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BANKS AND THE MACROECONOMIC TRANSMISSION OF INTEREST-RATE RISK

EUROPEAN CENTRAL BANK

EUROSYSTEM

Banks and the Macroeconomic Transmission of Interest-Rate Risk

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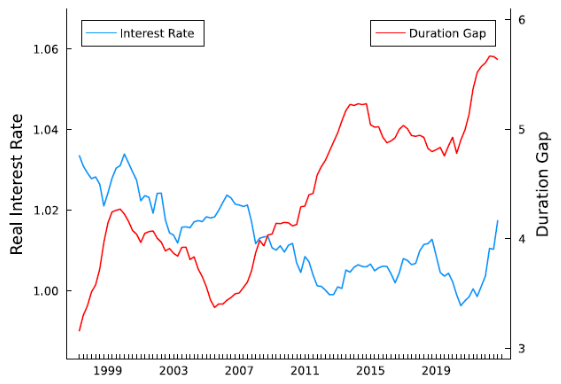
Motivation

Recent **monetary tightening** revealed significant exposure of US banks to interest-rate risk (IRR)

- ▶ balance-sheet losses, bank failures, credit slowdown

Balance-sheets increasingly sensitive to interest-rate changes

- ▶ average **duration gap** raised steadily over last decade



What are the implications and drivers of banks' IRR exposures?
How does bank regulation affect incentives to take-on IRR?

Data

Consolidated Reports of Condition and Income (Call Reports):

- ▶ assets and liabilities by maturity, m_j, between 1997-2022

$$\text{Duration Gap}_{i,t} = \sum_{j\in\mathcal{A}} m_j \frac{\text{Asset}_{j,i,t}}{\sum_{j\in\mathcal{A}} \text{Asset}_{j,i,t}} - \sum_{j\in\mathcal{L}} m_j \frac{\text{Liabilities}_{j,i,t}}{\sum_{j\in\mathcal{L}} \text{Liabilities}_{j,i,t}}$$

FR-Y-9C (BHC quarterly filings) merged to CRSP

Monetary policy shocks

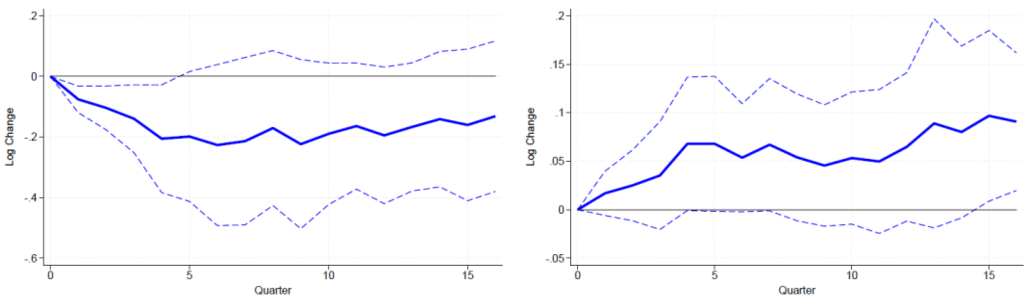
- ▶ series from Bu et al. 2021 and Nakamura-Steinsson 2014

Duration and Interests Rates

Impulse response of duration gaps to monetary policy shocks

- ▶ estimate average and heterogenous effects w.r.t leverage

$$\Delta log\ \text{Duration Gap}_{i,t+h} = \beta_0^h \Delta R_t + \beta_1^h \left(l_{i,t-1} - E_i\left[l_{i,t}\right]\right)\Delta R_t + \Gamma_1^h \mathbf{X}_{i,t-1} + \alpha_i^h + \epsilon_{i,t}$$



(a) Average (β_0^h) (b) Heterogeneity (β_1^h)

Fact 1 – Surprise interest-rate cut increases duration gaps
Fact 2 – More leveraged banks less responsive

Model

GE model with **endogenous interest-rate-risk exposure**

A continuum of banks

- ▶ invest in short- and long-duration assets
- ▶ face financial frictions (no-equity issuance + default risk)
- ▶ are heterogenous due to idiosyncratic risk

Bank net worth

$$n = \left[\underbrace{R^K - \overbrace{h\left(\frac{k^l}{k^s+k^l}\right)}^{\text{holding cost}}}_{\text{int. rate insensitive}} + \underbrace{(1-\delta)\omega\frac{k^l}{k^s+k^l}\overbrace{Q(\mathbf{S})}^{\text{asset price}}}_{\text{int. rate sensitive}}\right]\left(k^s+k^l\right) - \underbrace{b}_{\text{debt}}$$

- ▶ asset price fluctuates with level of interest rate
- ▶ portfolio share governs interest-rate-risk exposure

Optimal portfolio share given by

$$\underbrace{\mathbb{E}_{\omega',\mathbf{S}'|\mathbf{S}}\left[(1-\delta)\omega' Q(\mathbf{S}')\right]}_{\text{expected asset value}} + \underbrace{\frac{\text{Cov}\left((1-\delta)\omega' Q(\mathbf{S}'), \iota(\mathbf{s}',\mathbf{S}')\left(1+\lambda(\mathbf{s}',\mathbf{S}')\right)\right)}{\mathbb{E}_{\omega',\mathbf{S}'|\mathbf{S}}\left[\iota(\mathbf{s}',\mathbf{S}')\left(1+\lambda(\mathbf{s}',\mathbf{S}')\right)\right]}}_{\text{risk-premium }(<0)} \approx \underbrace{h'\left(\frac{k^{l'}}{k^{s'}+k^{l'}}\right)}_{\text{marginal cost}}$$

- ▶ $\iota(\mathbf{s}',\mathbf{S}')$: repayment indicator; $\lambda(\mathbf{s}',\mathbf{S}')$: shadow value of net worth

Testable implications

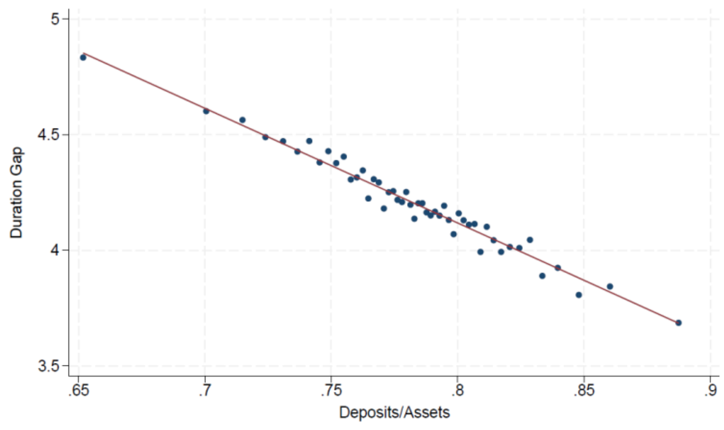
Aggregate: low interest rate → high long-term asset share

- ▶ banks experience capital gains, lower risk premium
- ▶ expect high asset value next period (if shock persistent)

Cross-section: low leverage → high long-term asset share

- ▶ low-leverage banks less constrained, lower risk-premium

Duration and Leverage



Fact 3 - Less leveraged banks have higher duration gaps

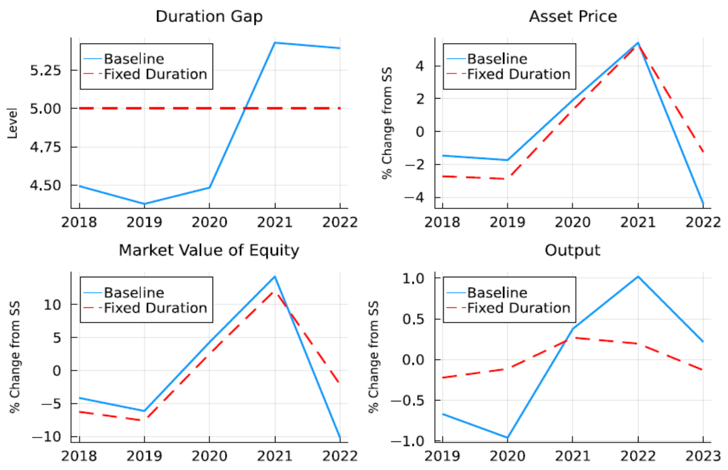
Aggregate Implications

Calibrate model to fit aggregate and cross-sectional banking moments, then feed with sequence of interest rates from data starting in 2003

- ▶ reproduce untargeted increase in banks' duration gaps prior to tightening
- ▶ generate asset-price contraction in line with empirical counterpart

What is the role of endogenous duration adjustments for macro dynamics?

- ▶ compute counterfactual where long-term-asset share kept constant
- ▶ account for **30% of asset-price decline** and **40% of equity losses**



Policy Counterfactuals

Model features inefficiencies:

- ▶ pecuniary externality + deposit insurance

Use model to conduct two policy counterfactuals

Short-term liquidity requirement

$$\frac{k^{l'}}{k^{s'}+k^{l'}} \leq \theta$$

- ▶ limit ability of banks to invest in long-term assets
- ▶ effective in mitigating effects of interest-rate hike

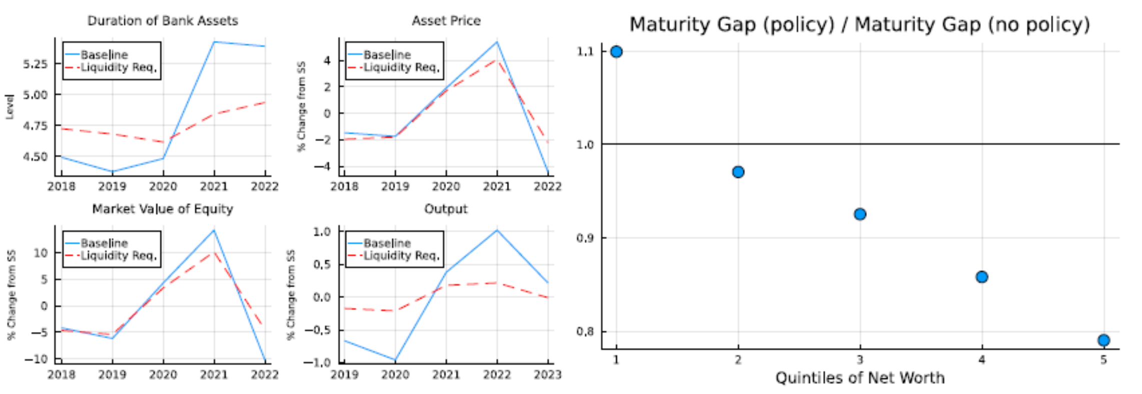
Leverage requirement

$$b' \leq \xi\left(k^{s'}+k^{l'}\right)$$

- ▶ limit ability of banks to leverage
- ▶ worsens impact of tightening by redistributing risk

Heterogenous effects important to understand aggregate impact of policies

Liquidity Requirement



Capital Requirement