Bank of England

Monetary policy,

State-dependent capital requirements

and the role of Non-Bank Financial Intermediaries
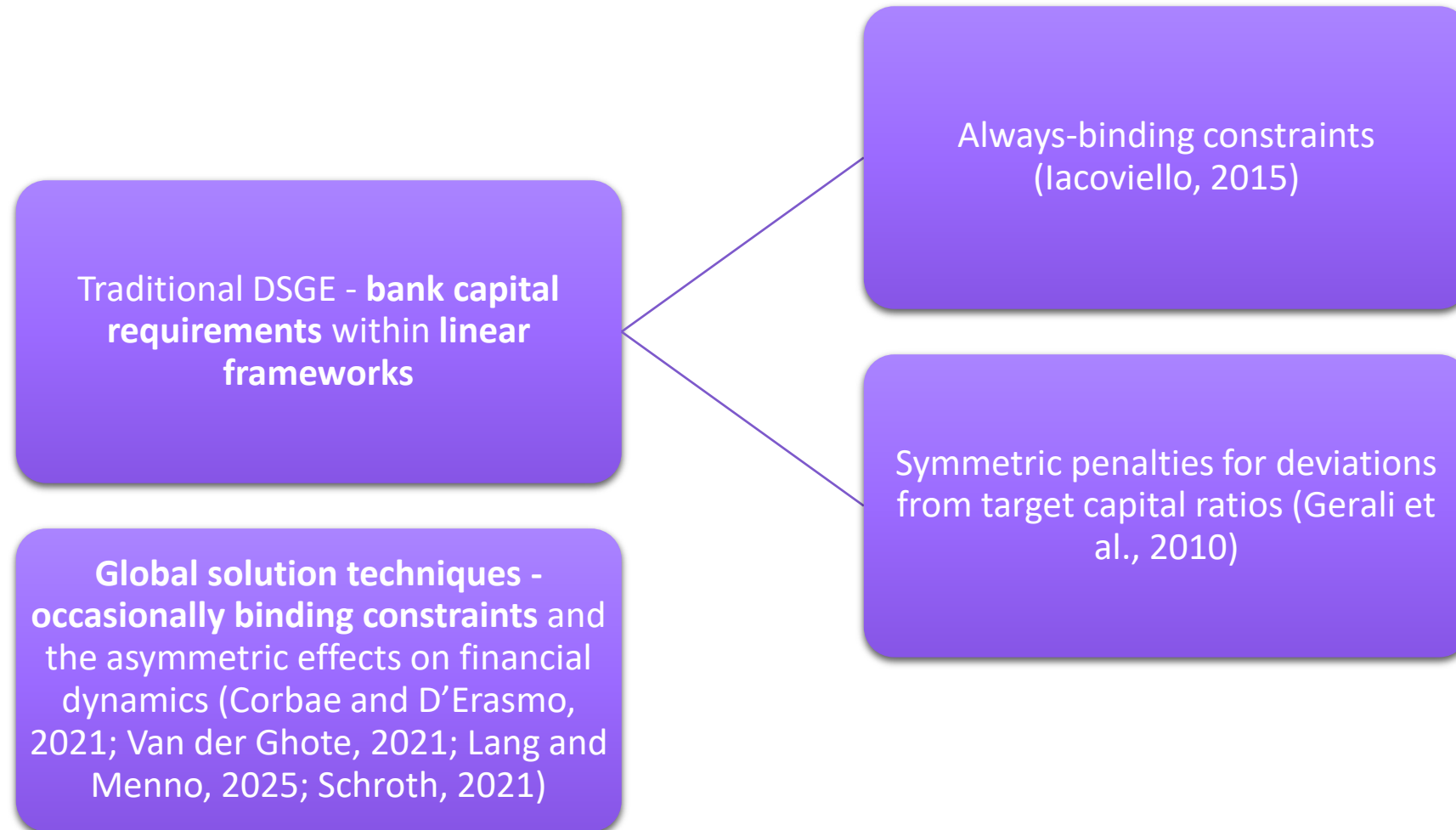
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September 19th, 2025

Theoretical literature on bank capital requirements

Traditional DSGE - **bank capital requirements** within **linear frameworks**

Always-binding constraints (Iacoviello, 2015)

Symmetric penalties for deviations from target capital ratios (Gerali et al., 2010)

Global solution techniques - occasionally binding constraints and the asymmetric effects on financial dynamics (Corbae and D'Erasmo, 2021; Van der Ghote, 2021; Lang and Menno, 2025; Schroth, 2021)

Our paper

State-dependant capital requirement

- Gerali et al. (2010) – capital requirements as adjustment costs;

- We depart from the symmetric specification – **quadratic cost activated only when a bank's capital ratio falls below a regulatory threshold*** [*nonlinear relationship between credit supply and bank capital* – He and Krishnamurthy, 2019; Holden et al., 2020]

  - Loan-deposit spread sensitive to capital shortfall but not surpluses (Bichsel et al., 2022);

  - Banks with ample capital ≈ unconstrained banks

* *deleveraging point* – above the regulatory minimum (***precautionary behavior, Δ*** – banks maintain excess capital to reduce expected costs of future inadequacy) [Karmakar, 2016; Van den Heuvel, 2008]

Regulated commercial banks and non-bank financial institutions

- **Commercial banks** operate under **capital requirements** and benefit from government guarantees (deposit insurance schemes);

- **NBFI** rely on **market discipline** – incentive compatibility constraint (Gertler and Karadi, 2011)

- **Banks' market power in setting interest rates** *vs* perfect competition assumed for NBFIs: commercial banks adjust rates only partially in response to policy shifts

- **Entrepreneurs** access funding from both sectors – externally imposed loan-to-value ratios limiting the amount they can borrow to a portion of collateral (physical capital). Remaining collateral used for borrowing from shadow banks.

- **NBFI lending as long-term bonds** (Sims and Wu, 2021), rather than claims priced identically to capital (Gebauer and Mazelis, 2023)

Road map

The contribution to the transmission channel of a policy rate increase

- Asymmetric capital requirements
- NBFIs

Measurement of tail risk (Aikman et al., 2021) – NBFI *vs* no-NBFI

- Simulating the model multiple times (1,000)
- Averaging across simulations
- Plotting output distribution over time (100 periods)

ZLB scenario

Welfare evaluation

Results

1. **NBFI amplify the contractionary effects** of monetary policy through <u>the **asset price channel**</u>

    *   NBFI market value of bonds ↓
    *   Net worth ↓
    *   Lending capacity ↓

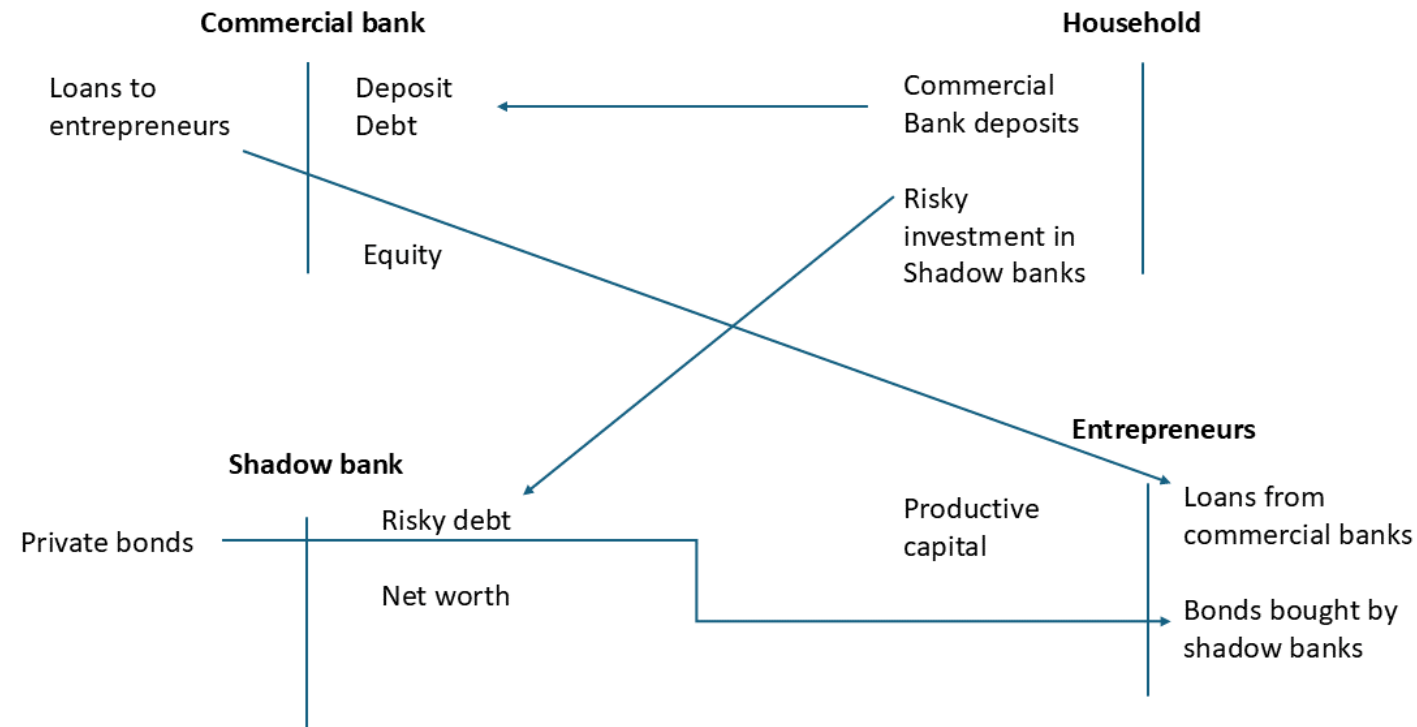   This effect outweighs **the lending competition channel** (Gebauer and Mazelis, 2023).

    TAKEAWAY: Declining bond prices impose leverage constraints that prevent NBFIs from offsetting reductions in bank credit.

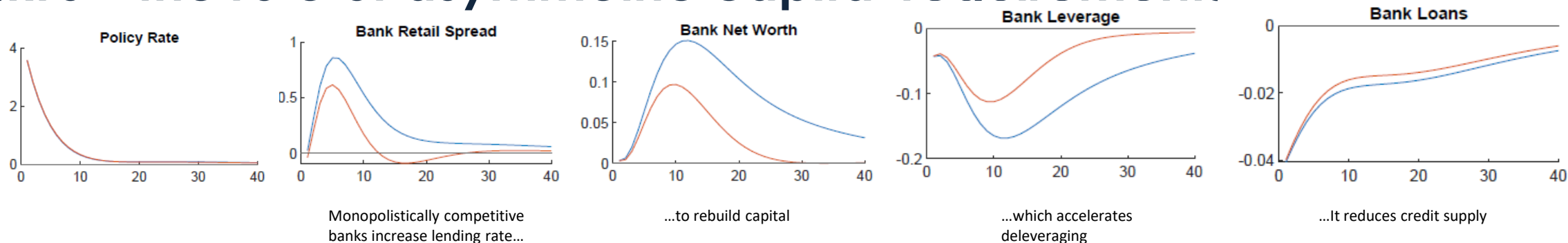2. **The amplification effect is strongest in the left tail of GDP distribution.**

    It remains pronounced under zero lower bound.

3. **Long-run benefits.** A greater share of NBFI lending associated with higher welfare – lower regulatory burdens free resources from adjustment costs.

Overview of model relationships
between agents involved in financial intermediation

IRFs – the role of asymmetric capital requirements

Policy Rate

Bank Retail Spread
Monopolistically competitive
banks increase lending rate…

Bank Net Worth
…to rebuild capital

Bank Leverage
…which accelerates
deleveraging

Bank Loans
…It reduces credit supply

Symmetric Macroprudential Regulation

The increase in spreads is noticeably subdued: the accumulation of capital heightens adjustment costs, discouraging banks from fully raising lending rates
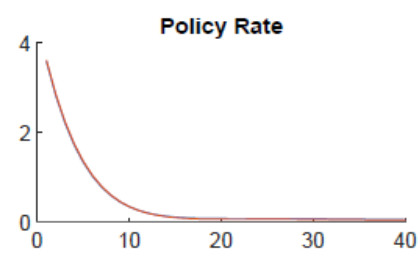
Asymmetric Macroprudential Regulation

Banks face no adjustment costs if capital levels exceed regulatory targets **– lending rates can be raised more aggressively**
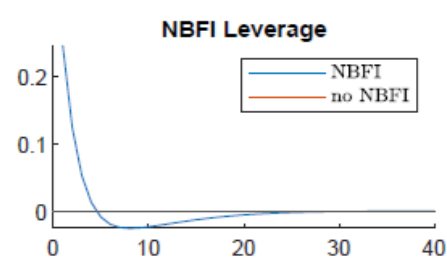
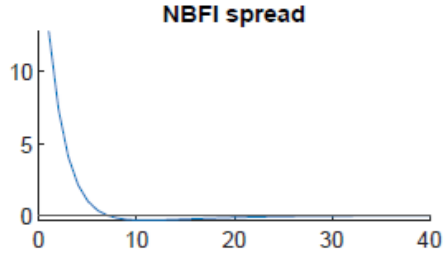Sharper contraction in loans, leverage and output

GDP

IRFs – the role of NBFIs

Policy Rate

NBFI Leverage — NBFI / no NBFI

NBFI spread

NBFI Bonds
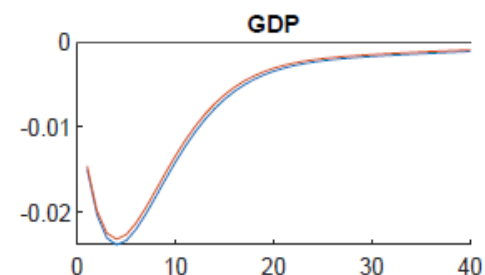
Total funds to Entrepreneurs
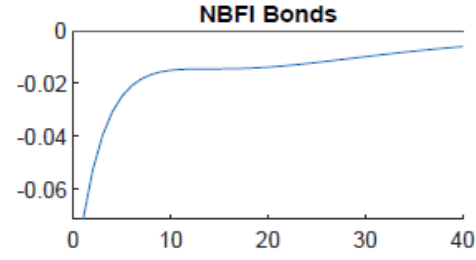
When monetary tightening occurs, Bond prices decline…

NBFI leverage increase suddenly

The heightened leverage constrains NBFI ability to lower interest rate, even when incentive exists.

Reduction in total NBFI lending
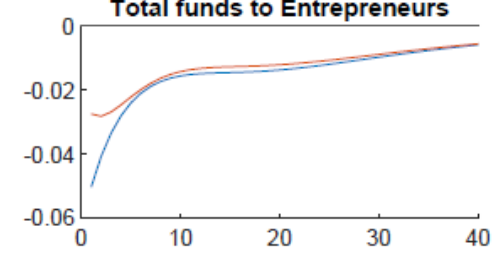
Entrepreneurs find themselves in a less favourable position compared to a scenario where only banks operate.

VS

Gebauer and Mazelis (2023) – when conventional banks reduce lending, NBFIs step in to fill the gap. They do so accepting slimmer intermediation spreads to capture greater market share (**the lending competition channel**)
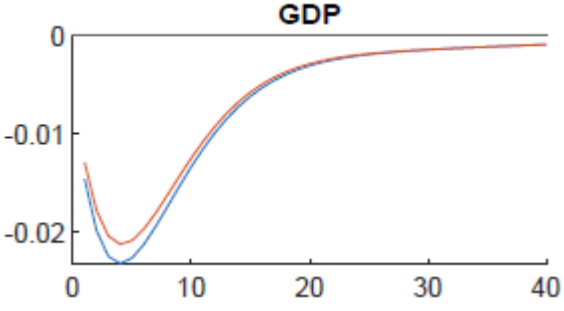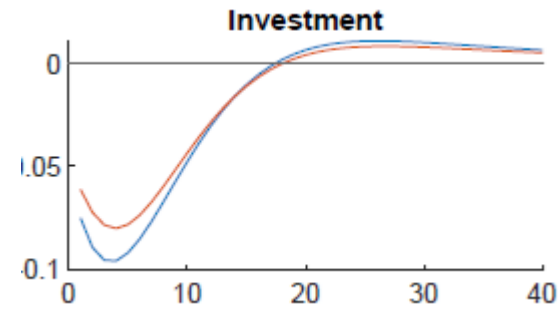

Investment

GDP

NBFI intensify credit squeeze.

NBFI amplify the familiar mechanism of financial accelerator.

GDP-at-risk

Table 3: 5th percentile and median values of the distribution of output deviations from steady state.

	No NBFI	NBFI	diff.
Median, linear	-0.0888%	-0.0986%	-0.0098%
Median, non linear	-0.1687%	-0.1759%	-0.0072%
GaR, linear	-8.8319%	-9.6250%	-0.7931%
GaR, non linear	-9.1712%	-9.9841%	-0.8129%

Note: GDP-at-risk and median values are computed respectively as the 5th and the 50th percentiles of the distribution of output deviations from the steady state over 100 periods, where each period is averaged over 1000 simulations. The non-linear model includes an occasionally binding constraint on bank capital adjustment costs.

- In most previous studies, the gap between the median and the lower quantile (5th percentile) attributed to the non linearity (Forni et al., 2024; Adrian et al., 2020).

- **Our key point**: NBFI introduce a new source of risk beyond the non-linearity already present due to asymmetric macroprudential policies.

GDP-at-risk in a ZLB scenario

Table 4: 5th percentile and median values of the distribution of output deviations from steady state (two OBCs).

|	No NBFI	NBFI	diff.
Median, linear	-0.0373%	-0.0419%	-0.0046%
Median, non linear	-0.3564%	-0.3898%	-0.0334%
GaR, linear	-8.6408%	-9.4130%	-0.7722%
GaR, non linear	-9.0671%	-9.8712%	-0.8041%

Note: GDP-at-risk and median values are computed respectively as the 5th and the 50th percentiles of the distribution of output deviations from the steady state over 100 periods, where each period is averaged over 1000 simulations. The non-linear model includes two occasionally binding constraints on bank capital adjustment costs and on the policy rate.

GDP-at-risk

Figure 4: Probability Density Functions: GDP deviations from steady state
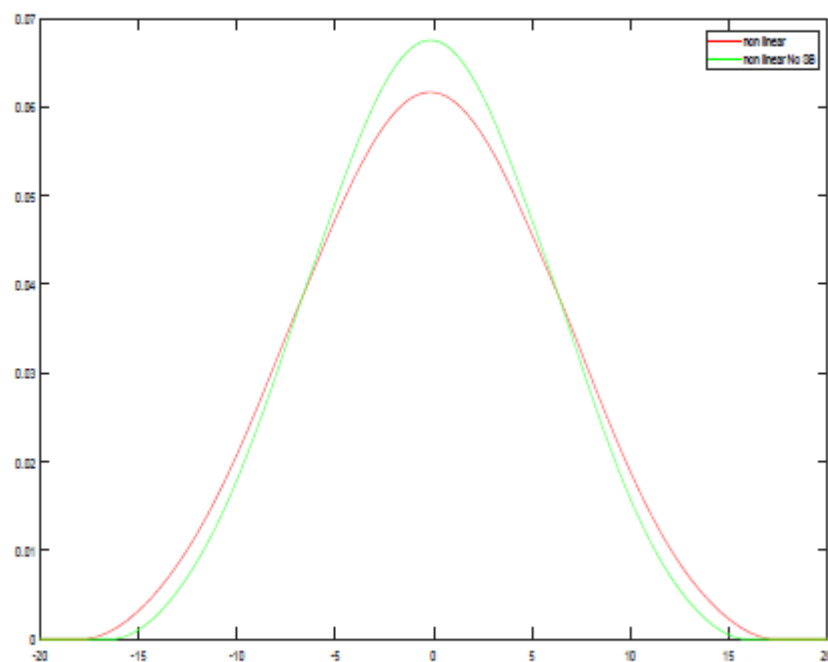
(a) One OBC (asymmetric adj. costs)
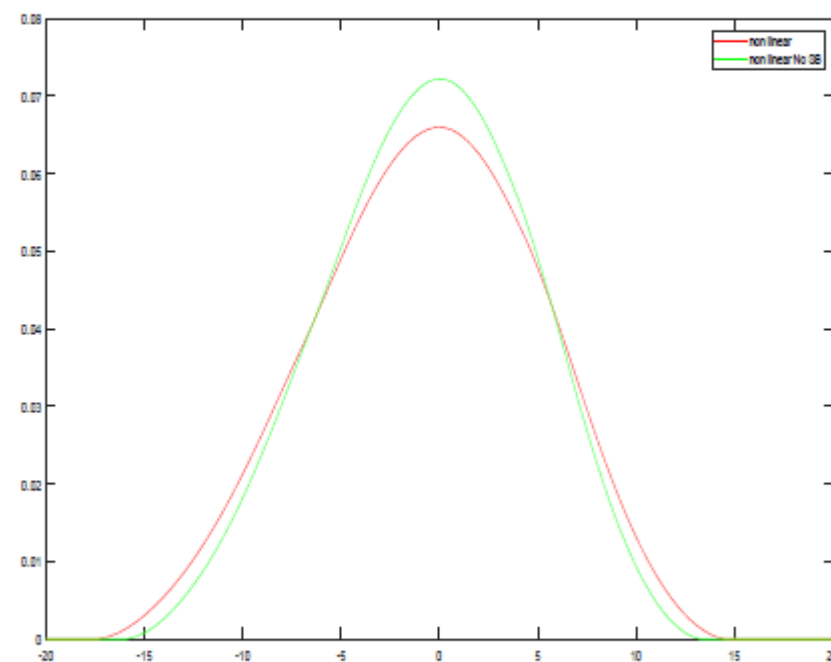
(b) Two OBC (asymmetric adj. costs + ZLB)

Is a capital-constrained banking system more likely to encounter the lower bound?
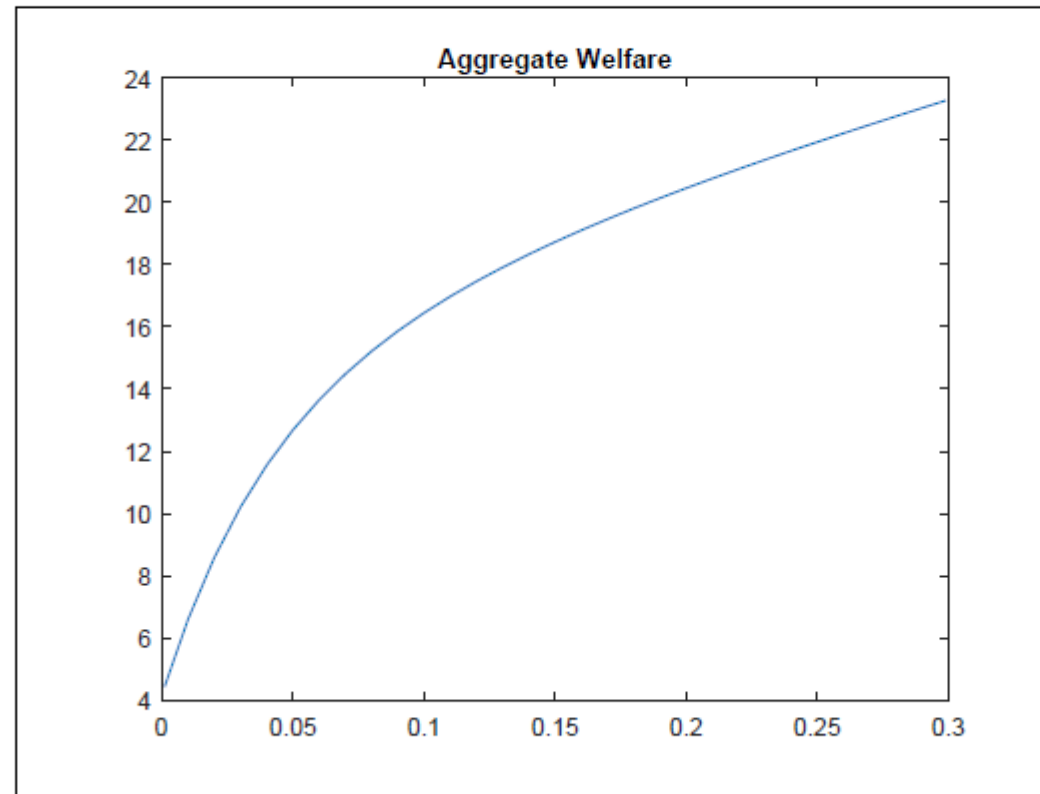
Table 5: Binding likelihood across models

	Banks overcapitalized	Banks undercapitalized	
ZLB binding	8.3%	24.03%	32.33%
ZLB not binding	32.72%	34.95%	67.67%
	41.03%	58.98%	100%

$$\frac{8.3}{41.03} = 20.2 \quad < \quad \frac{24.03}{58.98} = 40.7$$

Welfare analysis

Figure 5: Welfare analysis: aggregate welfare across different combinations of m^s

Concluding remarks

Trade-off

NBFI introduce **short-run vulnerabilities** by amplifying adverse shocks – especially through **the asset price channel**

They simultaneously deliver **long-run welfare gains** through reduced regulatory burden and enhanced resource allocation.

Short-term resilience ⟷ *Long-term prosperity*

Monitoring the feedback loops

Monetary interventions

Regulatory policy ⟷ Structural composition of the financial sector