

Monetary Tightening and U.S. Bank Fragility

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Motivation

- ❑ Banks engage in maturity transformation
- ❑ They finance long duration assets with short-term deposits
- ❑ As interest rates rise, the value of a bank's assets can decline, potentially leading to bank failure through two broad, but related channels
 - First, if a bank's liabilities exceed the value of its assets, it may become insolvent
 - Especially for banks that need to increase deposit rates as rates rise (e.g., S & L crisis)
 - Second, the uninsured depositors may become concerned about potential losses and withdraw their funds, causing an insolvency bank run

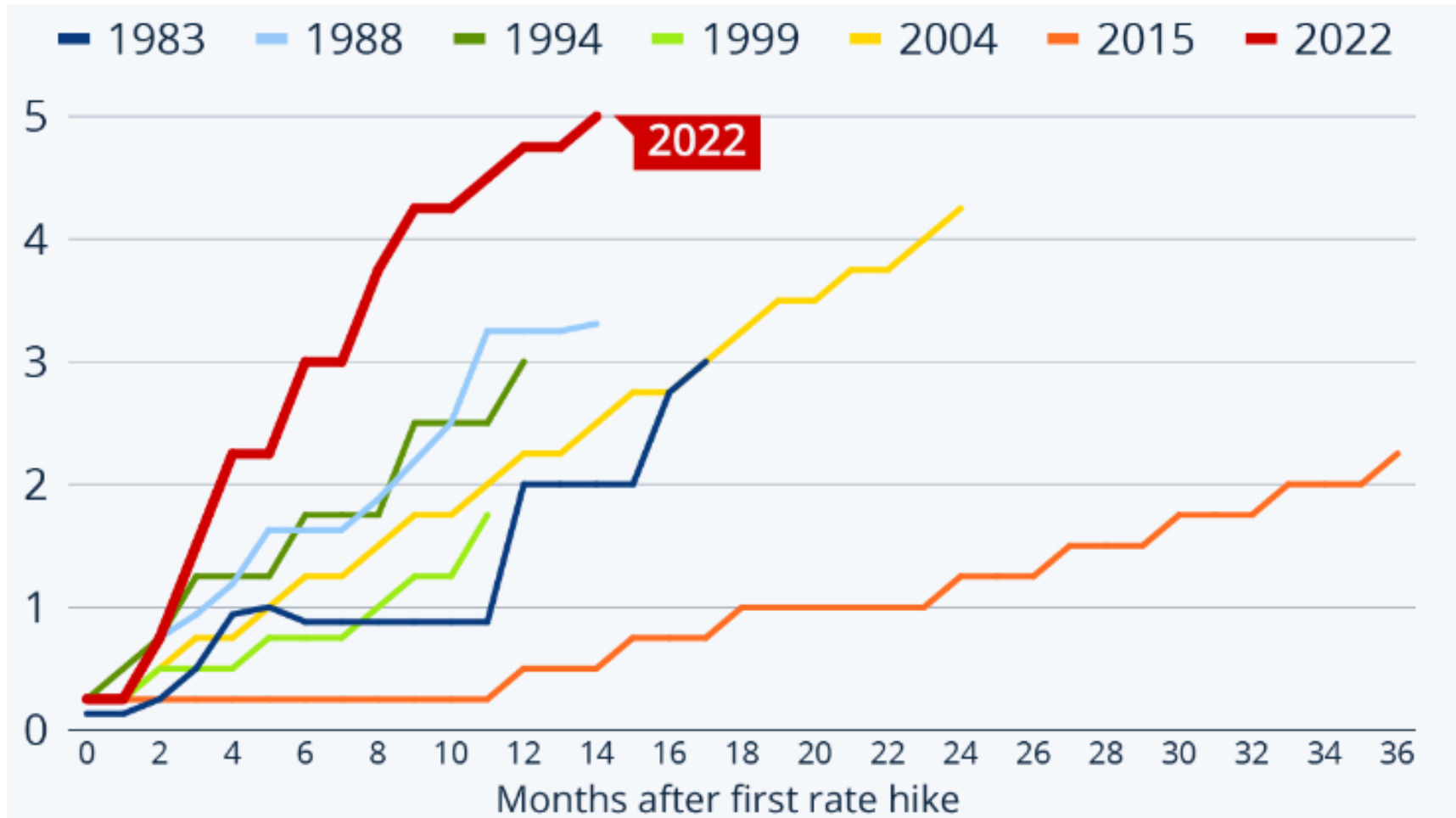
Main Question

- How exposed are banks to interest rate risk in practice?
 - “Deposit franchise” can hedge part of the banks’ exposure to rate risk?
 - Low deposit rates, insured depositors may not care about bank risk
 - But runnable “uninsured” debt can lead to bank insolvency (Jiang et al. 2020)?
 - Half of banks deposits are uninsured, providing \$9 trillion in debt funding

- Answer to this question has important implications
 - Banks stability
 - Impact on real economy (“credit channel”)
 - Constraints on monetary policy
 - Financial regulation

- We analyze the U.S. banks’ exposure to a recent rise in interest rates

Our Focus: Recent Monetary Tightening



Source: U.S. Federal Reserve

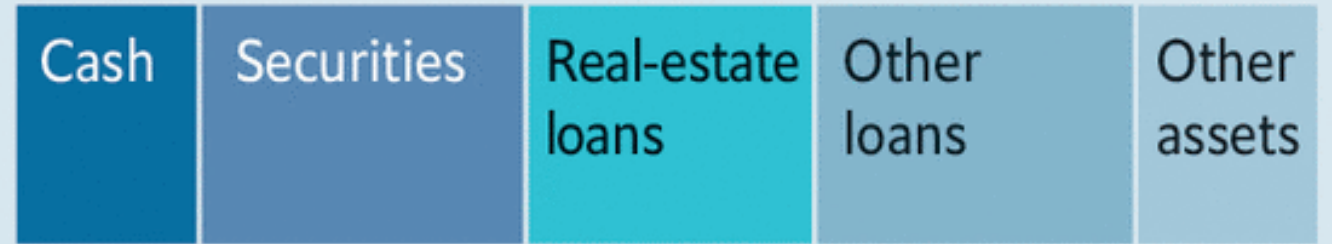
US Banking

- 4,844 banks
- Assets: \$24 Trillion
- Highly levered:
 - $\text{Equity/Asset} = 10\%$

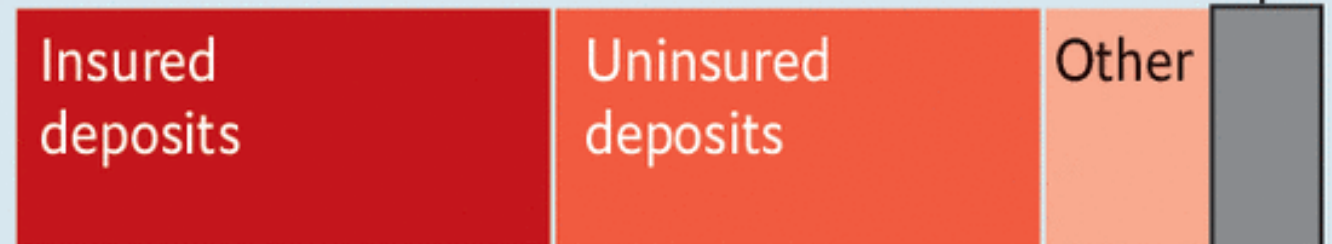
Between the balance-sheets

US banks, aggregate balance-sheet, Q1 2022, \$trn

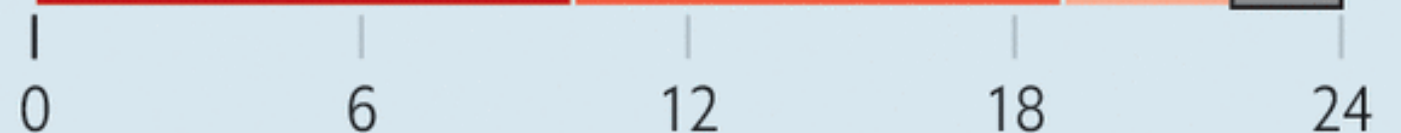
Total assets



Total liabilities



Total equity



Main Findings (March 13)

- We analyze the U.S. banks' asset exposure to a recent rise in the interest rates
 - Banks assets declined \$2.2 trillion in value during a recent monetary tightening
 - This decline in asset values was largely unhedged with interest rate derivatives
 - The decline in the order of pre-existing bank capitalization ($E/A = 10\%$, $A = \$24$ trillion)

Main Findings (March 13)

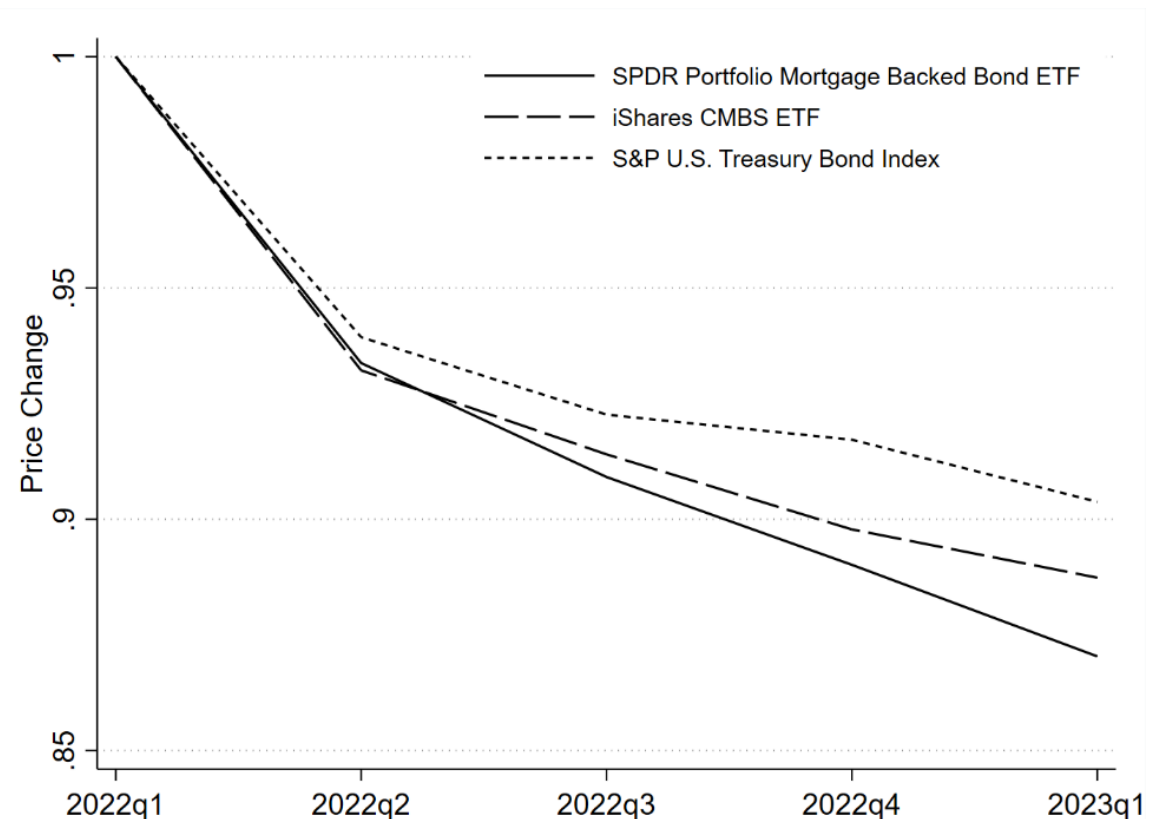
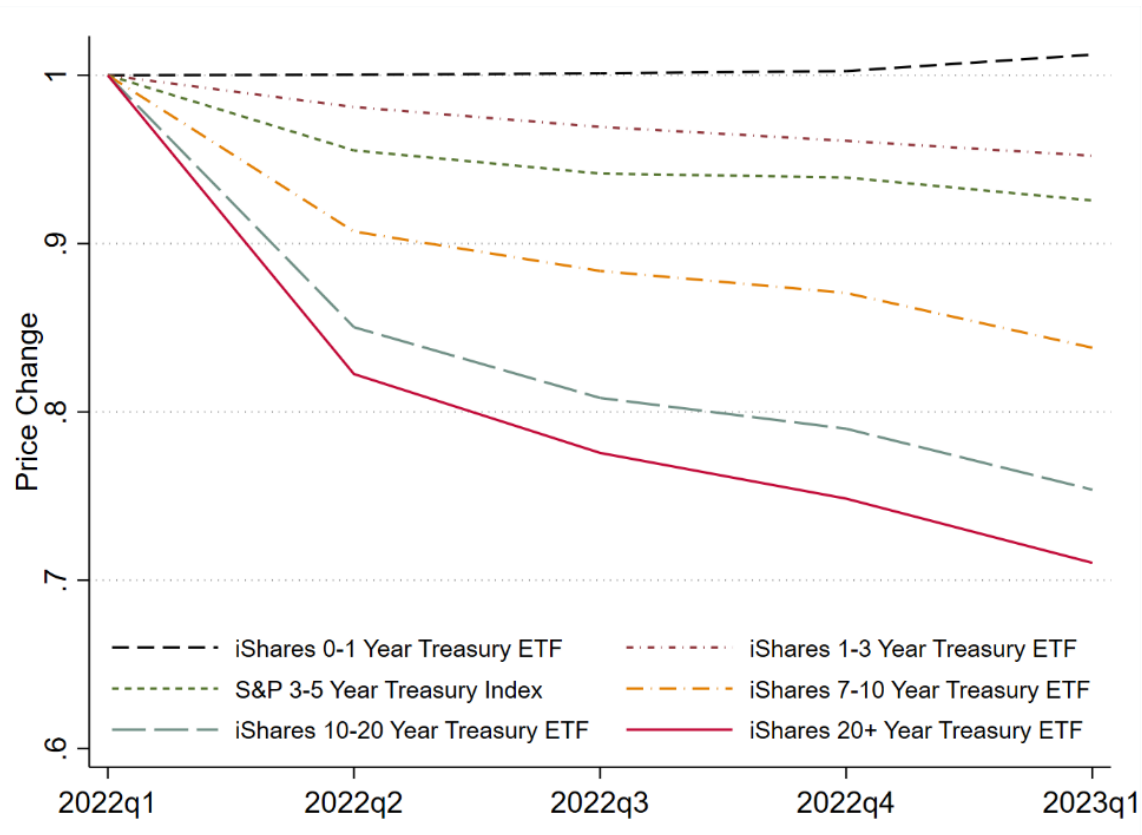
- ❑ We show that bank's uninsured leverage is the key driver of bank insolvency risk
 - *Model*
 - If interest rate increases sufficiently, a run equilibrium leading to insolvency possible
 - Banks with **higher uninsured leverage** and **lower capitalization** at **higher risk**
 - *Empirical Analysis*
 - Half of uninsured deposits withdraw: **186 banks insolvent with assets of \$300 billion**
 - All uninsured depositors withdraw: **+1,600 banks at risk with assets of \$4.9 trillion**
- ❑ Overall, recent rate increases significantly increased bank insolvency risk
 - This also eroded the banks' ability to withstand adverse credit events (CRE distress)

Marking-to-Market Bank Assets

□ Mark to market banks' securities & loans using their maturity and market prices

○ ~80% of banks' total assets

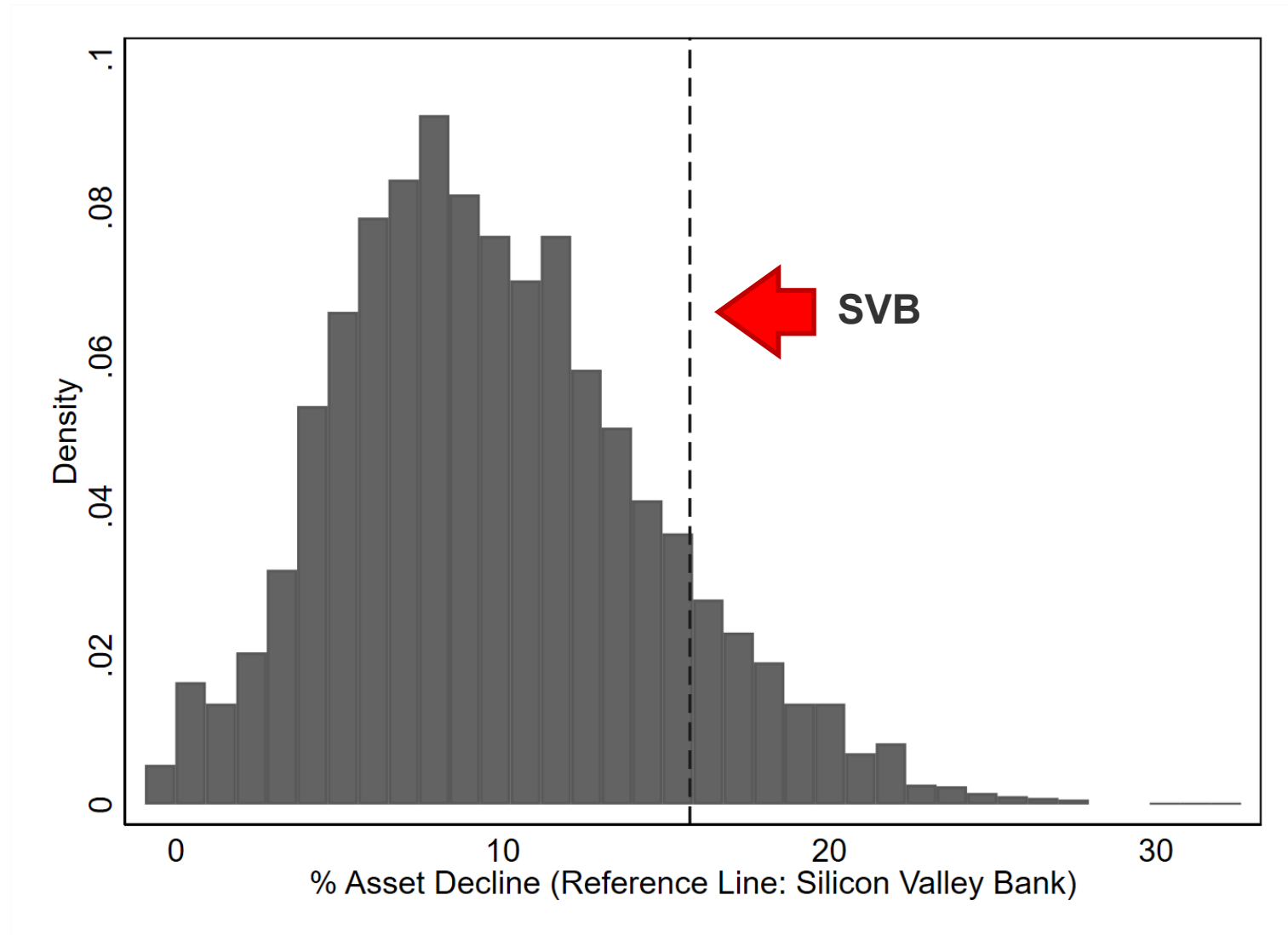
○ Longer maturity assets more affected by interest rate increase



Mark-to-Market Losses

- ❑ Aggregate decline in the value of banks' assets: 2.2 Trillion!
 - 10% of bank assets, close to pre-tightening aggregate bank capitalization
- ❑ Largest for regional (mid-sized) banks as % of banks' assets

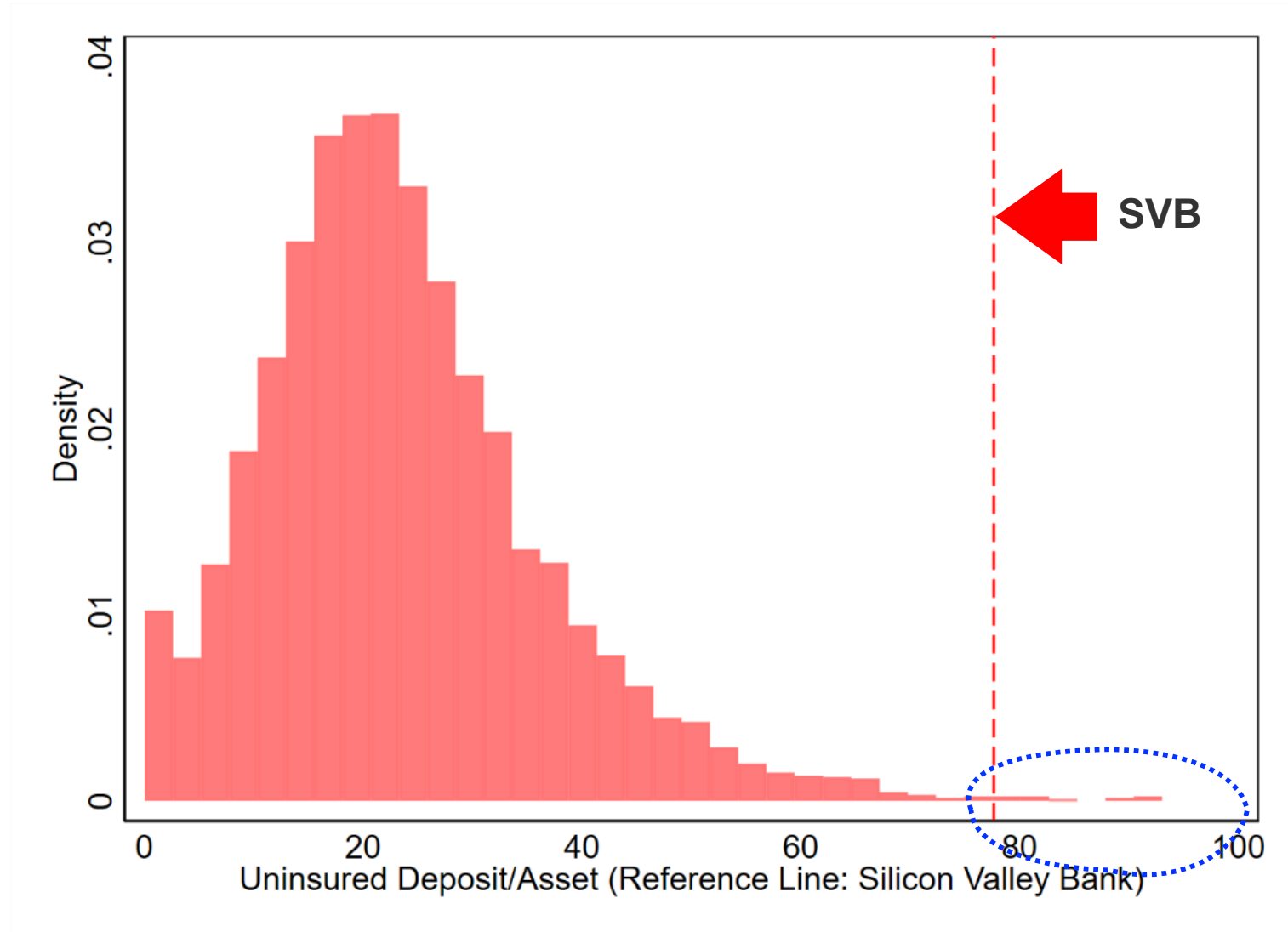
Banks' Unrealized Losses



□ 10% of banks have worse MTM losses than SVB (16%)

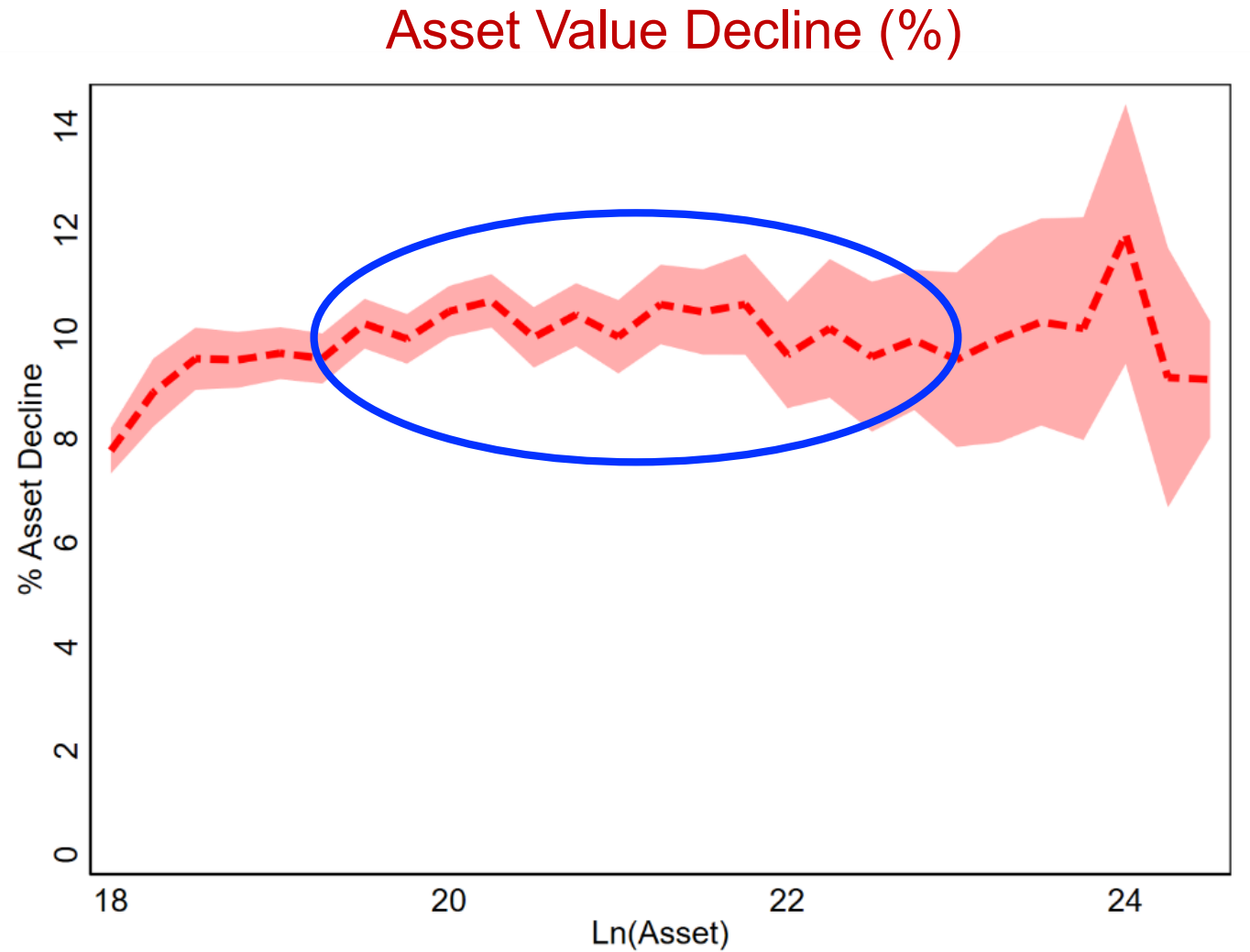
→ *If SVB failed because of losses alone, more than 500 other banks should also have failed*

Uninsured Leverage



❑ Less than 1% banks have higher uninsured leverage ratio than SVB

Banks' Unrealized Losses & Bank Size



Bank Size

- ❑ Asset declines largest for regional mid-sized banks

Did Banks Hedge their Rate Exposure?

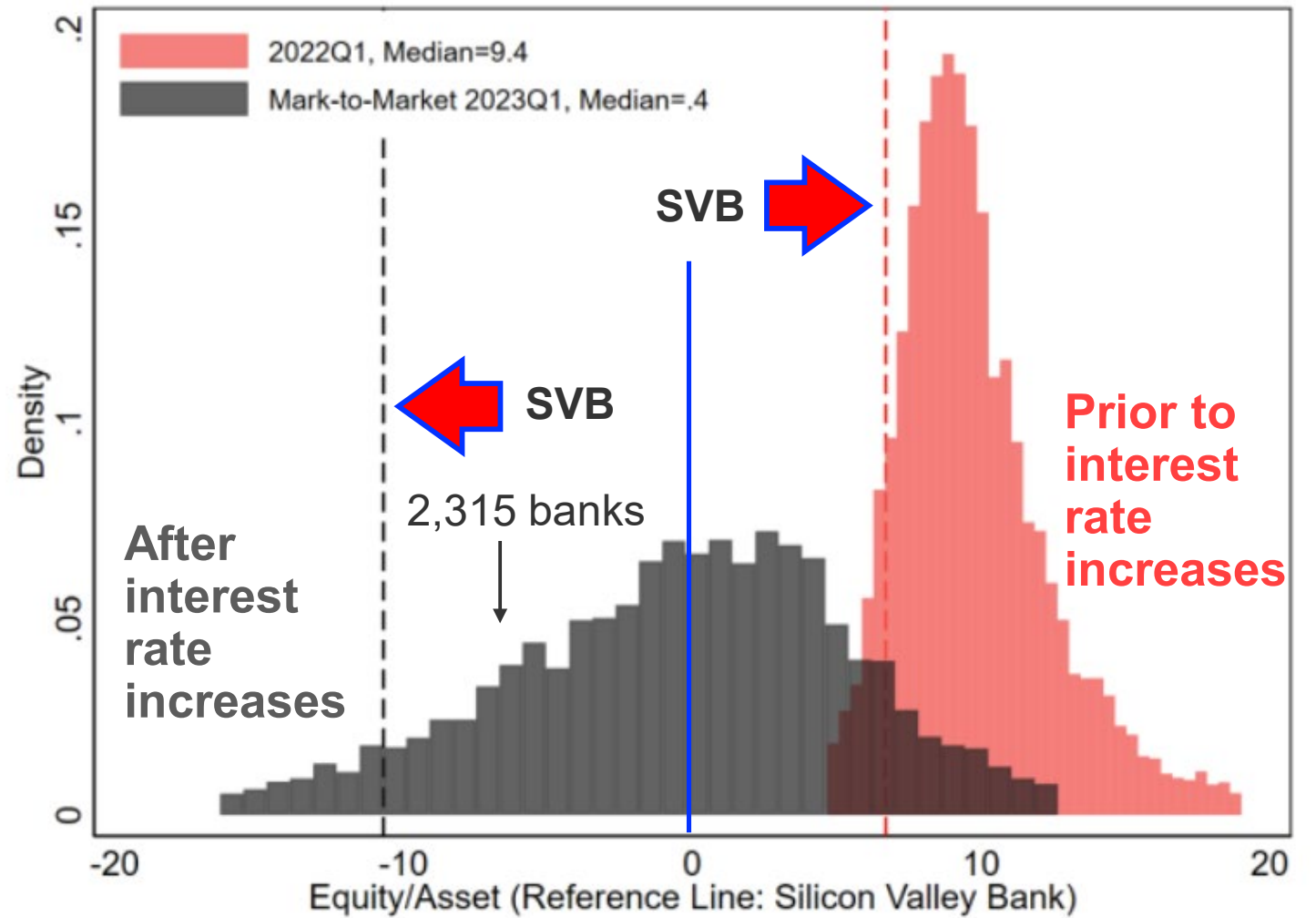
Answer: NO

- 94% of aggregate banking assets are not hedged
- Over 3 quarters of reporting banks: no material use of interest rate swaps
- Asset duration of about 4.6: 2pp interest rate increase → about 9% implied losses

“Marked-to-Market” Bank Capitalization

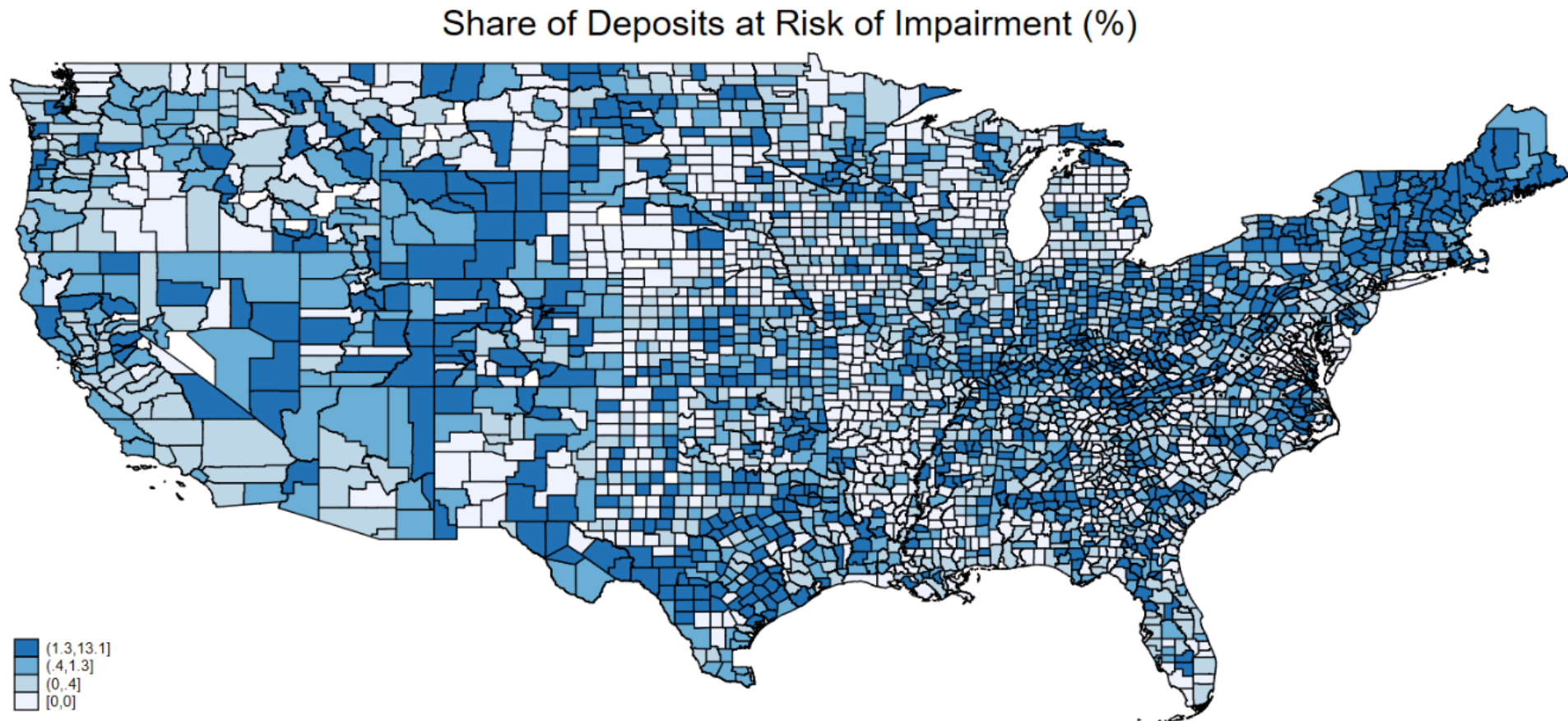
- ❑ After marking-to-market bank assets and assessing their liabilities at face value
 - 2,315 banks have negative equity (close to half of US banks)
 - \$11 trillion of assets in the aggregate

Equity/Assets



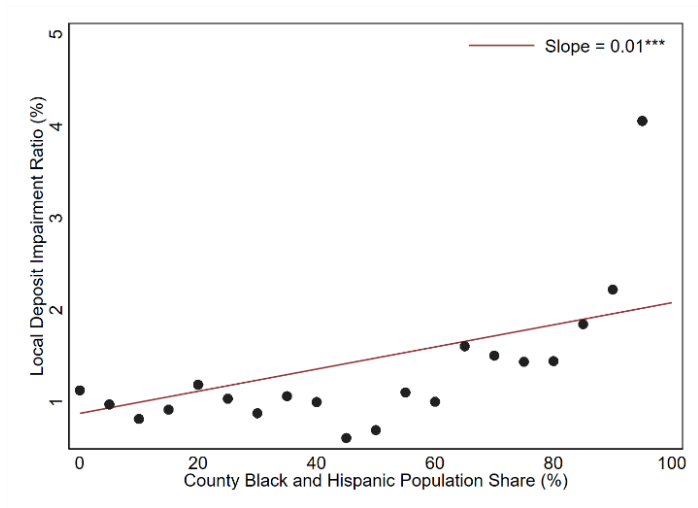
Regional Exposure to Bank Risk

- The most exposed counties have up to 13% deposits at the risk of impairment

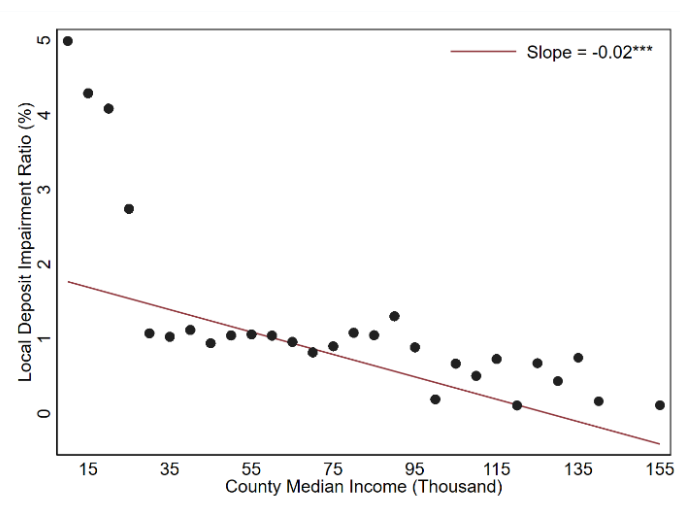


Regional Exposure to Bank Risk

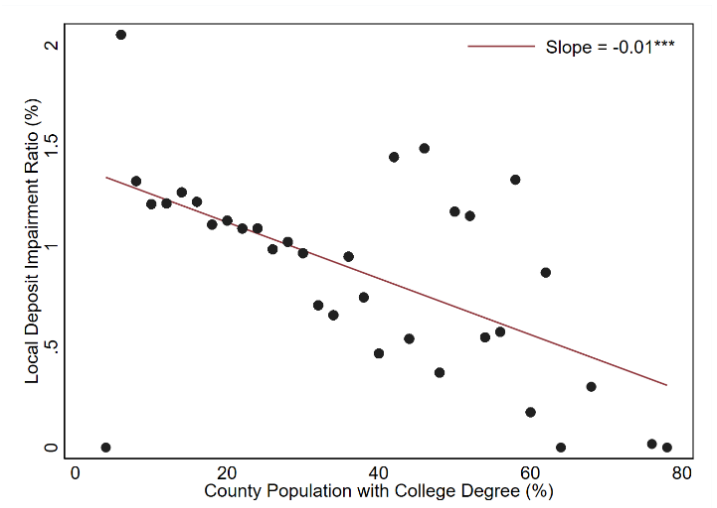
- More exposed regions are those with
 - More minority population
 - Lower income
 - Lower share of college educated



Minority Population



Income

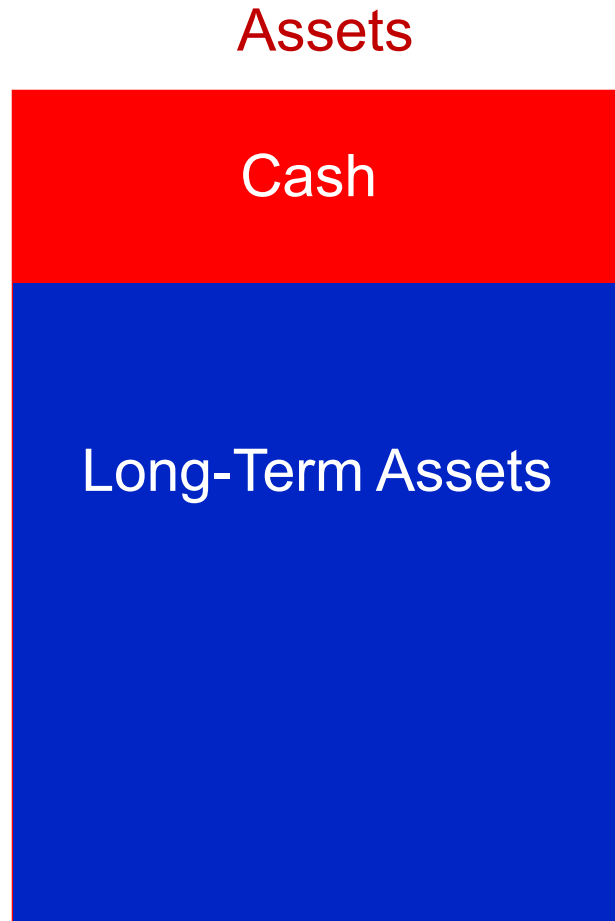


College Education

Rate Increases and Bank Insolvency

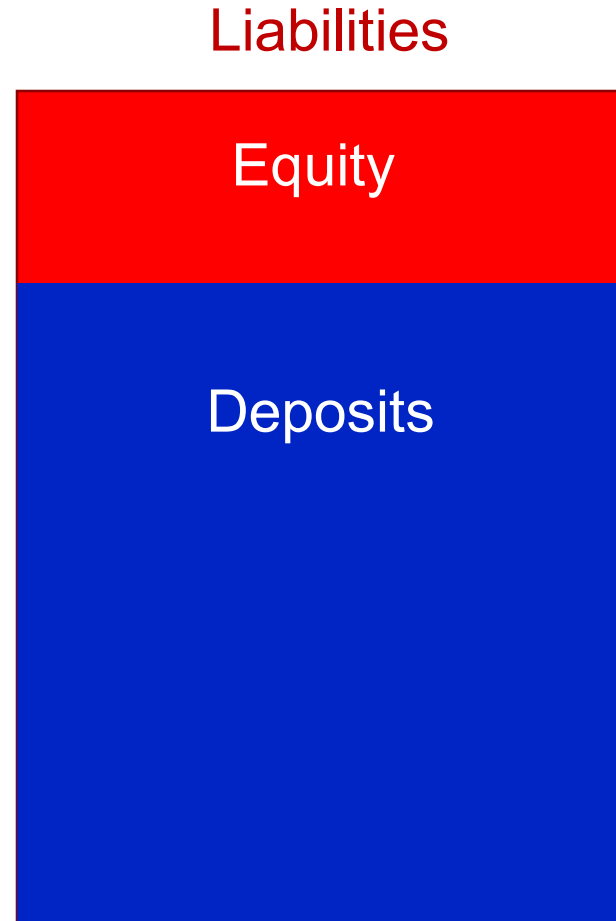
- Bank solvency ultimately depends on the “stickiness” of deposits
 - The extent of this stickiness will depend on the bank’s uninsured leverage
 - More uninsured leverage → higher deposit “flight” risk
 - This is the solvency and not the liquidity issue!

Simple Example

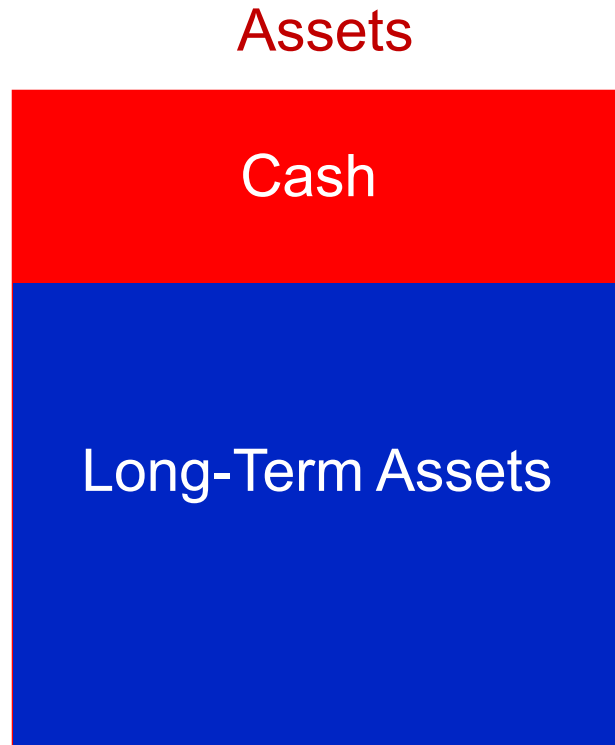


Interest rate ↑

=



Simple Example

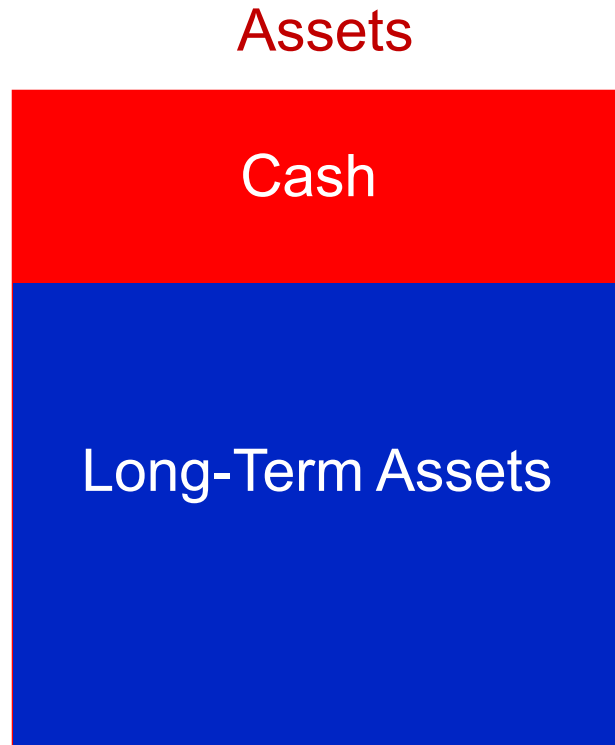


Interest rate ↑

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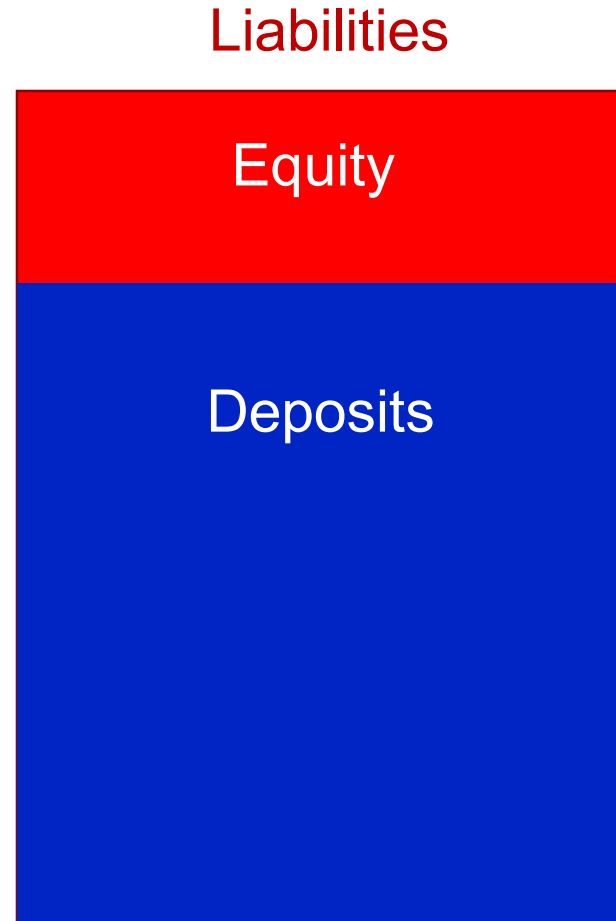


Simple Example



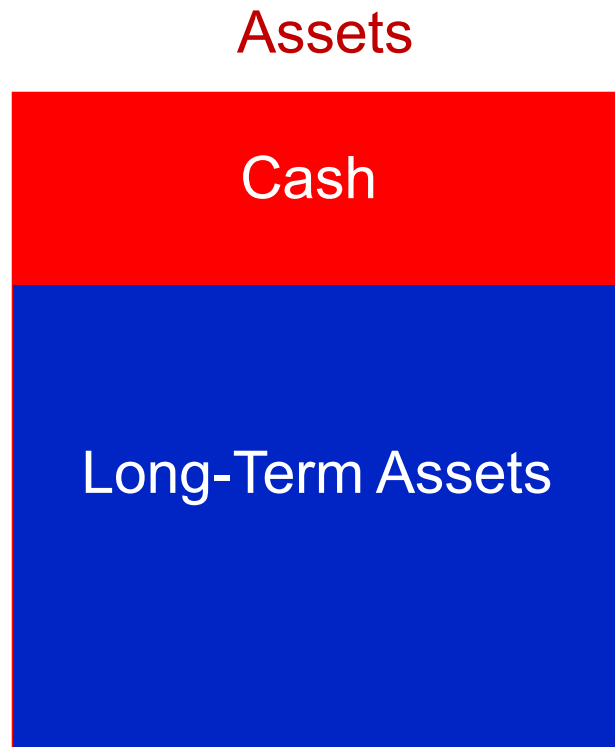
Interest rate ↑

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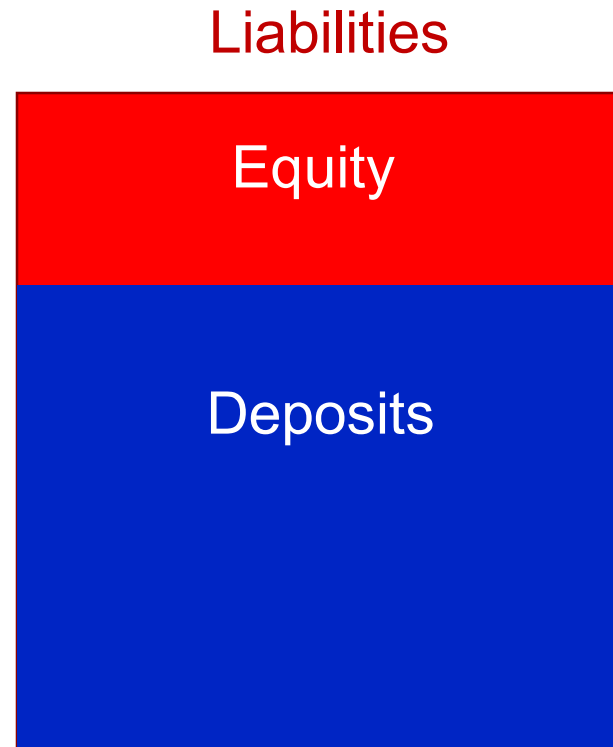
“Sticky deposits”

Simple Example



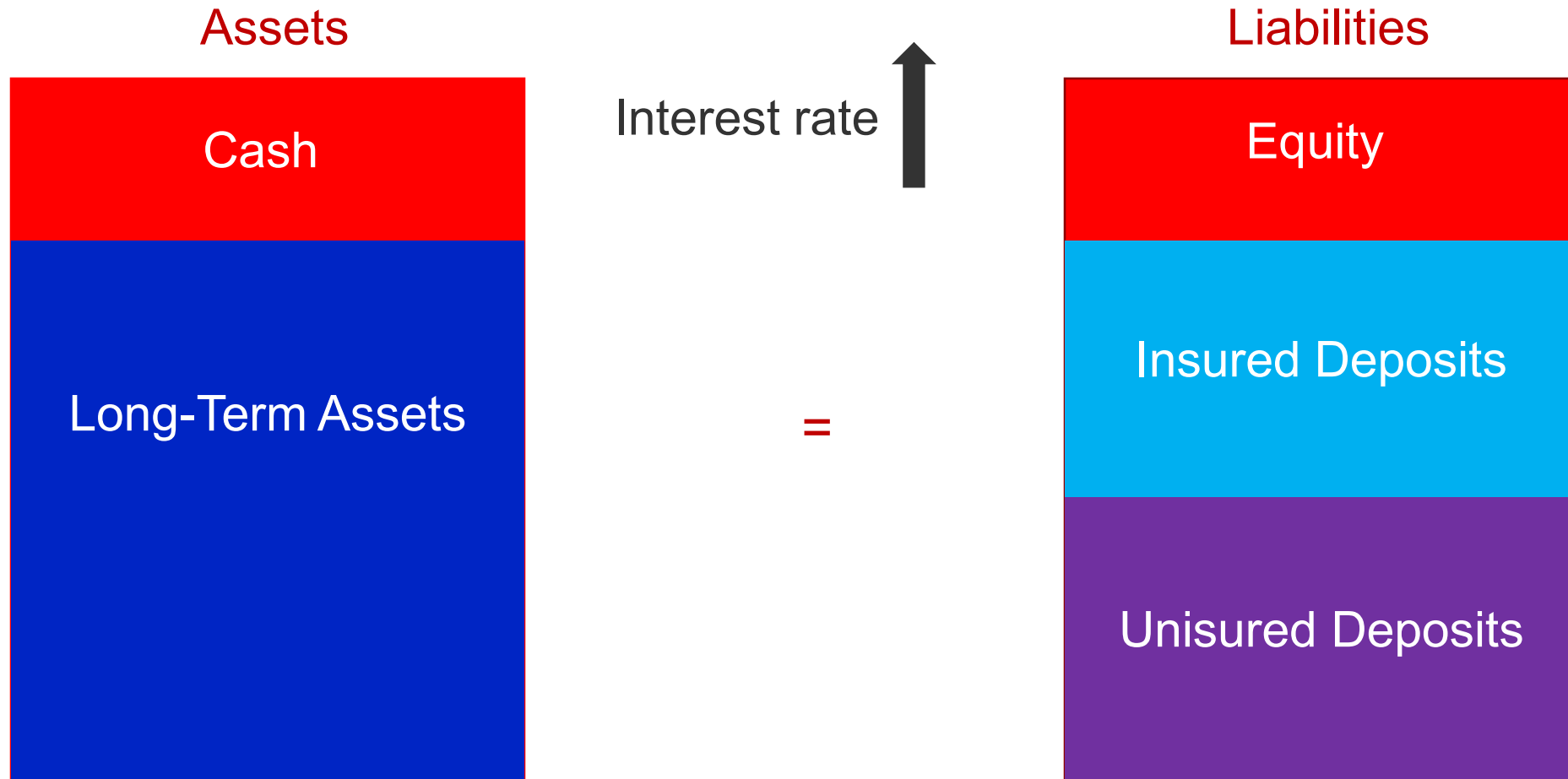
Interest rate ↑

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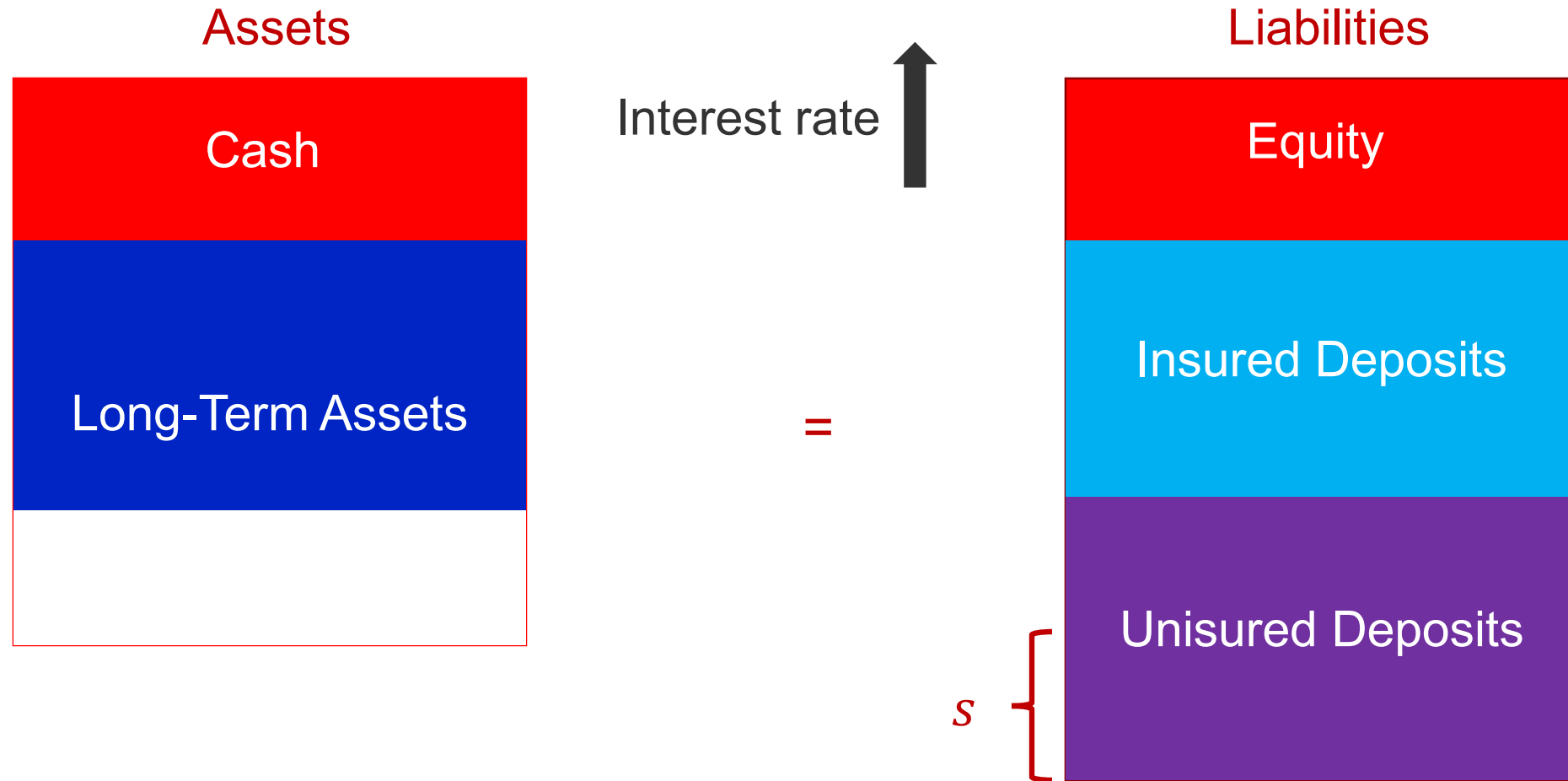


“Sticky deposits”

Simple Example with Uninsured Deposits



Simple Example with Uninsured Deposits



❑ Can a bank survive the withdrawal by s share of uninsured depositors after rate increase?

Simple Model

- ❑ Assume insured depositors are sticky
- ❑ Unlike insured depositors, uninsured depositors can lose money if the bank fails
 - No explicit FDIC guarantee
- ❑ This gives them incentives to run
- ❑ Run incentives will depend on how “awake” the other uninsured depositors are
 - Share of uninsured depositors expected to withdraw following a rate increase

Main Proposition: A Solvency Run

- When interest rate increases sufficiently, a “solvency run” is possible
- Banks at a higher risk of solvency run:
 - Lower initial capitalization
 - More exposure to long-duration assets
 - Higher uninsured leverage
 - More “awake” uninsured depositors

How Many Banks are at Risk of Such Runs?

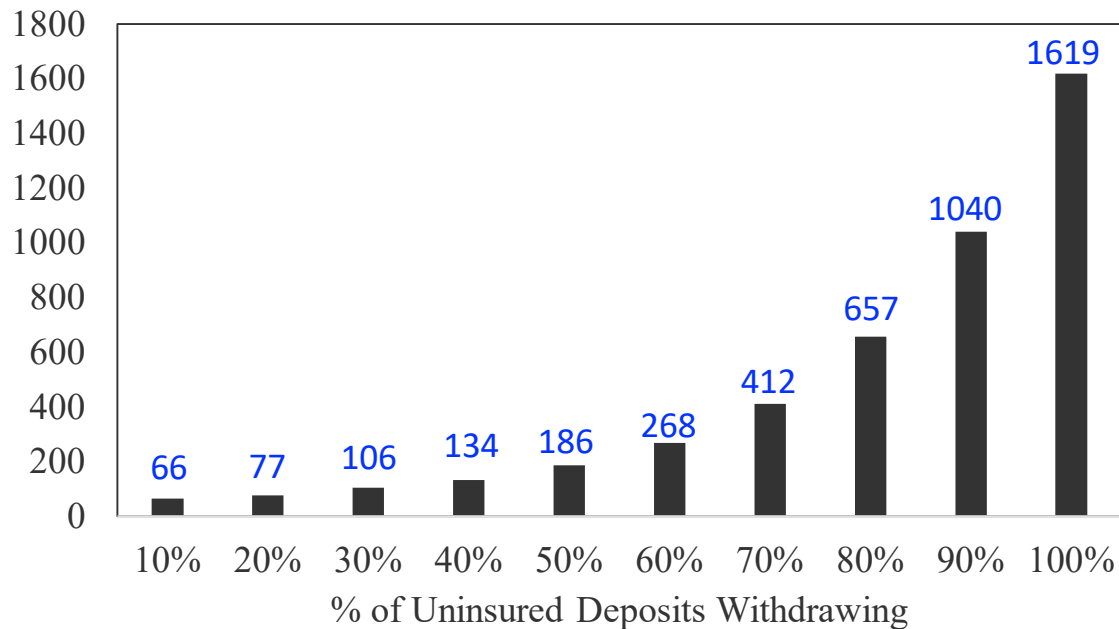
- ❑ We empirically assess the uninsured depositors run risk for each US bank

- ❑ Bank insolvency condition:
 - Marked-to-market value of remaining bank assets after a given share of uninsured deposits withdraws is insufficient to cover the face value of insured deposits
 - In this case FDIC steps in to protect insured depositors

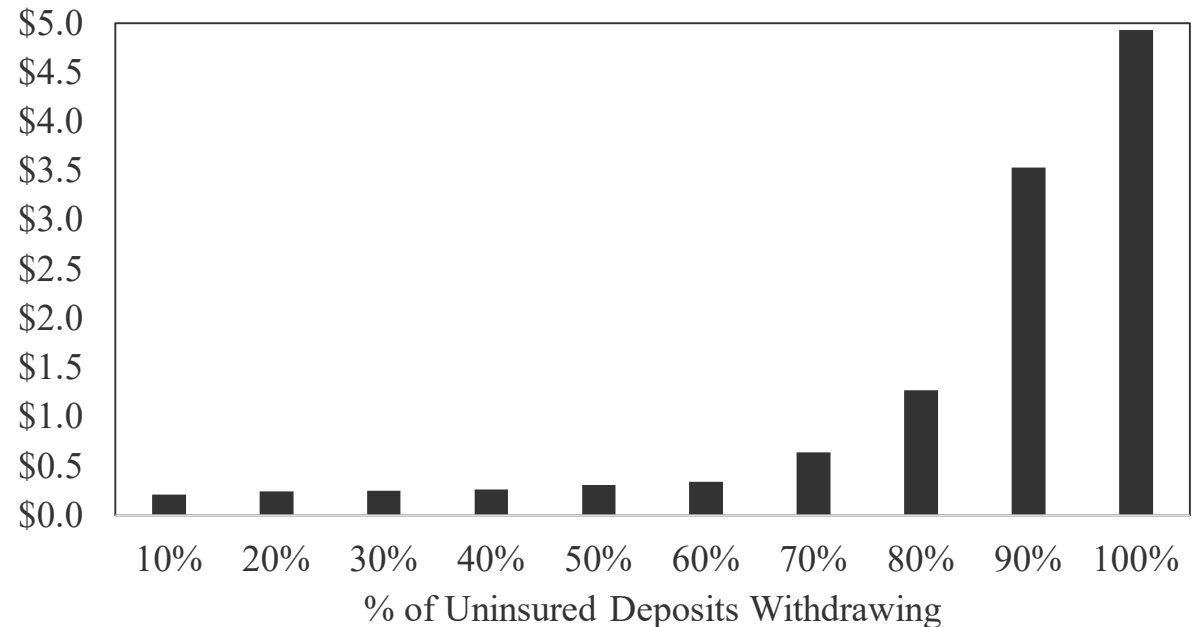
- ❑ How many banks are insolvent if a *given* share of uninsured depositors withdraw?

Different Uninsured Depositor Run Scenarios

Number of Insolvent Banks



Aggregate Assets of Insolvent Banks (in \$ Trillions)



- 50% uninsured deposits withdrawal: 186 banks insolvent with assets of \$300 billion
- 100% uninsured deposits withdrawal: +1,600 banks insolvent with assets of \$4.9 trillion

Uninsured Leverage & Unrealized Losses

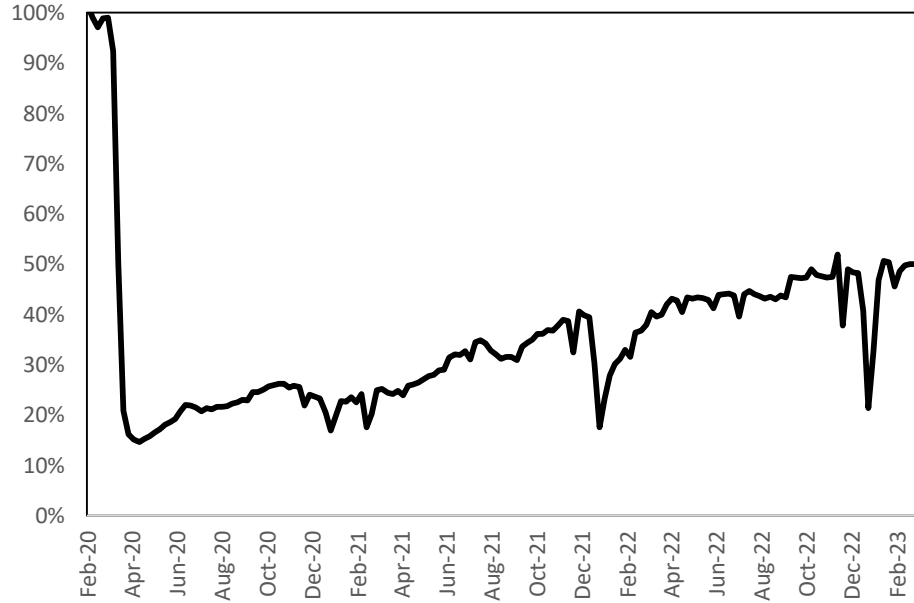
Flight risk v turbulence



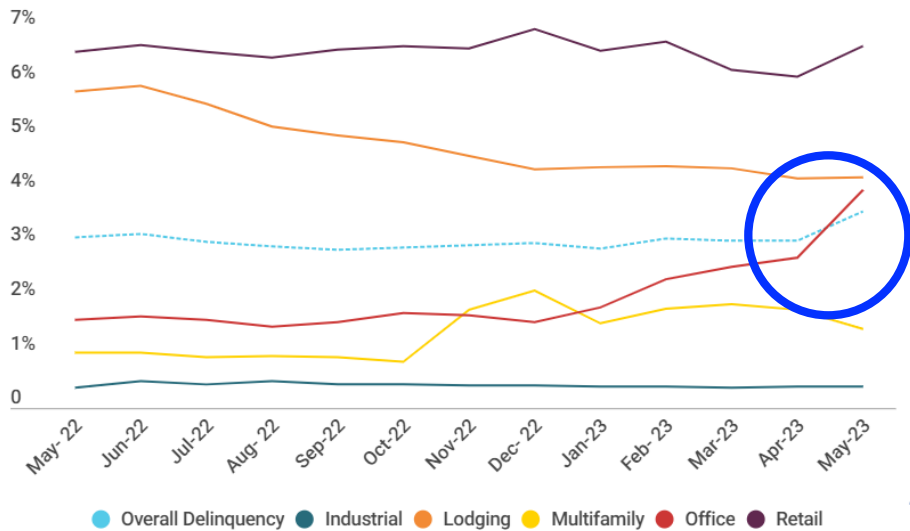
What About
Credit Risk?

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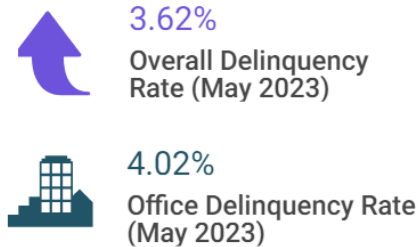
Physical Office Attendance (Kastle)



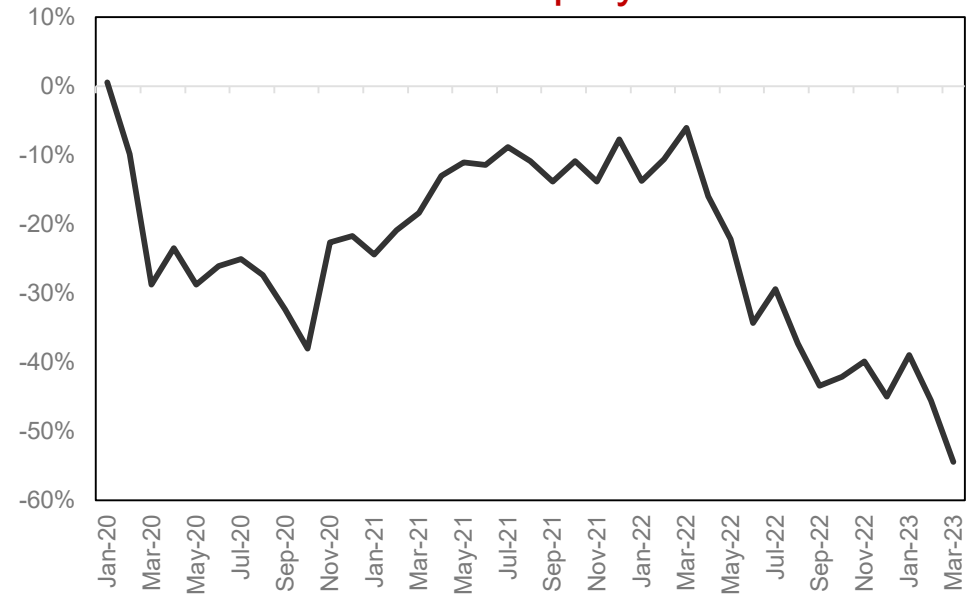
Delinquency Rates by Major Property Type



Delinquency Trends



Office REIT Equity Values

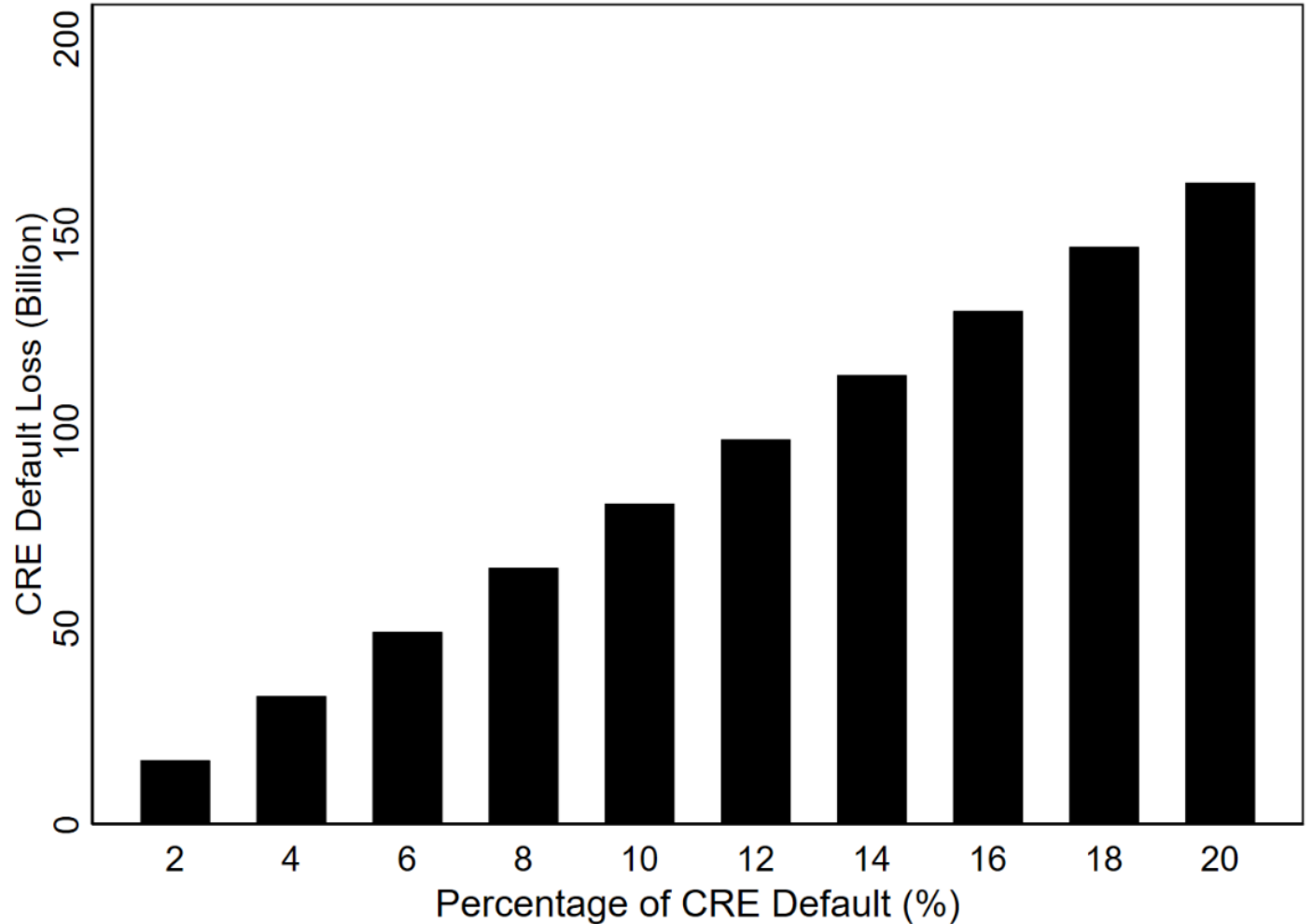


What About Credit Risk?

- ❑ The decline in banks' asset values has eroded their ability to withstand adverse credit events
 - Illustrate through banks' resilience to distress on commercial real estate (CRE) loans
- ❑ CRE loans constitute a substantial share of bank assets (\$2.7 trillion)
 - Especially for smaller and mid-size banks (25-30% of their assets)
- ❑ Most of CRE loans mature in the next few years and require refinance → increased default risk
- ❑ Deteriorating CRE fundamentals (especially in the office sector)

	(1) All Banks	(2) Assets <1.384B	(3) Assets [1.384B,250B]	(4) Assets >250B
Aggregate Assets	24T	1.4T	9.0T	13.5T
Aggregate Commercial Real Estate Loans	2.7T	419.5B	1.7T	589.5B
Commercial Real Estate Loans/Asset (%)				
Mean	25.7	24.9	30.6	4.7
P50	25.1	23.9	31.7	3.7
P95	49.9	48.8	53.8	10.2
Number of banks	4,844	4,096	735	13

Banks' Losses due to CRE Distress

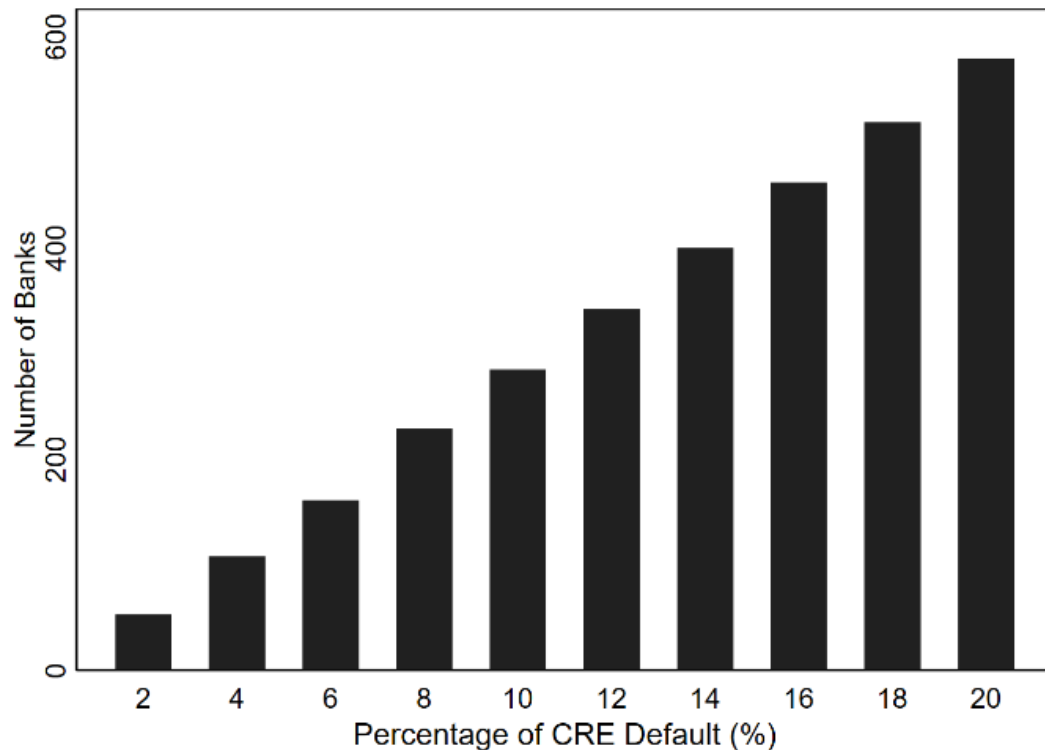


- ❑ Losses due to CRE distress: around \$80-\$160 billion (10% to 20% default rate)
- ➔ *Still can push meaningful number of banks into insolvency due to their eroded asset values*

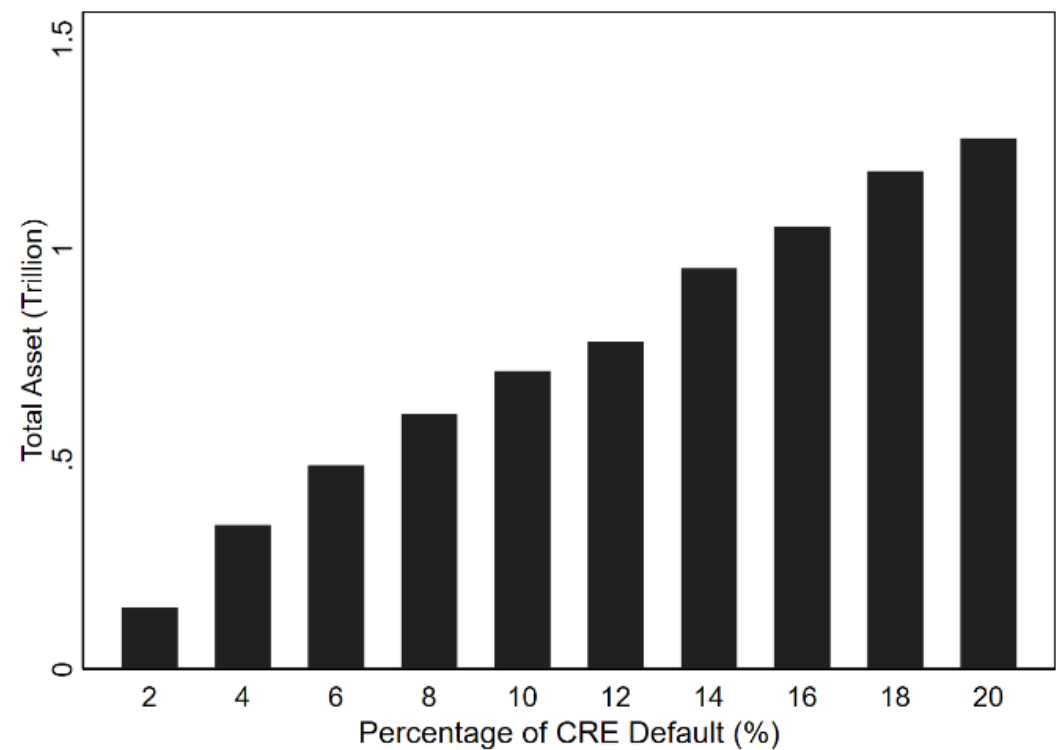
Impact of CRE Distress

- ❑ 10% CRE distress: *additional 285 banks* with assets worth \$700 billion have “negative equity”
- ❑ 20% CRE distress, *additional 579 banks* with assets worth \$1.26 trillion have “negative equity”

Number of Banks with Negative Equity



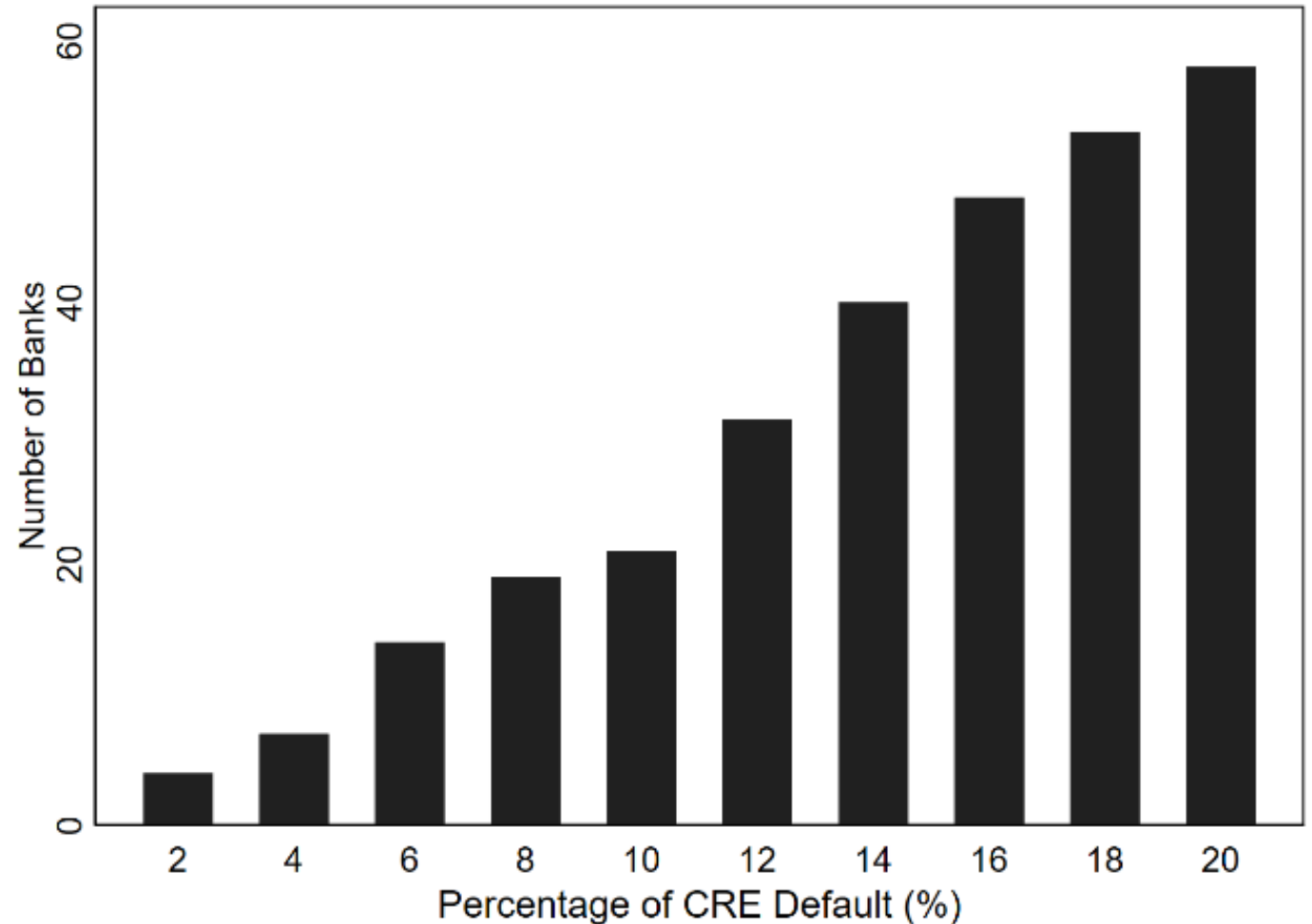
Assets of Banks (in \$ Trillion)



Additional Insolvent Banks due to CRE Distress

(50% Uninsured Depositors Withdraw)

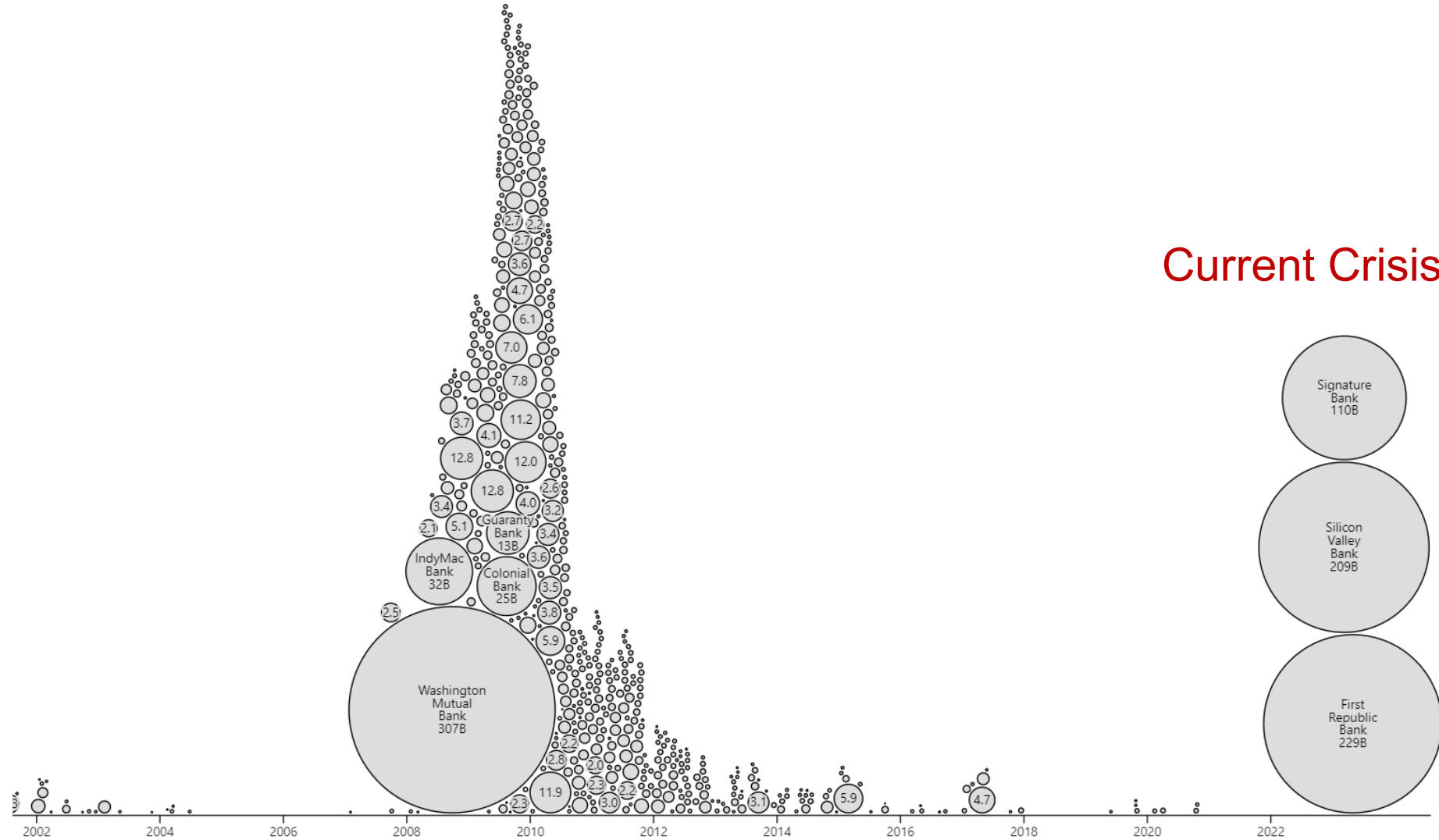
Number of Insolvent Banks



- ❑ Prior to rate increases all banks could survive our CRE distress scenarios
- *Now: Up to 60 of additional banks subject to insolvency run (in addition to 186)*

Beyond SVB?

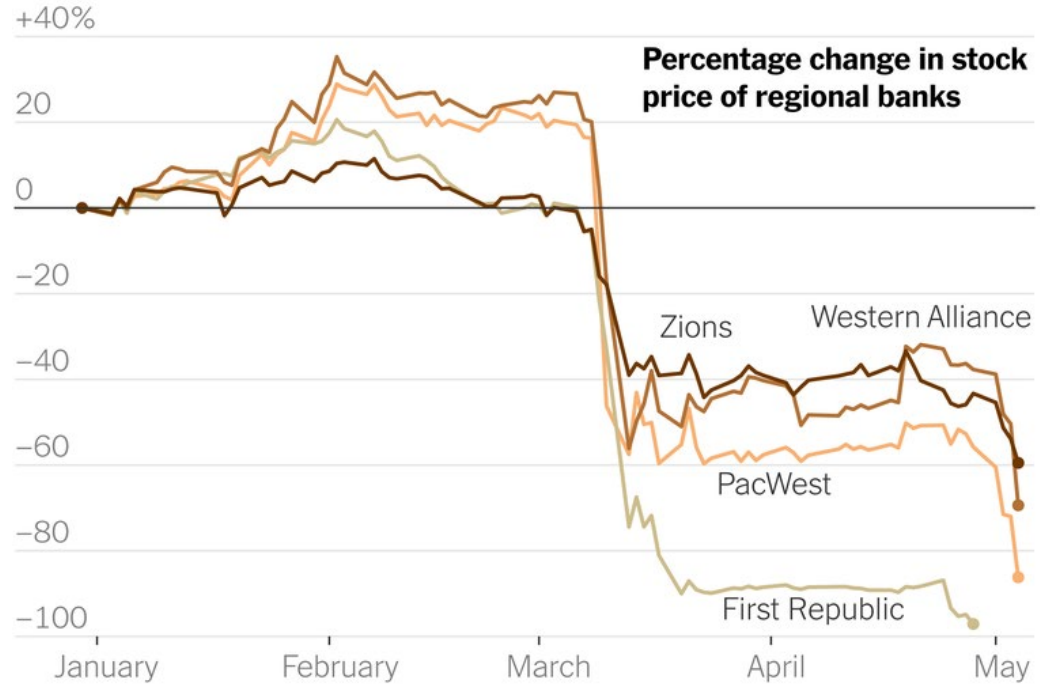
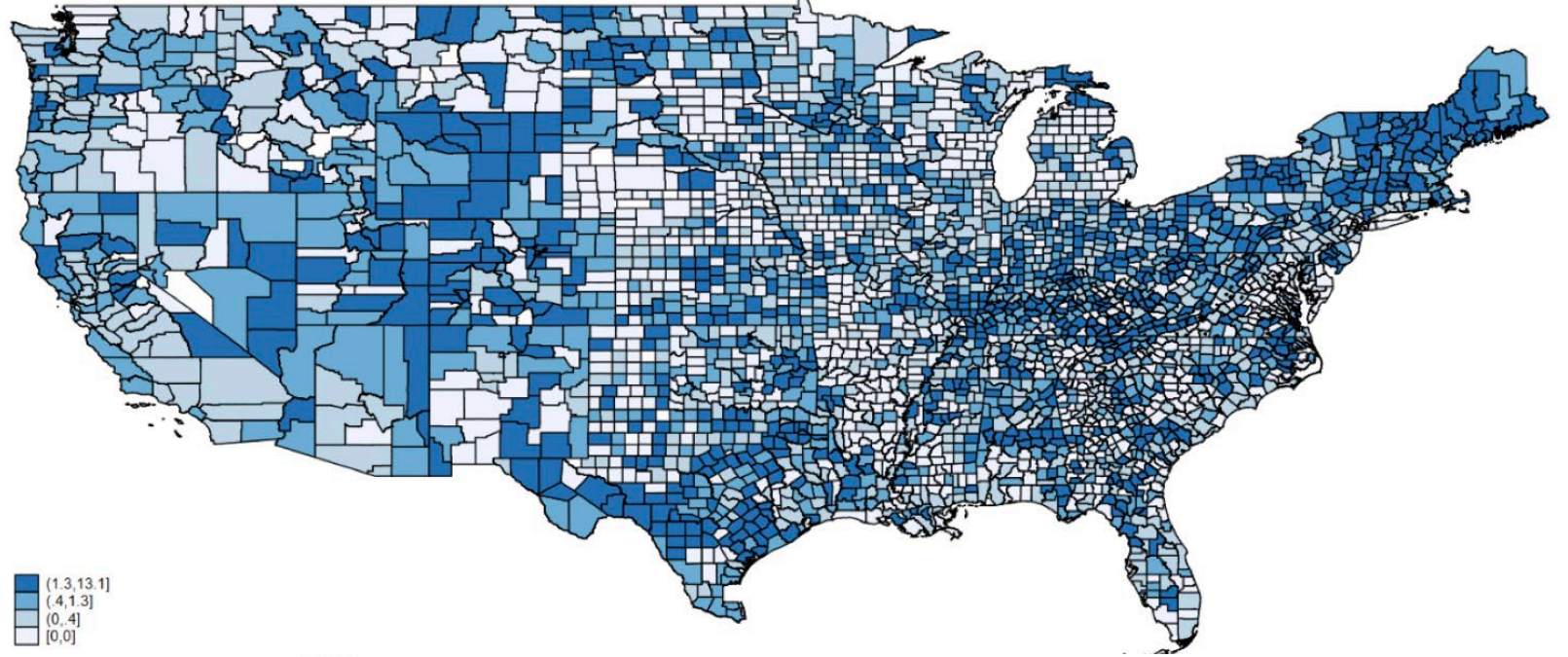
Great Recession



Current Crisis

Beyond SVB?

Share of Deposits at Risk of Impairment (%)



Summary and Implications

- ❑ Banks face considerable solvency risk due to a recent monetary tightening
 - More than \$2 trillion decline in the banks' asset values

- ❑ Banks' uninsured leverage a key factor affecting insolvency risk
 - About 200 regional banks at risk of insolvency runs (base scenario)
 - Up to 1,600 banks at risk of insolvency runs (full run)

- ❑ Other effects
 - Eroded banks' ability to deal with credit distress & potential recession
 - Can lead to “credit crunch” adversely affecting the real economy
 - Can constrain the conduct of monetary policy going forward

Now What?

Extended coverage to uninsured depositors

Bank Term Funding Program

Mitigates short term risk...

...but losses and fundamental insolvency risk remain....

...potential credit distress will make things worse...

What next in the short run?

**“Market-based bank
recapitalization”**



What next in the short run?

**“Market-based bank
recapitalization”**

Resolving the Banking Crisis

This Version: April 12, 2023 **(with FAQs)**

First Version: March 28, 2023

[Link to Current Draft](#)

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Summary

1. New economic conditions have led to insolvency concerns across the banking system.
2. There are too many banks in this situation to resolve with one-off solutions.
3. Government backstops and regulatory forbearance risk a repeat of the S&L crisis.
4. Requiring banks to promptly raise equity capital will both reduce fragility and provide a needed market test to identify truly insolvent banks.
5. The amount of private capital needed is in the range of \$190 to \$400 billion.

What about the long run?

Higher bank capital
requirements?

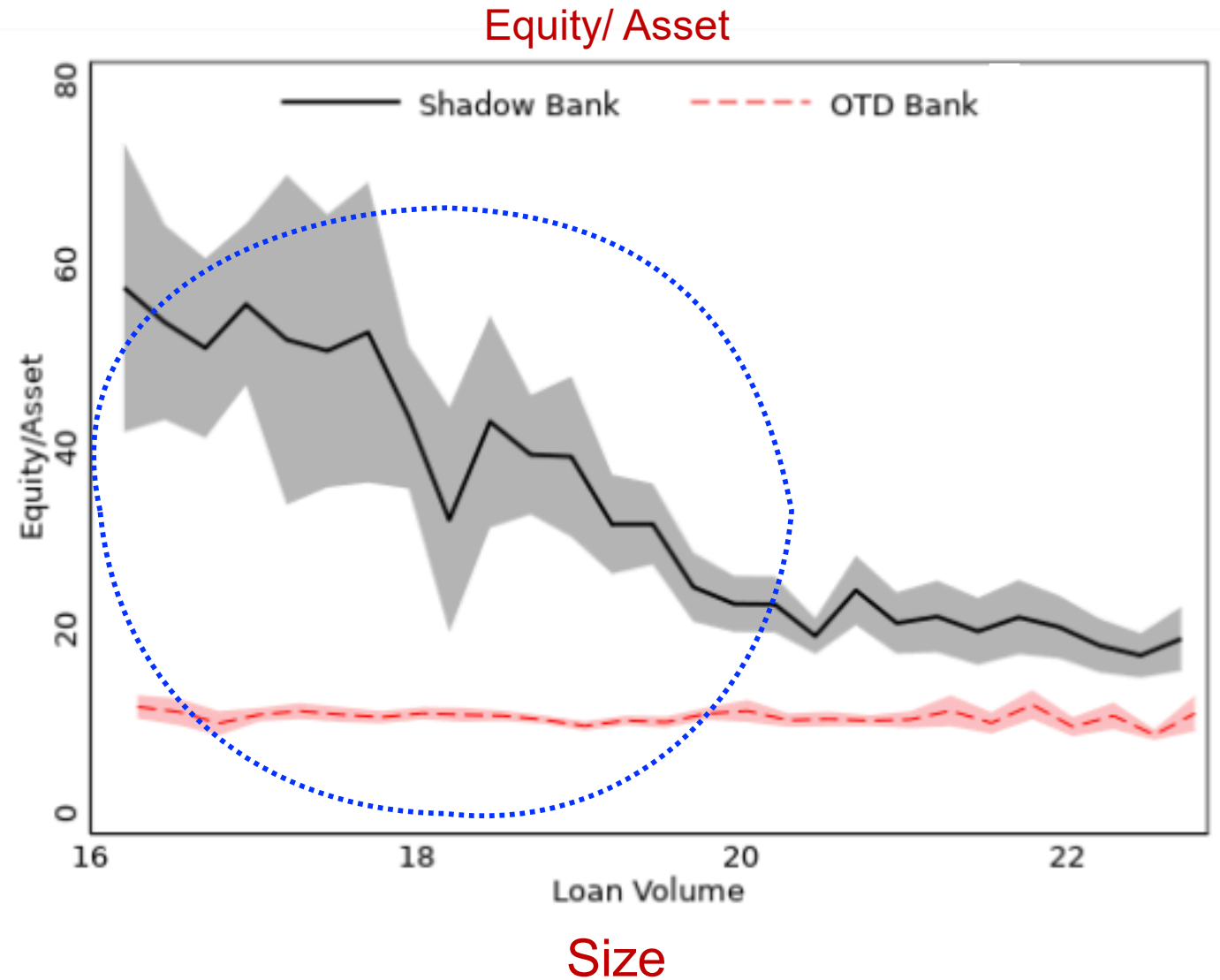
Non-bank lenders have
more than twice as
much capital as banks
(Jiang et al. 2020)



What about the long run?

Higher bank capital requirements?

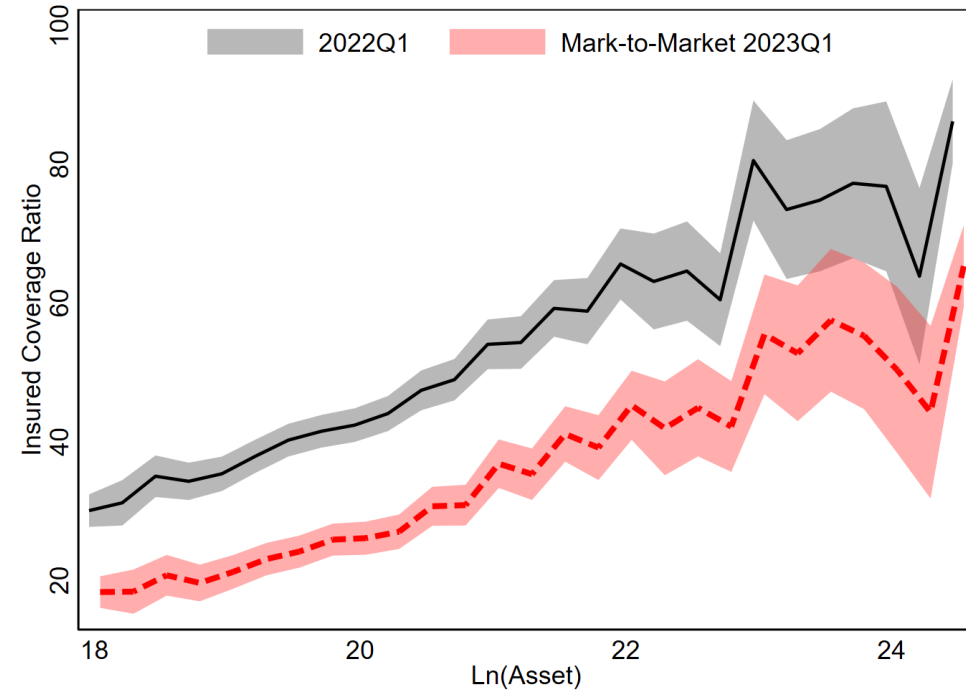
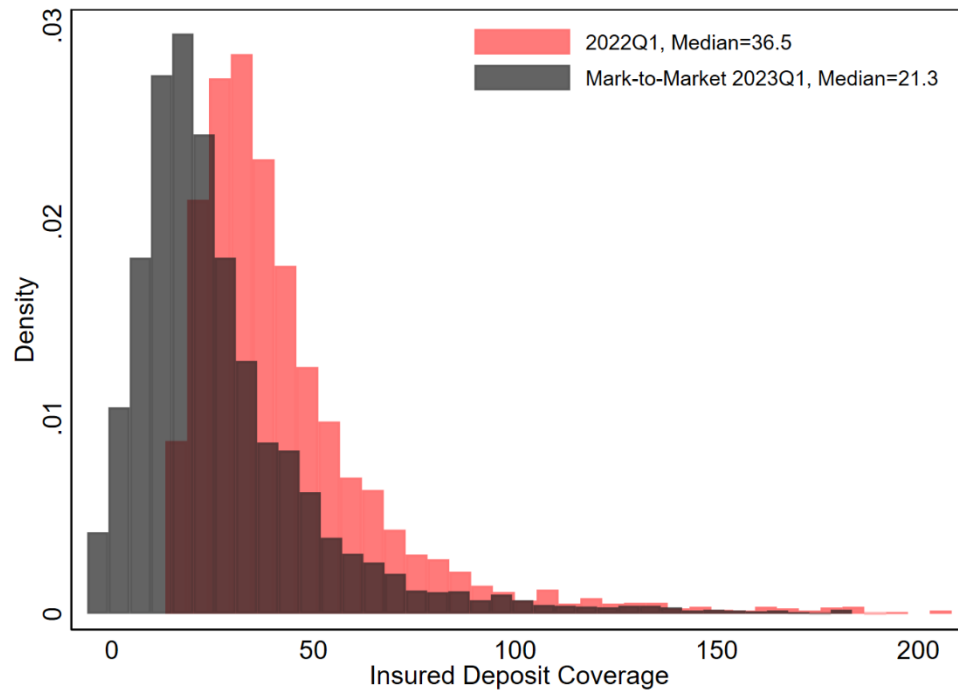
Non-bank lenders have more than twice as much capital as banks (Jiang et al. 2020)



Appendix

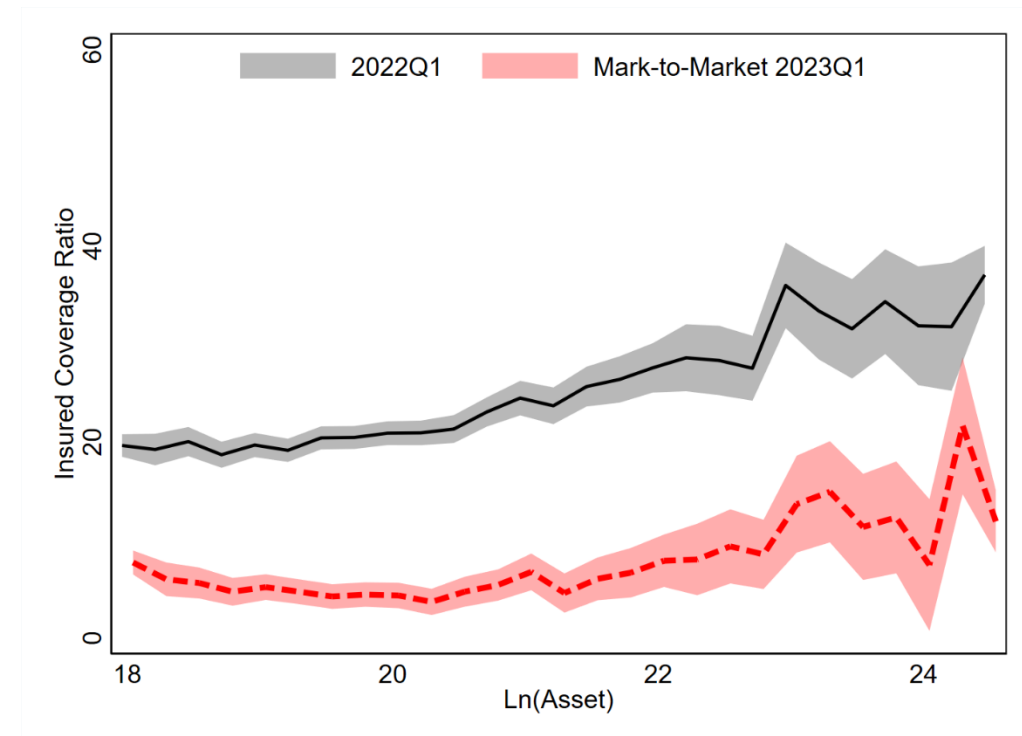
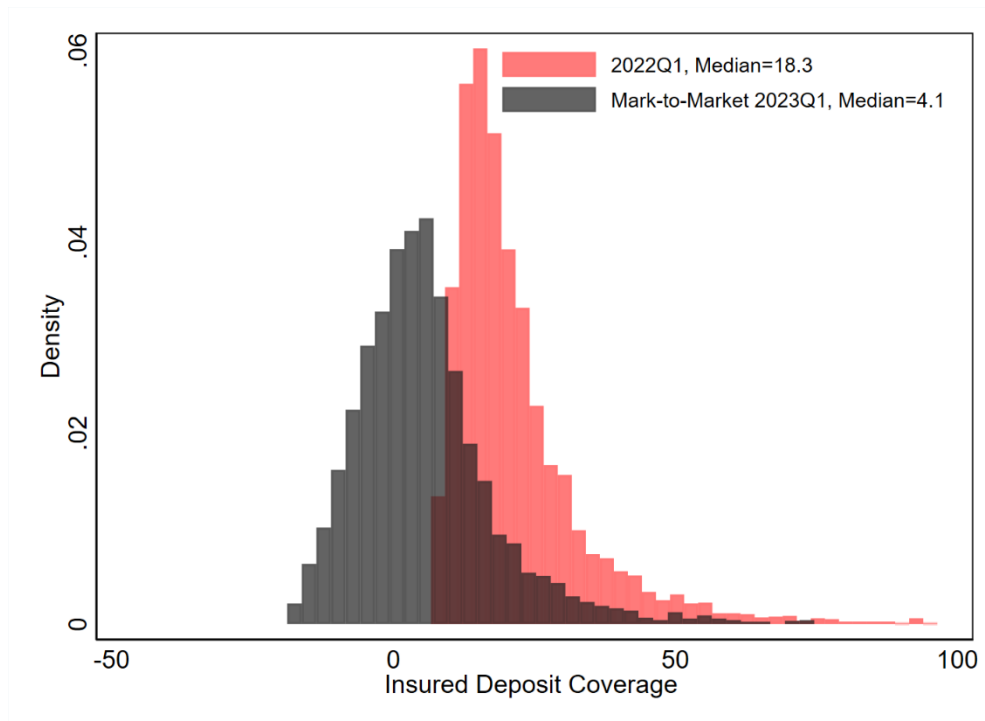
Distribution of Insured Deposit Coverage Ratio

□ 50% uninsured depositors run (i.e., $s = 0.5$)



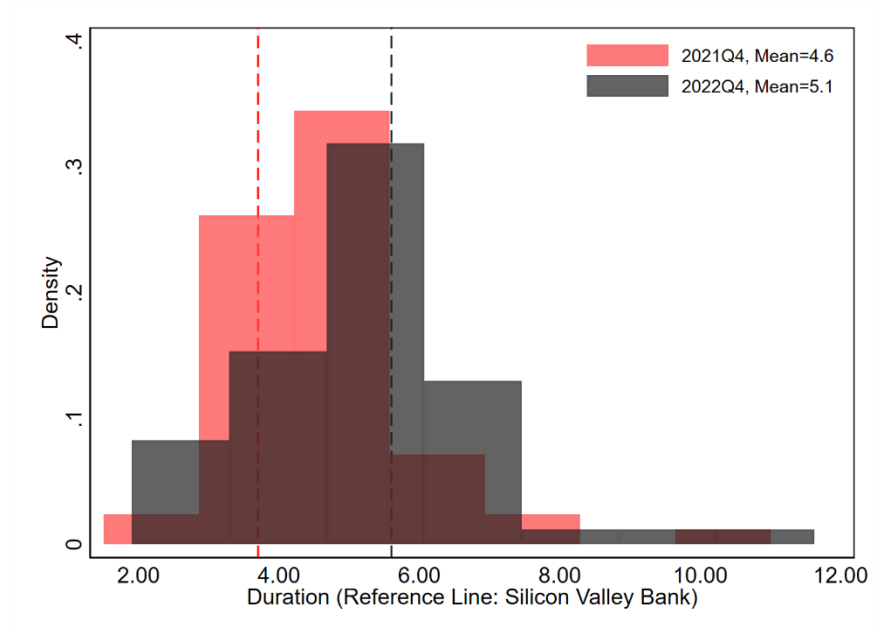
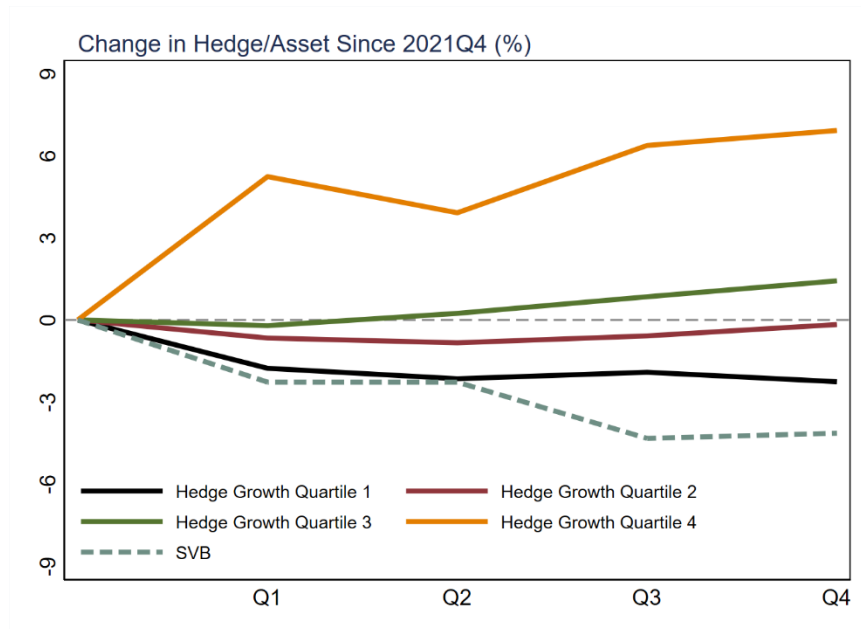
Distribution of Insured Deposit Coverage Ratio

□ All uninsured depositors run (i.e., $s = 1$)



Hedging Adjustment in 2022

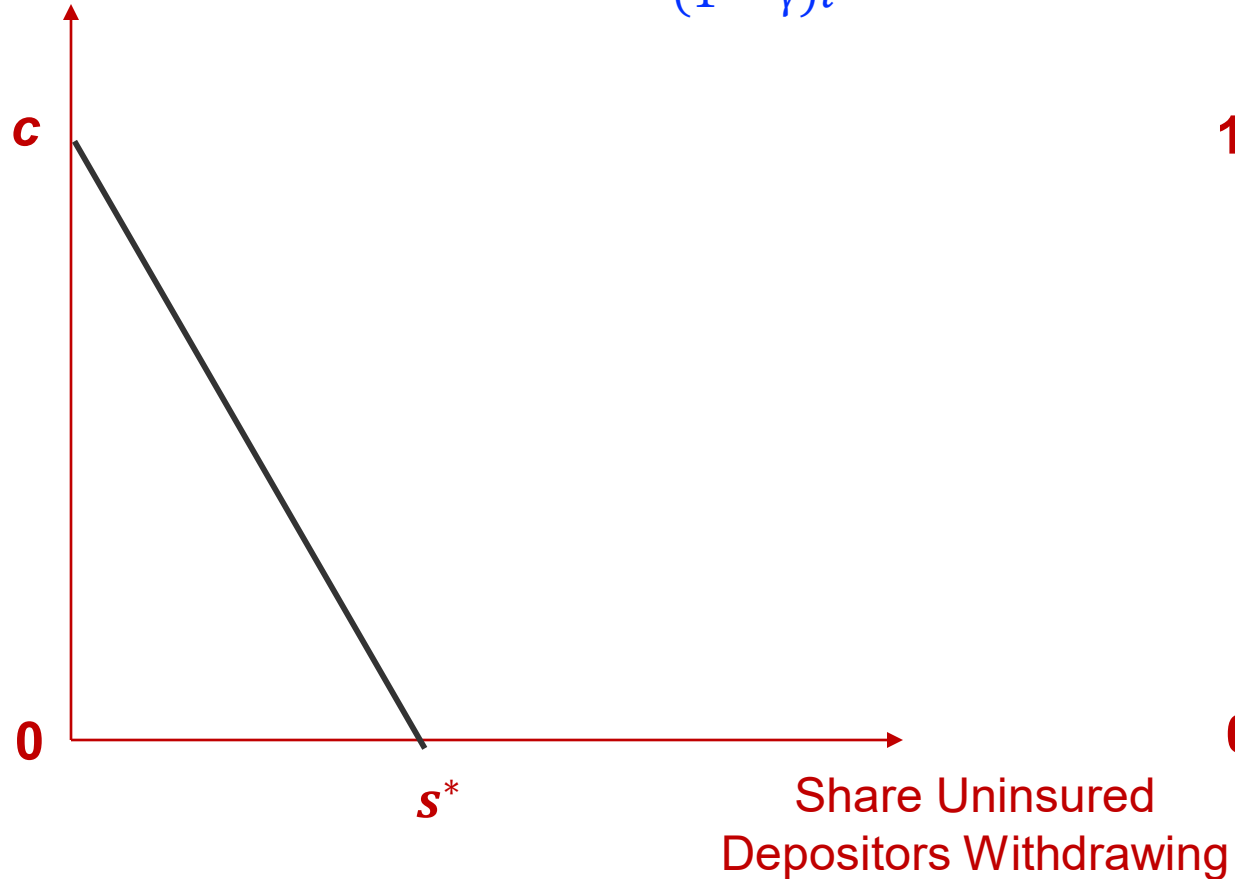
- ❑ Several banks significantly decreased hedging
- ❑ Average duration increased



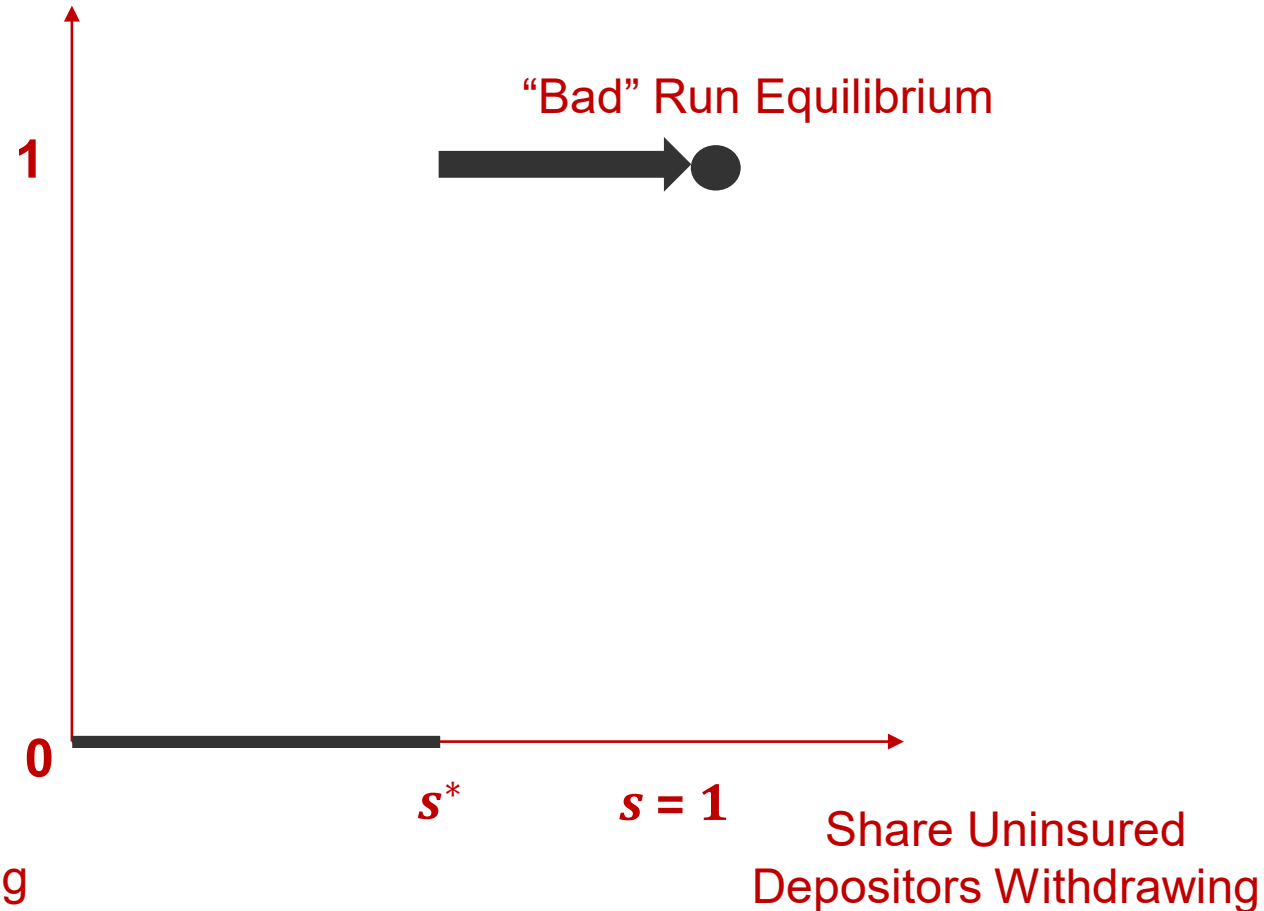
Main Proposition (Visual Analysis)

Equity Value

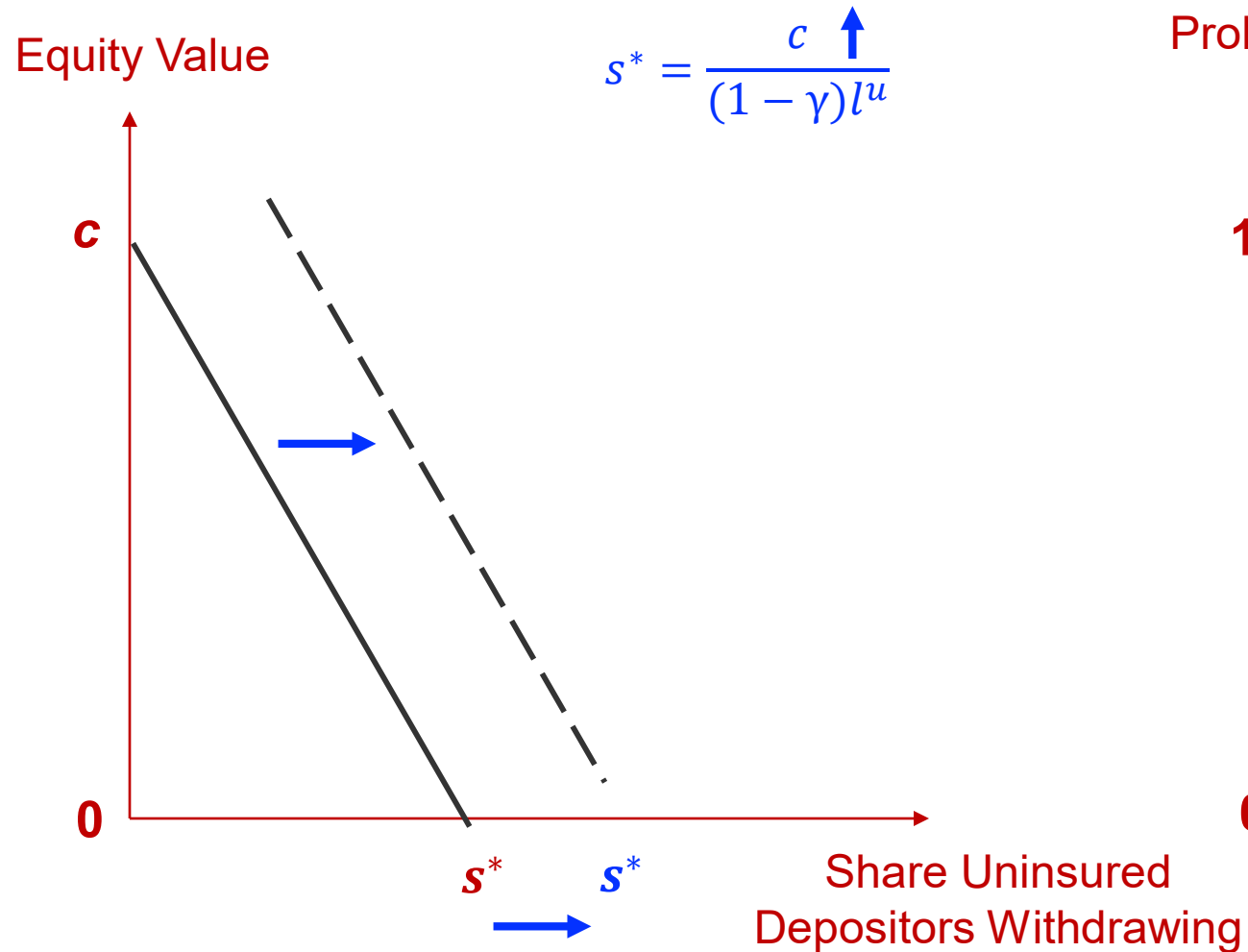
$$s^* = \frac{c}{(1 - \gamma)l^u}$$



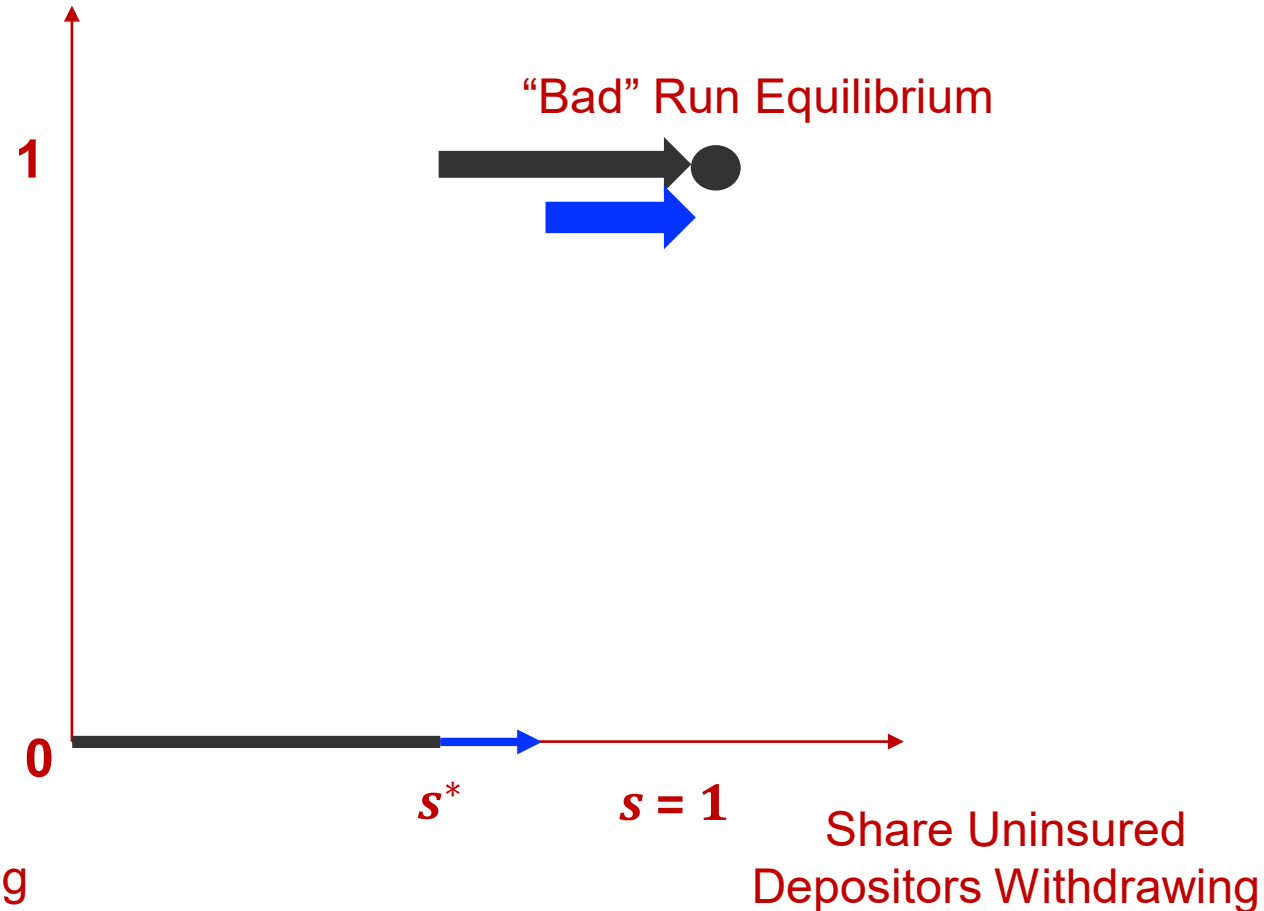
Probability of Bank Insolvency



Main Proposition (Visual Analysis)

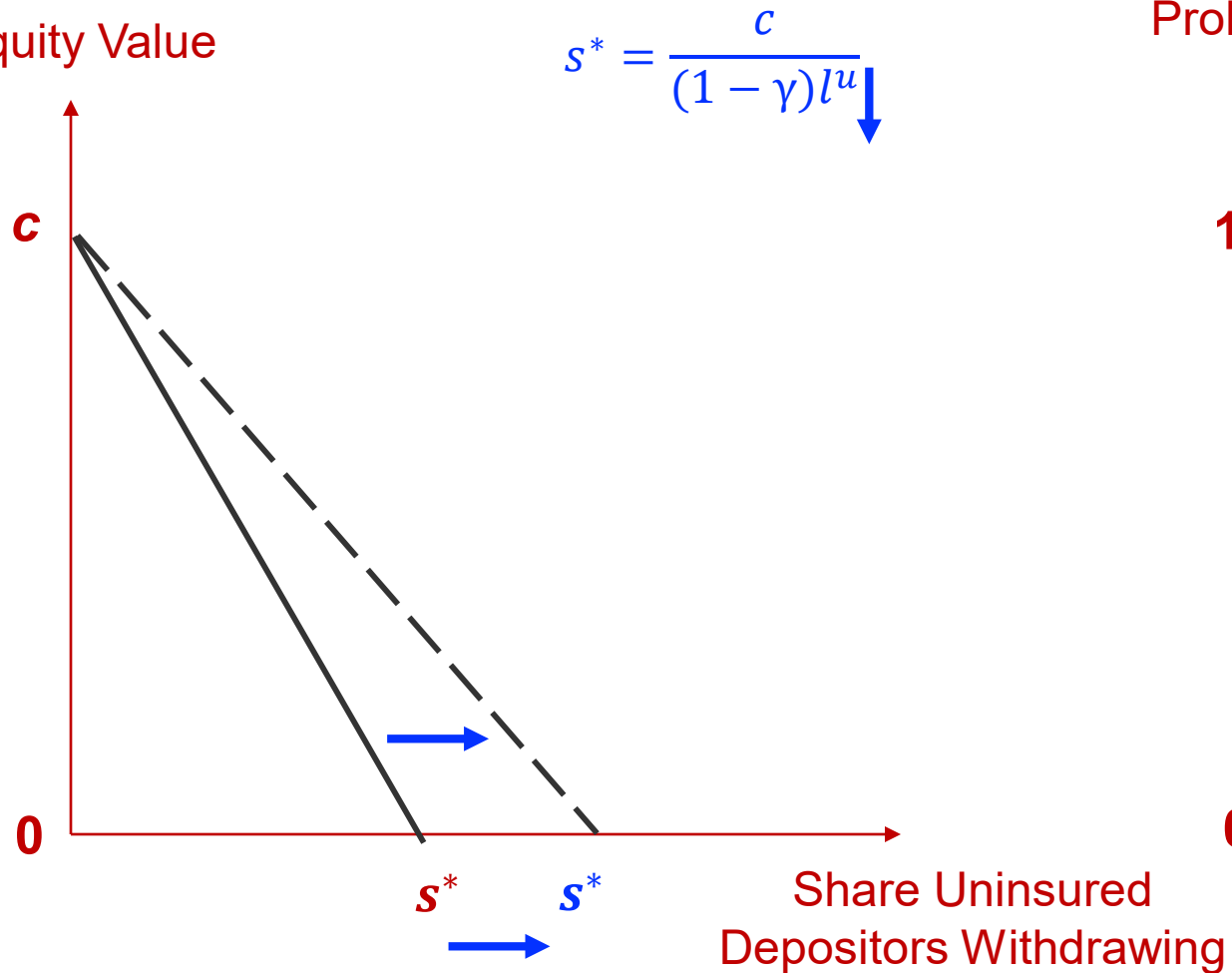


Probability of Bank Insolvency



Main Proposition (Visual Analysis)

Equity Value



Probability of Bank Insolvency

