-in-the-game of equity*]

Bank Risk and Benefits of Regulation

Liquidity and capital requirement both mitigate moral hazard from deposit insurance

Effect on failures from:	Liquidity requirement	Capital requirement
Liquidity Risk	**–**	**0**
Credit Risk	**+**	**–**
Overall	ambiguous	**–**

Note: comparison across steady states; assumes binding liquidity requirement

- Capital requirement is the only tool that reduces failures from credit risk
- Liquidity requirement is the only tool that reduces failures from liquidity risk
  - Adverse side effect: a higher binding liquidity requirement reduces ability of banks to operate profitably and raises the probability of failure from credit risk

Bank Risk and Benefits of Regulation

Replicating social planner's problem

$$V_0(\theta) = \max_{\{c_t,d_t,b_t,B_t,L_t,E_t,K_{t+1}\}_{t=0}^{\infty}} \sum_{t=0}^{\infty} \beta^t u(c_t, d_t, b_t)$$

$$\text{s.t. } K_{t+1} = F(K_t, 1) + (1-\delta)K_t - c_t - g(d_t, L_t) - \varphi(K_t - L_t) + \tau_t^L(\theta)L_t - \tau_t^E(\theta)E_t + Q_t(\theta),$$

$$B_t + b_t = \bar{B},\ E_t + d_t = L_t + B_t,\ B_t = (\lambda + \tau_t^{\bar{w}}(\theta))d_t,\ E_t \geq \gamma L_t,\ K_t \geq L_t$$

where $\theta = (\lambda, \gamma, K_0)$ and the social planner takes the following variables as given:

$$\begin{aligned}
\tau_t^E(\theta) &\equiv \hat{R}_t^{E,ce} - R_t^{E,ce} \\
\tau_t^L(\theta) &\equiv \mathbb{E}\left[\varepsilon | \varepsilon > -r_{L,t}^{ce}\right] \\
\tau_t^{\bar{w}}(\theta) &\equiv \bar{w}_t^{ce} - \lambda \\
Q_t(\theta) &\equiv \tau_t^E(\theta)E_t^{ce} - \tau_t^L(\theta)L_t^{ce} - \Psi_t^{ce}(\theta)
\end{aligned}$$

Bank Risk and Benefits of Regulation

With risky banks, the sufficient statistics for the marginal welfare costs of the requirements remain the same as in the baseline model

Their marginal welfare *benefits* are:

$$\text{MWB}(\lambda) = \sum_{t=0}^{\infty} \frac{\varpi_t}{c_t} \left\{ \tau_t^E \frac{\partial E_t}{\partial \lambda} - \tau_t^L \frac{\partial L_t}{\partial \lambda} - \frac{\partial \Psi_t}{\partial \lambda} \right\}$$

$$\text{MWB}(\gamma) = \sum_{t=0}^{\infty} \frac{\varpi_t}{c_t} \left\{ (\gamma \tau_t^E - \tau_t^L) \frac{\partial L_t}{\partial \gamma} - \frac{\partial \Psi_t}{\partial \gamma} \right\}$$

where ϖ_t is a series of positive weights that sum to one.

- Each term reflects a reduction in a distortion or resolution costs
- Does not appear amenable to a sufficient statistic approach

Bank Risk and Benefits of Regulation

To quantify the welfare benefits and optimal policy we fully calibrate and numerically solve the expanded model. For the calibration:

- Standard choices are made where possible.
- For the distributions of liquidity and credit risk, match relevant moments from call reports and the rate of bank failures.
- Remaining parameters are picked to match the spreads and ratios in the expressions for the marginal welfare costs.

Data-based targets and model moments				
Y^*	100.00	100.00	100.00	Normalized
d_{ss}/c_{ss}	0.94	0.94		FDIC and NIPA
L_{ss}/c_{ss}	1.07		1.07	FDIC and NIPA
$R^D - R^B$ %	-0.81	-0.81	-0.81	Measured in section 5
$R^E - R^D$ %	3.36	3.36	3.36	Measured in section 5
L_{ss}/K_{ss}	0.42	0.42	0.50	Durdu and Zhong (2023)
p_F (pre-Basel) Basel III %	(1.07)	(1.07) 0.16	(1.07) 0.16	Corbae and D'Erasmo (2021)
Mean deposit withdrawal %	0.75	0.75	0.75	Call Reports
p99 deposit withdrawal %	8.64	8.64	8.64	Call Reports
DIF losses / deposits %	25.96	25.96	25.96	FDIC Bank Failures & Assistance
Liq. driven failures in % (Pre-Basel) Basel III		(11.8) 40.3	(11.8) 42.0	

Bank Risk and Benefits of Regulation

Finding 1: The marginal welfare benefits of the capital requirement are far larger than for the liquidity requirement, echoing the results on the costs.

Reasons:

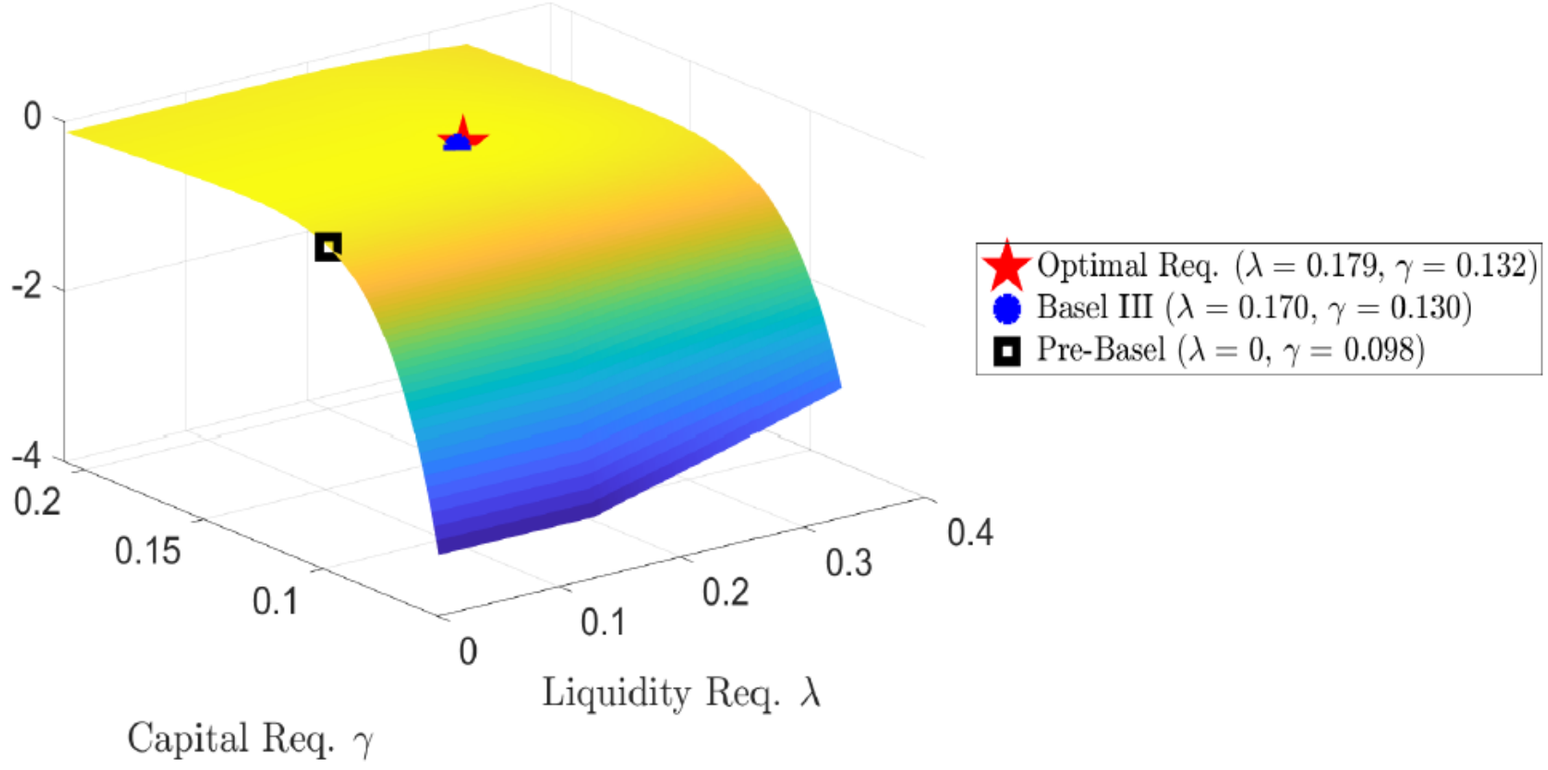
- Most bank failures stem from credit rather than liquidity risk, a result that is consistent with the empirical findings of Correia, Luck, and Verner (2026).
- Only the capital requirement reduces failures driven by credit risk.
- At low levels, the liquidity requirement becomes non-binding as the self-insurance motive dominates then.
    - In contrast, the marginal benefits of the capital requirement are especially large at low levels of that requirement.

Bank Risk and Benefits of Regulation

Finding 2: Welfare-maximizing levels of the requirements are close to Basel III.

- Sensitivity analysis: 12-16% for capital (tier 1/RWA); 17-24 % for liquidity requirement.

Finding 3: Post-crisis reforms have led to a net increase in welfare of 0.2% of cons.



Level of welfare expressed in percent consumption equivalents relative to Basel III

Conclusions

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

- Cost of ***capital*** requirement scales with the ***convenience yield on bank deposits***
- Cost of ***liquidity*** requirement scales with the ***difference in the convenience yields on HQLA assets and on bank deposits***

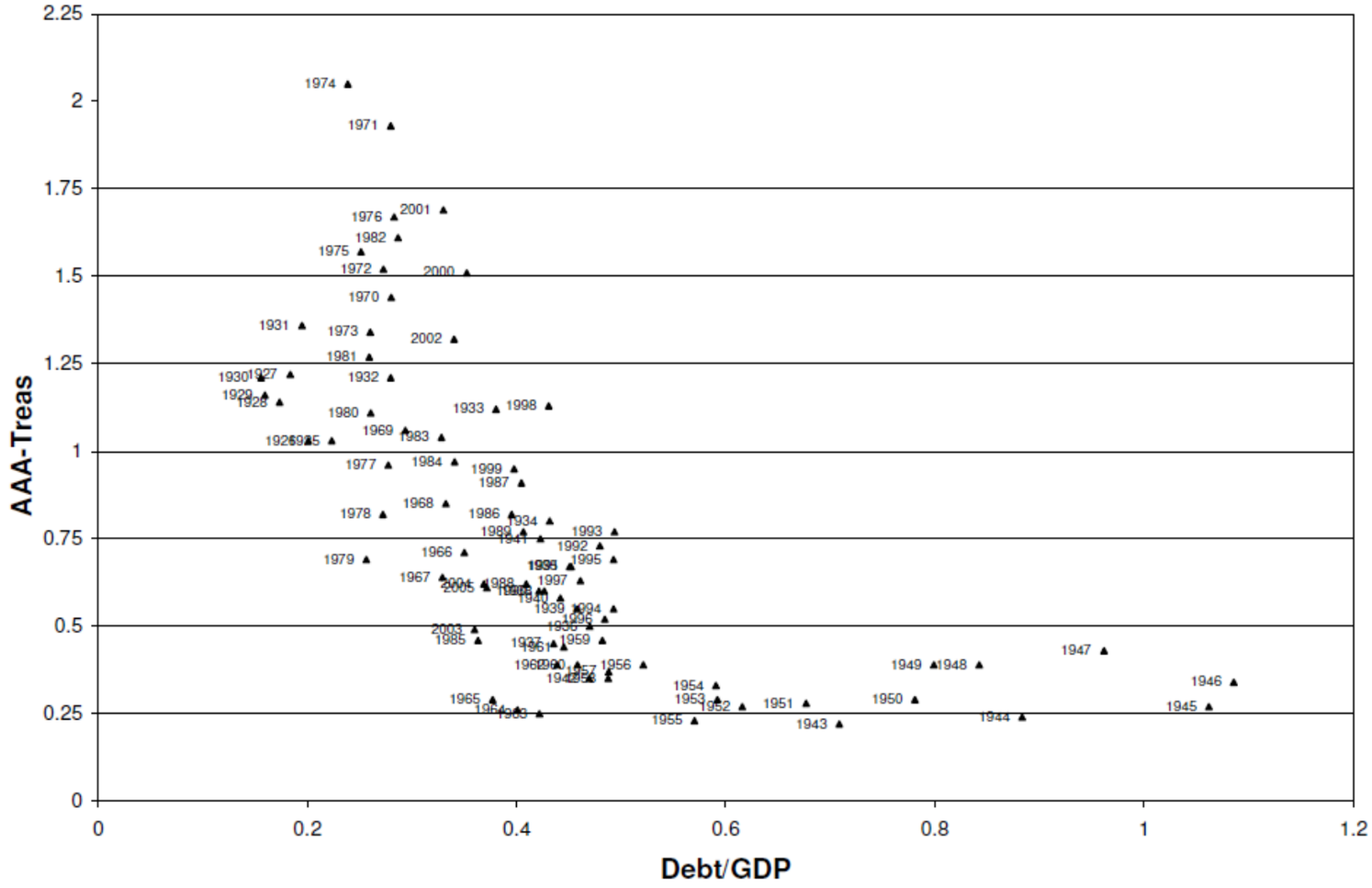
Quantitative result: Welfare cost of liquidity requirement is modest and much lower than the welfare cost of similarly sized capital requirements.

Still, optimal policy, which is close to Basel III, relies on both requirements and post-crisis reforms have resulted in a significant net increase in welfare.

Extra Slides

The Demand for Treasuries

Corporate Bond Spread and Government Debt



Source: Krishnamurthy and Vissing-Jorgenson, JPE

Equilibrium

Market Clearing:

$$d_t = D_t$$

$$e_t = E_t + E_t^F$$

$$\bar{B} = B_t + b_t$$

$$K_t = L_t + L_t^{NB}$$

$$H_t = 1$$

$$F(K_t, 1) - \xi\sigma_t L_t + (1-\delta)K_t = c_t + K_{t+1} + \varphi L_t^{NB} + \psi_t + T$$

Given a government policy γ, λ, $\bar{B}$, and T, an equilibrium is defined as a path of consumption, capital, deposits, equity an bond holdings, bank loans and financial returns, for t = 0,1,2,… such that:

1. Households, banks and nonfinancial firms all solve their maximization problems, described above, with taxes set according to the balanced budget constraint; and
2. All markets clear.

2. Gross Welfare Cost of the Policy Tools

Methodology:

1. Guess a ***constrained social planner's*** problem with the liquidity and capital requirements.
2. Verify that it ***replicates*** the decentralized equilibrium.
3. Differentiate the value of the problem (= ***welfare***) with respect to λ or γ.
4. Use optimality conditions *of the decentralized equilibrium* to express the marginal welfare cost in terms of ***observable sufficient statistics***.

Welfare Cost of Bank Capital Requirements

From: Van den Heuvel (2008)

$\nu_{CAP} \times 0.1$ in %

	$g_D = 0$	$g_D = g / D$
Sub-Debt (93-04)	0.22	0.10
Total Assets (86-04)	1.09	0.94
Risk adjusted	*0.85*	*0.71*
Total Loans (86-04)	1.36	1.22
Risk adjusted	*1.02*	*0.88*

Effect of the Capital Requirement on Steady State Income

Capital requirement affects capital stock even in steady state, in contrast to inflation in the Sidrauski model.

Example:

$$g \equiv 0$$

$$u(c,d) = \tilde{u}\left(\left\{ c^{(\eta-1)/\eta} + ad^{(\eta-1)/\eta} \right\}^{\eta/(\eta-1)} \right)$$

$$\Rightarrow \quad d_t = a^{\eta} c_t (R_t^E - R_t^D)^{-\eta}$$

K^* is increasing (decreasing) in γ if $0 < \eta < 1$ $(\eta > 1)$

Intuition: $$MPK = R^L = \underbrace{R^E}_{\beta^{-1}} - (1-\gamma)(R^E - R^D)$$

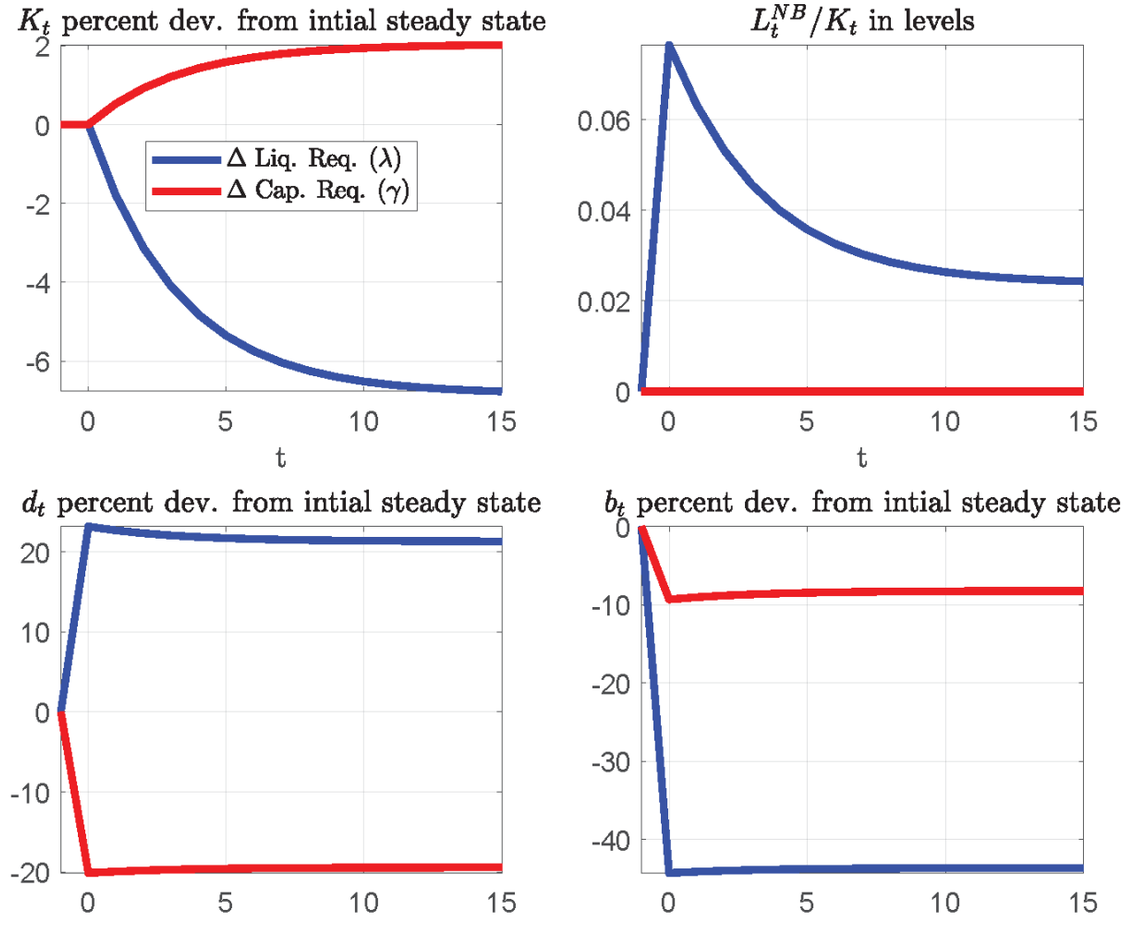
Equilibrium with Capital and Liquidity Regulation

- **Capital** requirement typically binds due to convenience yield on deposits.

- **Liquidity** requirement may or may not bind, depending on relative convenience yields of bank deposits and government bonds.

Equilibrium with Capital and Liquidity Regulation

- **Investment** is affected by *both* the capital requirement and the liquidity requirement, if binding.
  ($R^L = \gamma R^E + (1-\gamma)\tilde{R}^D(\lambda)$)
- Binding liquidity requirement leads **government bonds** to flow out of nonbanks → convenience yield rises.
- Possibility of **disintermediation of banks** (shadow banking?)
- More likely if demand for safe, liquid assets is high relative to supply.



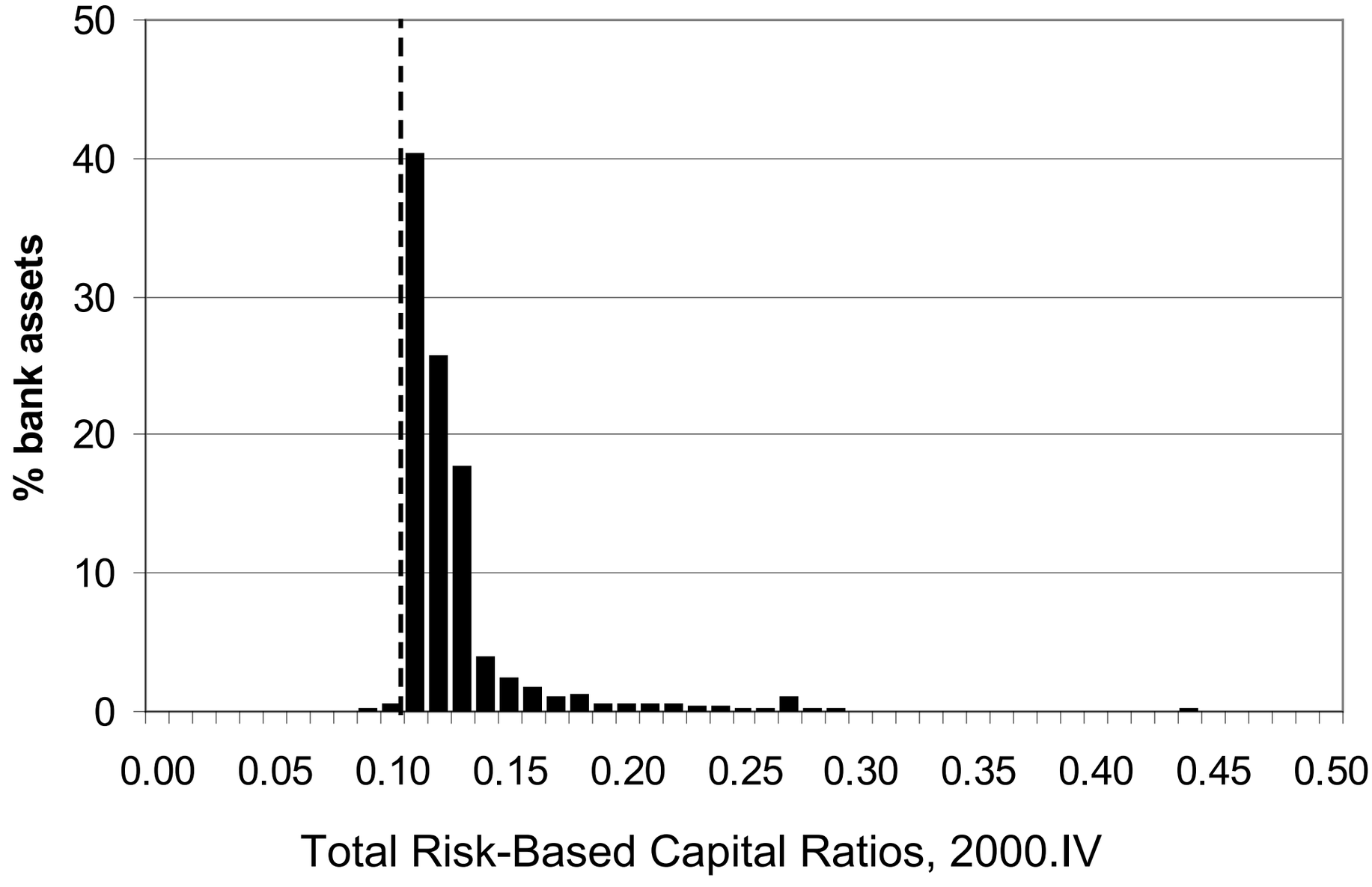
Narrow Banking

Interpret narrow banking as:

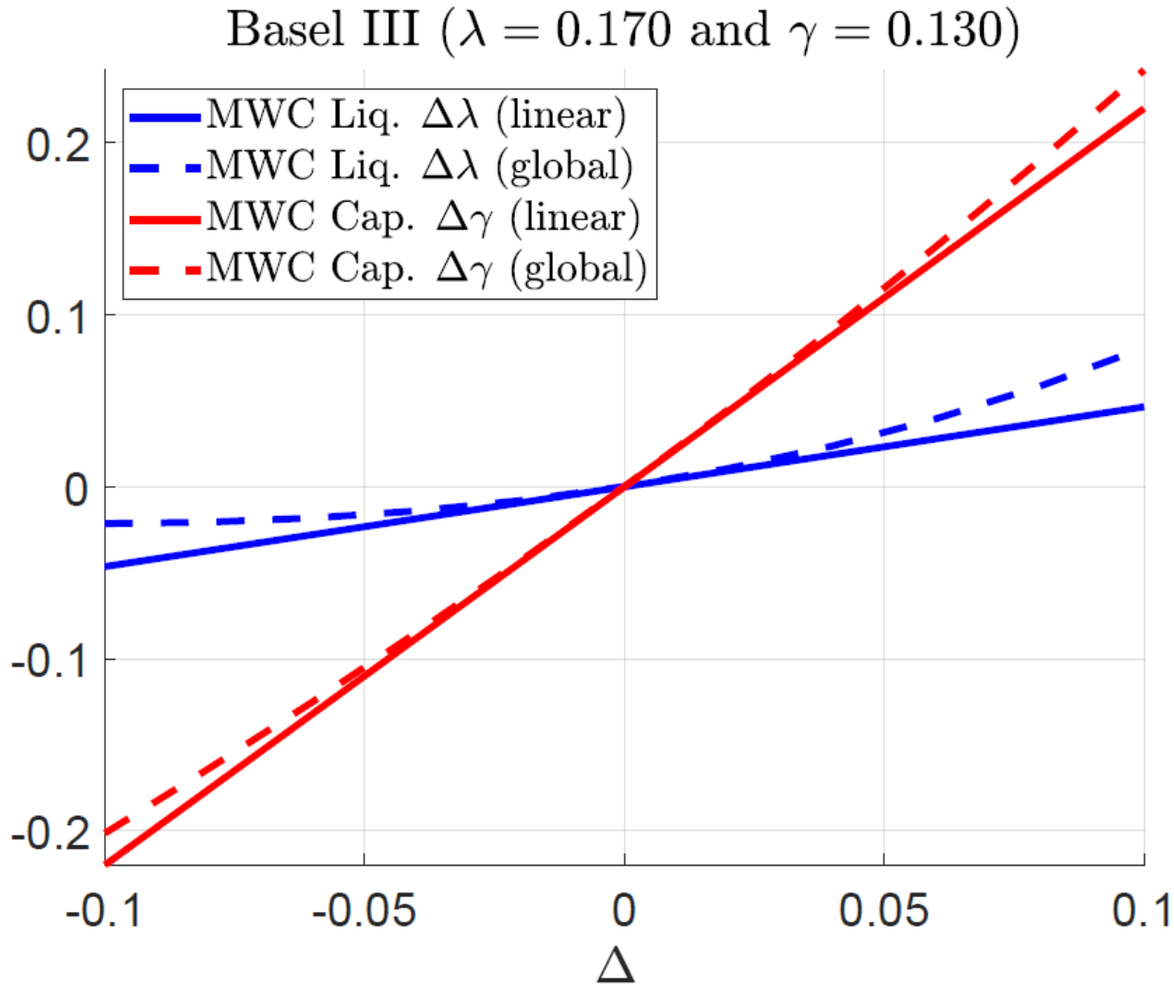
- Deposits fully invested in government bonds: $\lambda = 1$
- Loans made by finance companies without deposits: $\gamma = 1$

Welfare cost $\approx 2.4\%$ of consumption

[3.0% without linear approximation, based on global solution of fully calibrated model]


50
40
30
20
10
0
% bank assets
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0.40
0.45
0.50
Total Risk-Based Capital Ratios, 2000.IV

First-order approximate and exact welfare costs



Marginal welfare costs when economy is not currently in steady state

$$\nu_{Liq} = \sum_{t=0}^{\infty} \varpi_t \frac{d_t}{c_t} \left\{ R_t^D - R_t^B + g_D(d_t, L_t) \right\} \frac{1}{1-\lambda}$$

$$\nu_{Cap} = \sum_{t=0}^{\infty} \varpi_t \frac{L_t}{c_t} \left\{ R_t^E - \tilde{R}_t^D(\lambda) - \frac{g_D(d_t, L_t)}{1-\lambda} \right\}$$

with

$$\varpi_t \equiv \frac{\beta^t u_c(c_t, d_t, b_t) c_t}{\sum_{s=0}^{\infty} \beta^s u_c(c_s, d_s, b_s) c_s}$$

Bank Risk and Benefits of Regulation

Total deadweight resolution costs are:

$$\Psi_t = p_{F,t}\psi L_t$$

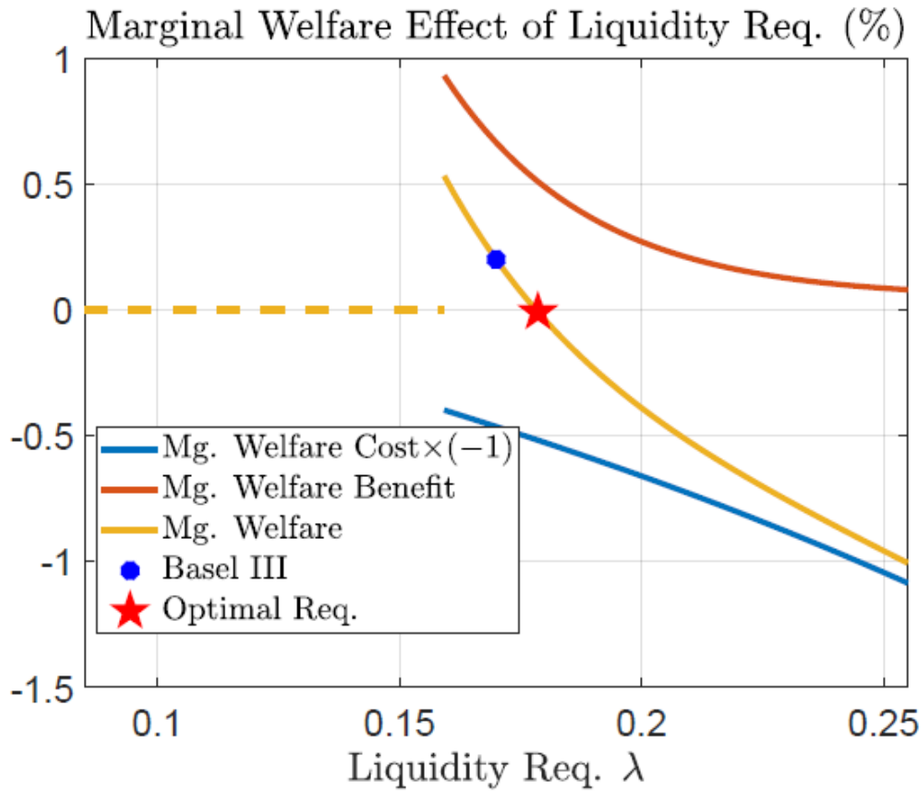
And lump-sum taxes are:

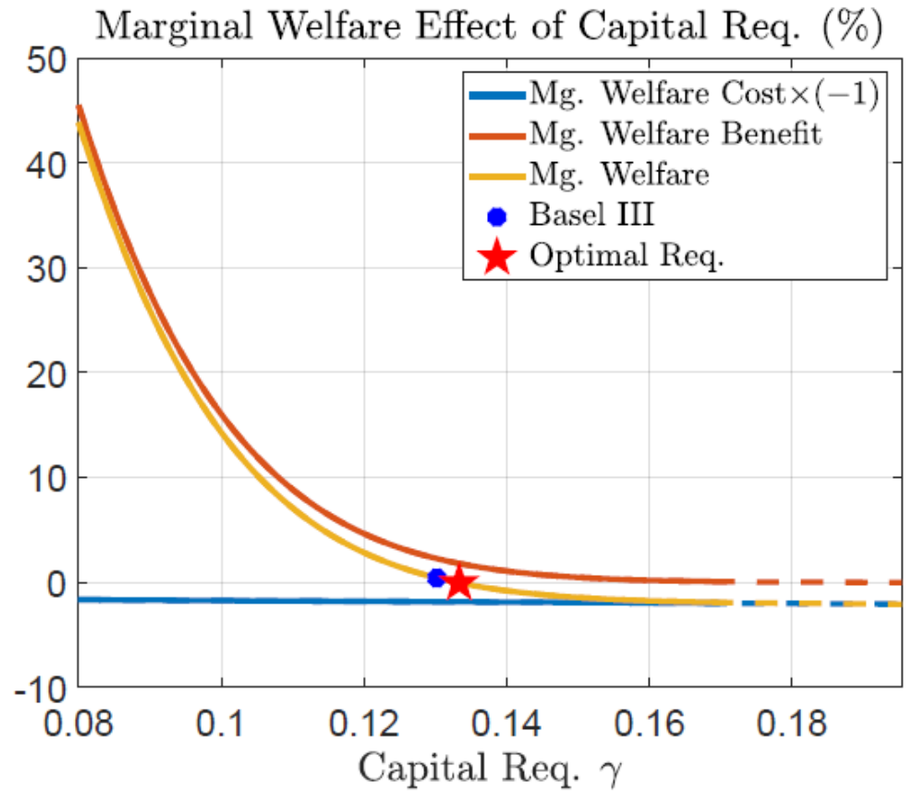
$$T_t = (R_t^B - 1)\bar{B} + \Psi_t - (1 - F_w(\bar{w}_t))r_{L,t}L_t - F_w(\bar{w}_t)\int_{\underline{\varepsilon}}^{-r_{L,t}} (r_{L,t} + \varepsilon))L_t dF_\varepsilon(\varepsilon)$$

Calibration: parameter values

		Value (different targets)		
		Basel III d_{ss}/c_{ss} (1)	Basel III L_{ss}/c_{ss} (2)	
Parameter				*Source*
γ_{Pre}	Cap. Req. pre-Basel	0.098	0.098	
λ_{Pre}	Liq. Req. pre-Basel	0	0	
γ	Cap. Req.	0.130	0.130	
λ	Liq. Req.	0.170	0.170	
α_K	Capital share	0.30		Standard
δ	Depreciation rate	0.12		Standard
n_D	Mg. cost deposits	0.0122		Measured in section 5
n_L	Mg. cost loans	0.019	0.018	Calibrated
A	TFP	21.58	21.55	Calibrated
β	Discount factor	1/1.06		Standard
σ_u	U risk aversion	2.0		Begenau and Landvoigt (2022)
σ_v	V risk aversion	1.6		Begenau and Landvoigt (2022)
e	CES liq. pref	1.25		Begenau and Landvoigt (2022)
a	CES liq. pref	0.373	0.305	Calibrated
φ	Mixed finance cost	0.0008	0.0001	Calibrated
θ_v	Ut. coeff. liquidity	0.016	0.017	Calibrated
ψ	Resolution cost	0.32	0.32	Calibrated
σ_ϵ	S.D. credit risk	0.044	0.044	Calibrated
$F_w \sim Beta(arg1, arg2)$	Deposit withdrawal dist.	(0.18, 23.51)	(0.18, 23.51)	Calibrated
$\bar{B}$	Gov. bond supply	0.425 Y^*		Measured FRED

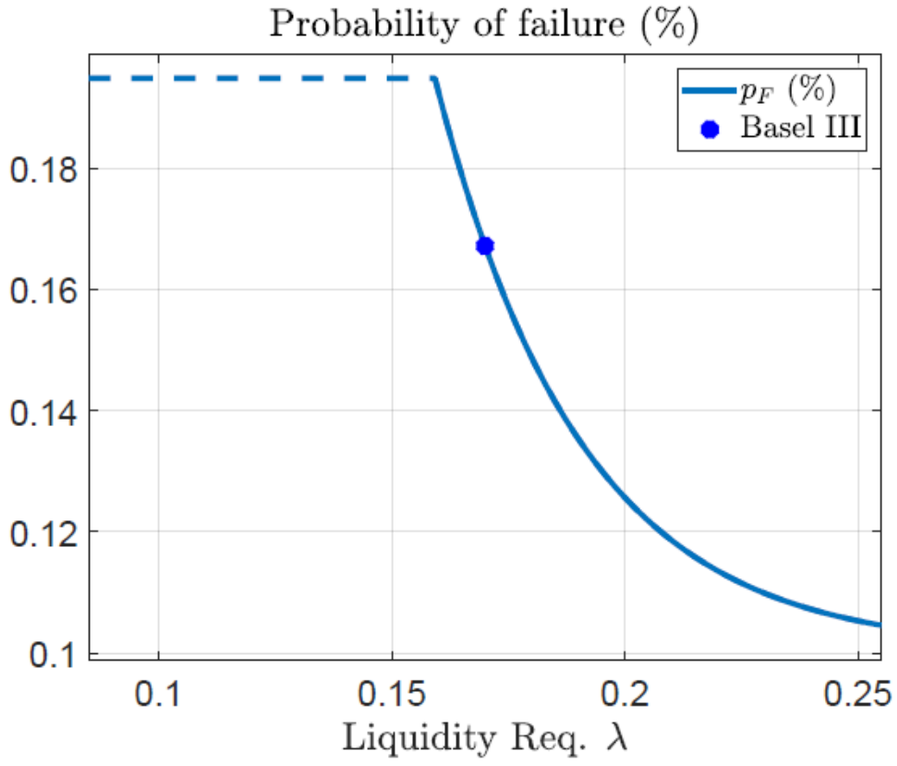
Marginal welfare benefits and costs

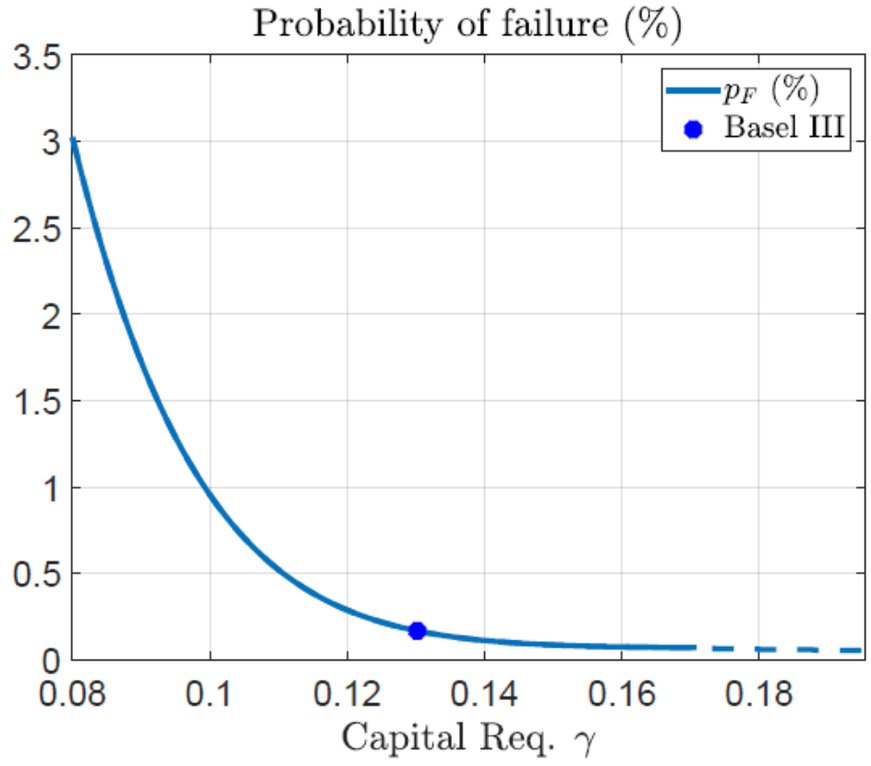




Note: Dashed lines correspond to estimates in which the liquidity constraint is slack.

Bank failure rate





Note: Dashed lines correspond to estimates in which the liquidity constraint is slack.

Optimal requirements: sensitivity analysis

Parameter change	Optimal Policy	
	Liq. Req. (λ^*)	Cap. Req. (γ^*)
$n_d = 0.0080$	0.207	0.130
$n_d = 0.0090$	0.198	0.131
$n_d = 0.0122$ (Baseline)	0.179	0.132
$\psi = 0$	0.116	0.045
$\psi = 0.32$ (Baseline)	0.179	0.132
$\psi = 1.13$ (BCBS (2010) no perm. eff.)	0.209	0.148
$\psi = 3.81$ (BCBS (2010) moderate perm. eff.)	0.237	0.161
$p_F = 0.50\%$ (Elenev et al. (2021))	0.181	0.120
$p_F = 1.07\%$ (Baseline)	0.179	0.132
$p_F = 1.45\%, \psi = 0.27$ (TARP recipients and cost adj. target 19.14%)	0.172	0.134

Note: Estimates are obtained using the calibration in column (1) of Table E1.