Interest Rate Risk in Banking

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Discussion by **Erica Jiang**
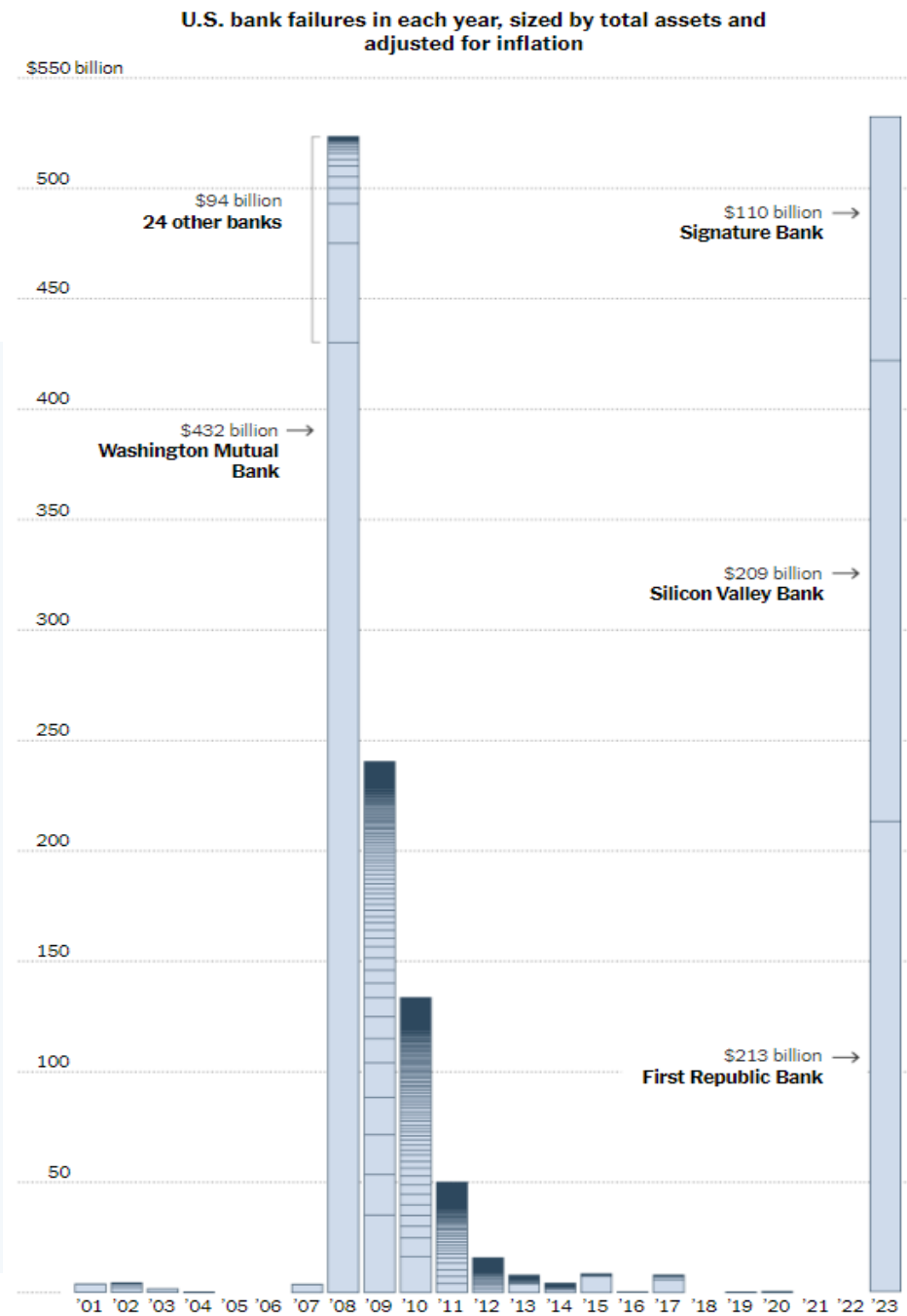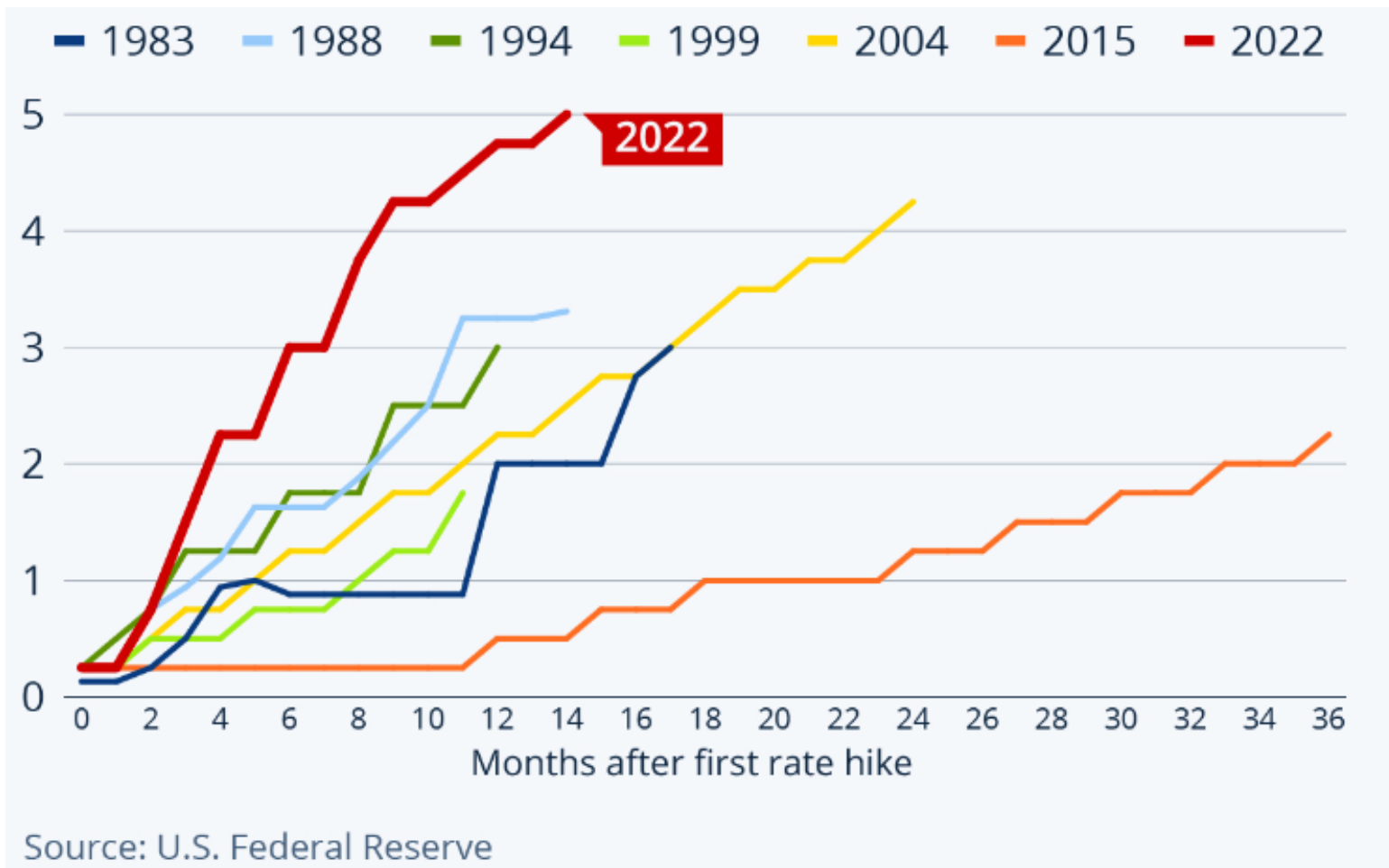
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Background

Source: U.S. Federal Reserve

U.S. bank failures in each year, sized by total assets and adjusted for inflation

$94 billion
24 other banks

$432 billion →
Washington Mutual Bank

$110 billion →
Signature Bank

$209 billion →
Silicon Valley Bank

$213 billion →
First Republic Bank

Source: FDIC and NYTimes

How exposed are banks to interest rate risk?

- Maturity transformation exposes banks to interest rate risk

- Deposit franchise may hedge against interest rate risk
  - Drechsler et al. (2021)

- Franchise value collapses when most valuable due to run
  - Jiang et al. (2023), Haddad et al. (2023), Drechsler et al (2023)

- Banks use limited interest rate swaps to hedge
  - Granja et al. (2024)

This Paper

Focus on a "no-run" equilibrium (best scenario for banks)

- Franchise value (FV) declines as interest rates rise
  - Exacerbates, rather than offsets, losses on security holdings
  - In contrast to existing studies (e.g., Drechsler et al. 2021)
- Intuition: Example 1 in Jiang et al (2023)
  - Deposit beta<1 does not offer equity value hedging benefits
  - Hedging benefits requires peculiar assumptions on fixed operating costs or changes in beta
- Contribution: Estimate FV under the assumption of no run

Methodology

Assets	Liabilities
Loans (L)	Deposits (D)
Securities (T)	Other Borrowing (B)
	Book Equity (E)

- Banks' value creation: deposit-taking and loan-making
  - Value creation from deposit-taking: $r^* - r^D$
  - From loan-making: $r^L - r^*$ (* *discuss later*)
  - Don't create value by holding securities (T/B)
- Banks' franchise value

$$FV = \text{PV}(D(r^* - r^D) + L(r^L - r^*) - C)$$

Findings

- Estimating FV, as the value of a replicating portfolio:

$$Spread = \phi_0 + \phi_r r^* + \phi_1 l^1 + \phi_t l^5 + \epsilon$$

- Empirical findings:
  - Fixed Component: $PV(\phi_0 - c)$ **Duration**
    - ϕ_0 is mostly from loan spread
    - $\phi_0 > c$ → positive duration; $FV \downarrow$ when $r^* \uparrow$

  - Floating Component: ϕ_r **Level of FV**
    - ϕ_r is mostly from deposit spread
    - Value creation mostly from deposit-taking (Egan et al, 2022)

Big-Picture Takeaway

Existing studies:

- Banks do not hedge asset interest rate exposure
- Most banks can survive in the absence of the RUN
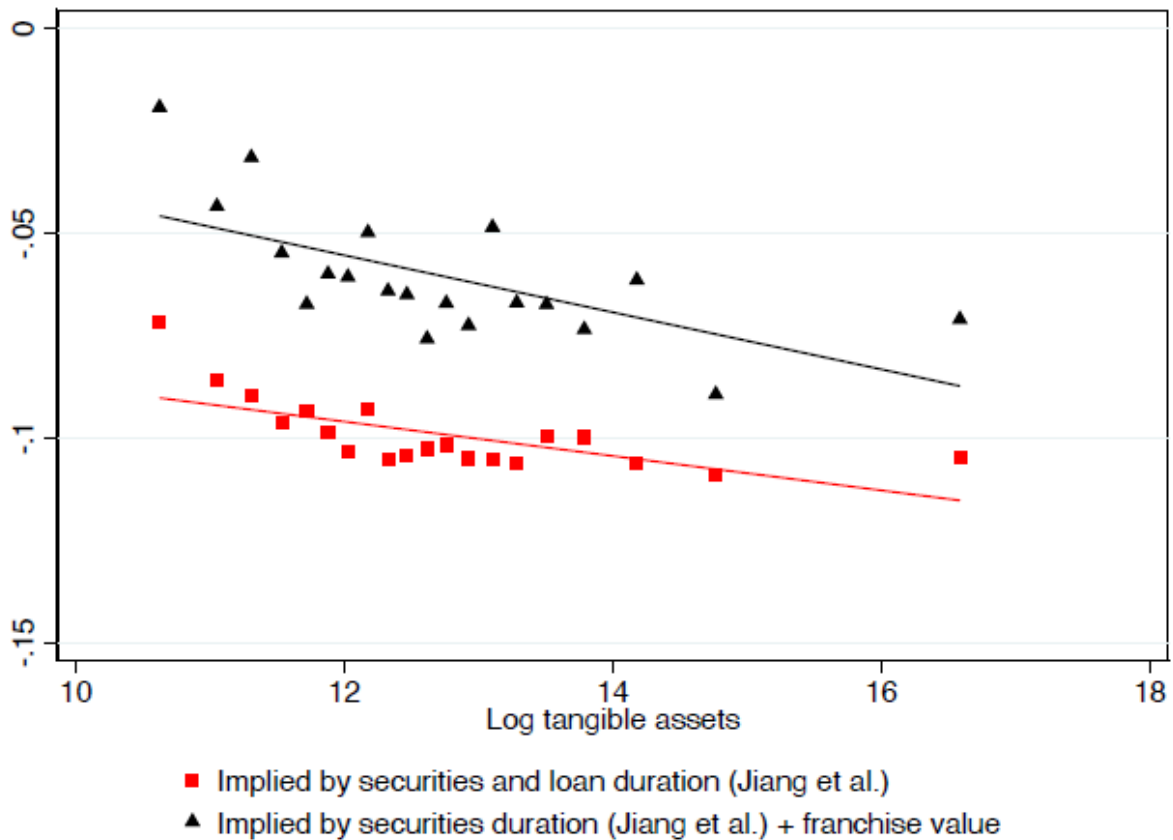- But unhedged exposure can trigger bank runs → FV collapses

This Paper:

- Further evidence that banks take interest rate risk
- Even in no-run equilibrium, measured franchise value does not help hedge bank equity value
- A lower bound for bank interest rate risk
- → much higher than prior literature claims
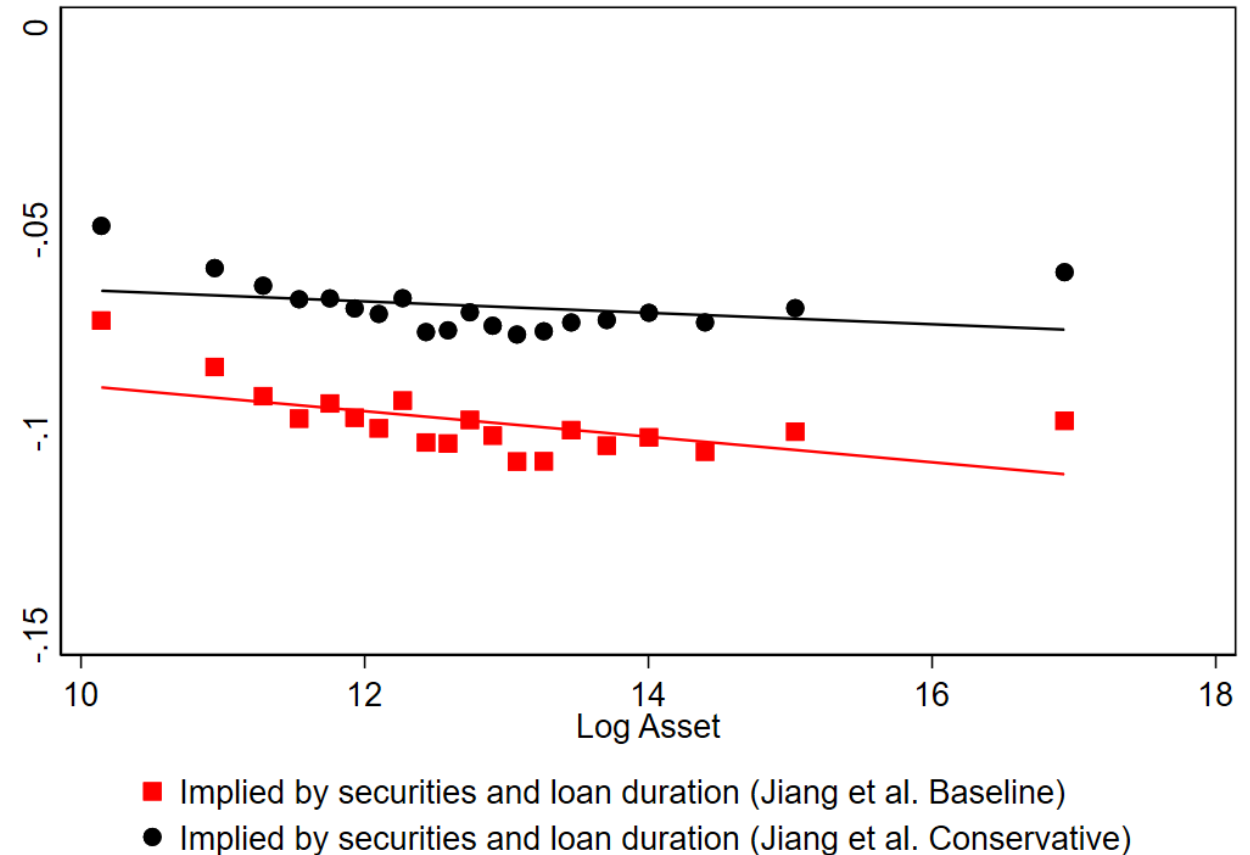
Bank Loss in 2023

- The loss on FV and securities combined is 6% of assets
  - Positive FV duration → no offsetting value changes
  - High FV duration is associated with more holdings of long-duration securities

- Existing FV is sufficiently high to make banks on-going solvent
  - High Continuation Value (level of FV) → capital buffer

Bank Loss in 2023

Figure 8 of the paper

Reproduced using Jiang et al. measures

Implied by securities and loan duration (Jiang et al.)
Implied by securities duration (Jiang et al.) + franchise value

Implied by securities and loan duration (Jiang et al. Baseline)
Implied by securities and loan duration (Jiang et al. Conservative)

Bank Loss in 2023

- The loss on FV and securities combined is 6% of assets
  - *In the ballpark of estimates in Jiang et al (2023)*

- Existing FV is sufficiently high to make banks on-going solvent
  - *In line with Jiang et al (2023): most banks can survive current level of interest rates in the absence of the RUN*

Other Comment: Loan Franchise Estimation

- Banks' value creation: deposit-taking and loan-making
  - Value creation from deposit-taking: $r^* - r^D$
  - From loan-making: $r^L - r^*$ (** discuss later*)
 - Don't create value by holding securities (T/B)

- Loan spread:

$$r^L_{t,b} = \frac{Interest\ Income_{t,b}}{L_{t,b}} - \rho_b$$

  - ρ_b: risk-neutral expected credit losses

- Time varying vs non-time varying: $\rho_{b,t}$ vs ρ_b?
  - Banks' risk-taking behavior may change over time (expected credit losses)
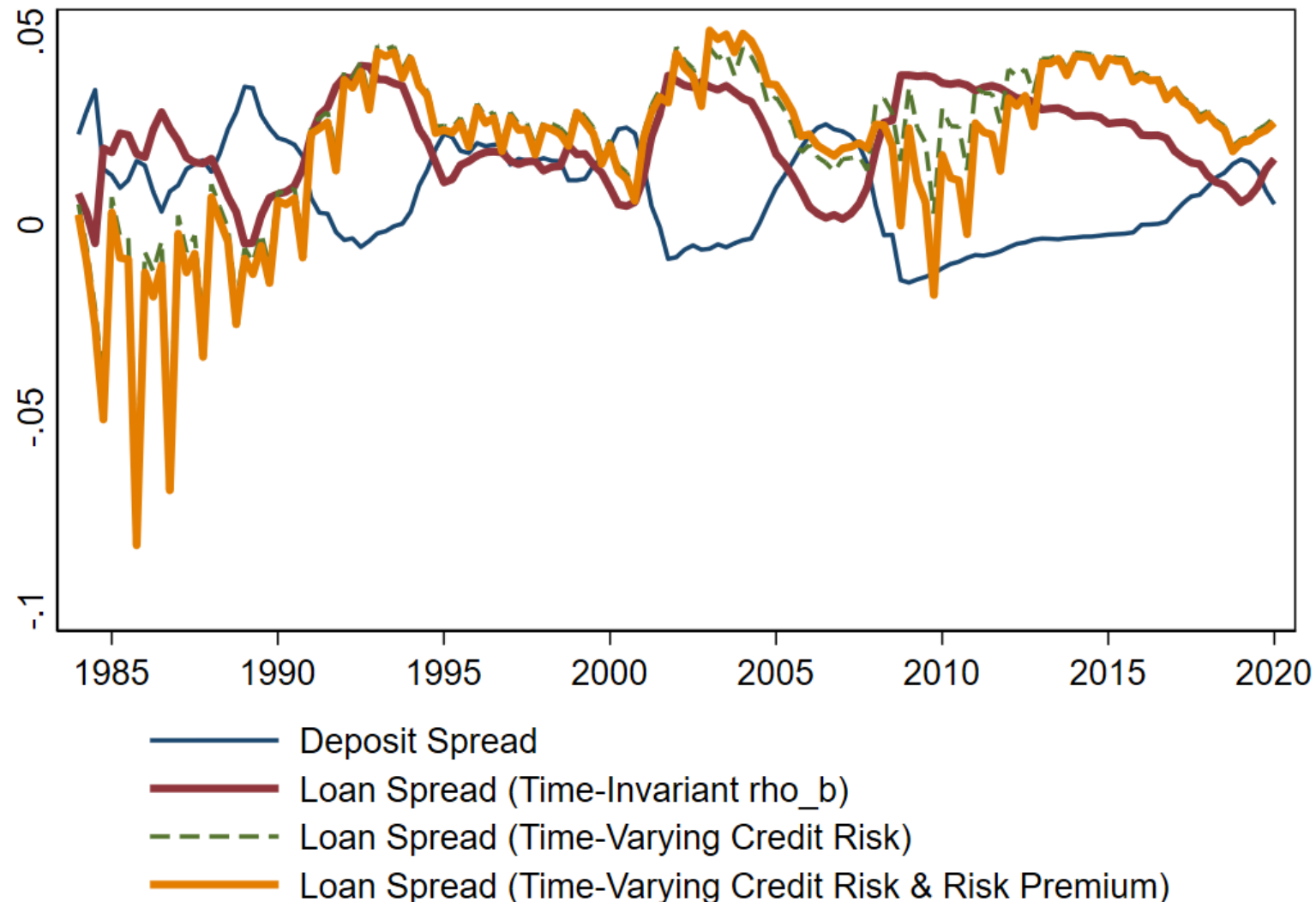 - Risk premium changes over time (Berndt et al., 2018)

Loan Spread Measurement

- **Blue & Red Solid Lines**:
Replication of Figure 1
  - Risk premium calibrated to match Figure 1

- **Green Dash Line**:
  - Time-varying risk premium from Berndt et al. (2018)
  - Invariant loss-provision
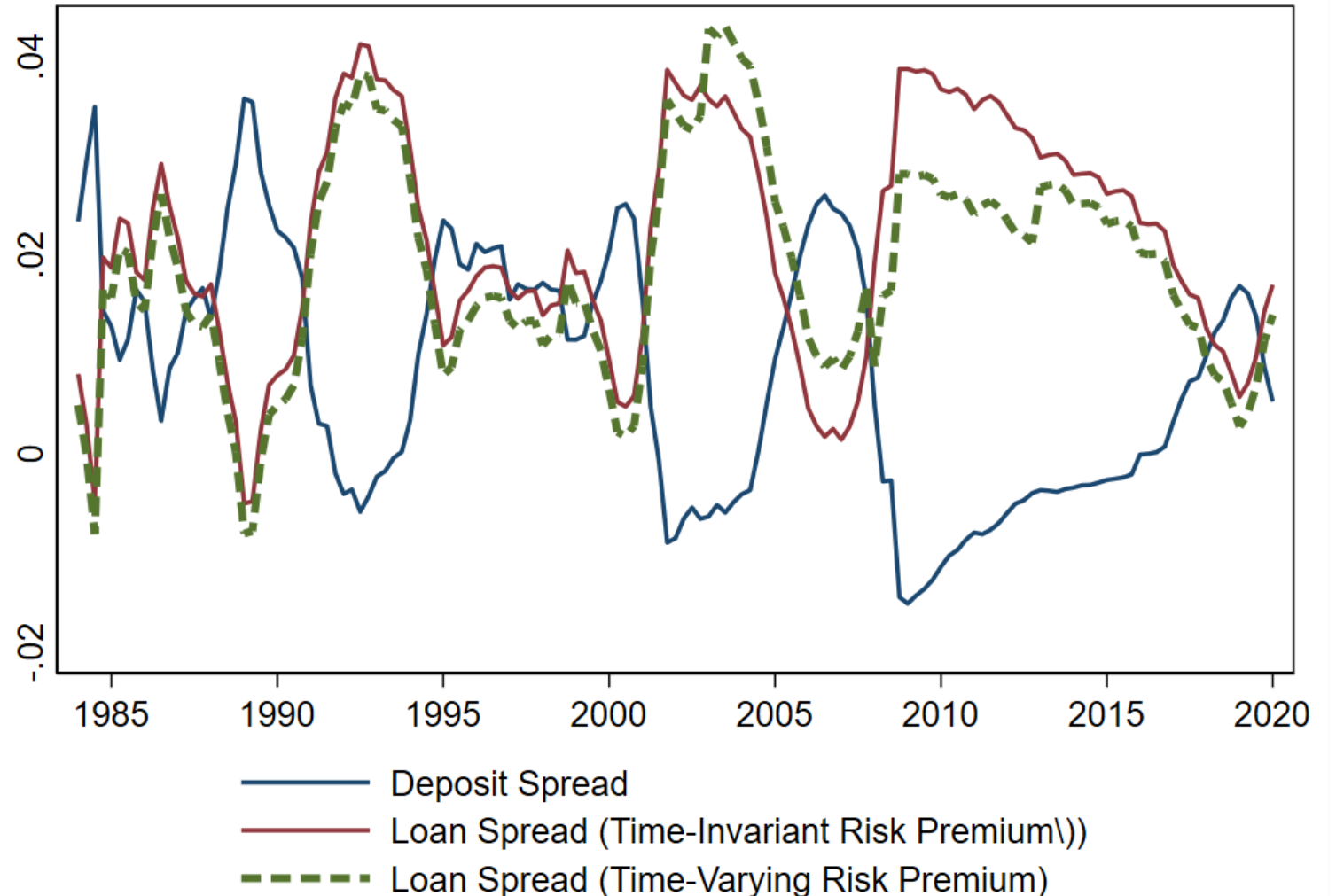
Deposit Spread
Loan Spread (Time-Invariant Risk Premium\))
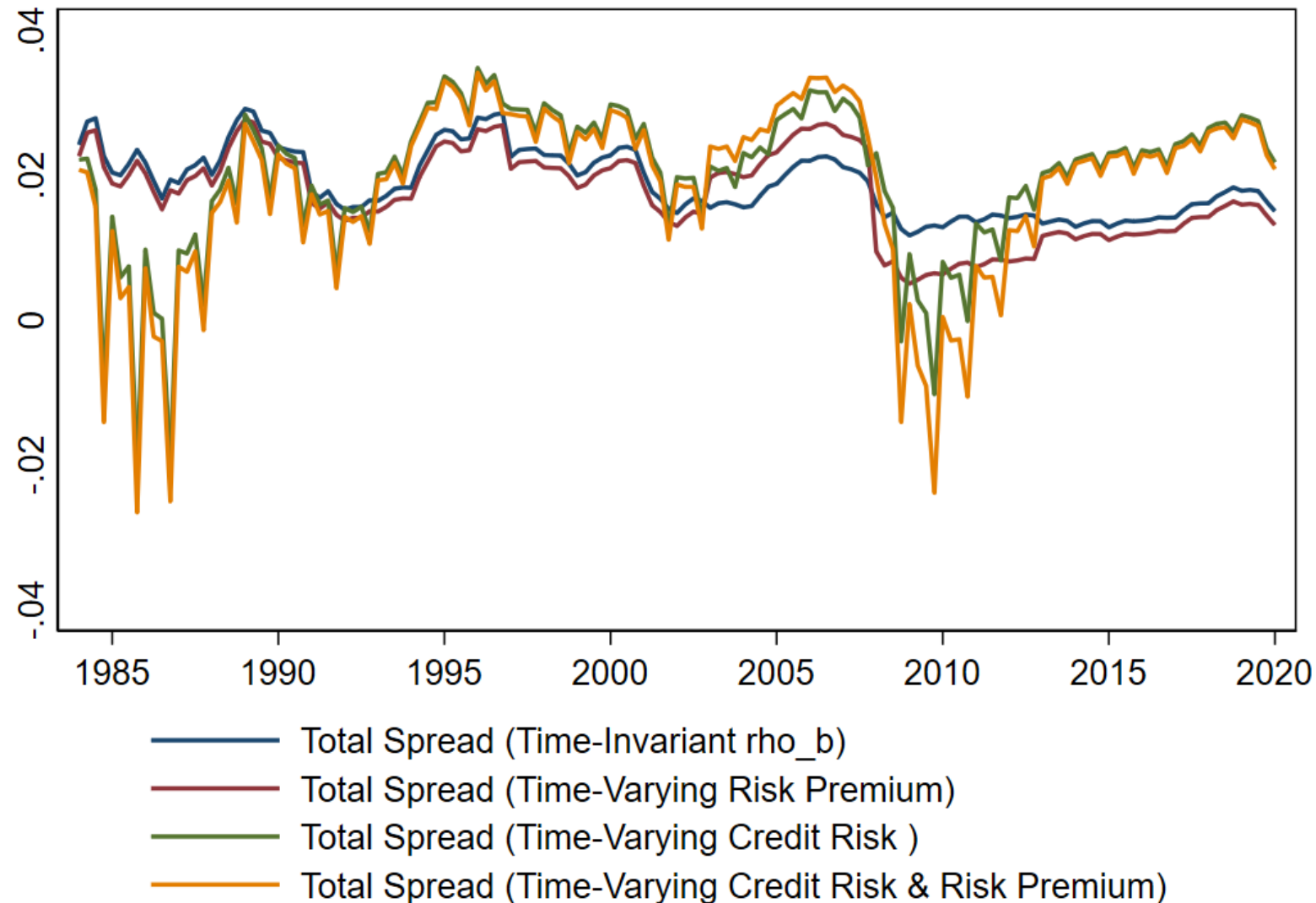Loan Spread (Time-Varying Risk Premium)

Loan Spread Measurement

- **Blue & Red Solid Lines**:
Replication of Figure 1
  - Risk premium calibrated to match Figure 1

- **Green & Orange Lines**:
  - Time-varying loss-provision & risk premium from Berndt et al. (2018)

Loan Spread Measurement

Total Spread (Time-Invariant rho_b)
Total Spread (Time-Varying Risk Premium)
Total Spread (Time-Varying Credit Risk)
Total Spread (Time-Varying Credit Risk & Risk Premium)

Loan Spread Measurement

- Nevertheless, main finding about **positive duration** holds.

	Intercept ϕ_0	Fed Funds ϕ_r	Term Swap ϕ_1	Term Swap ϕ_5
Deposit Spread	**0.002**	**0.31**	**-0.34**	**-0.27**
Loan Spread	**0.021**	**-0.21**	**0.29**	**0.40**
Time varying risk premium	0.019	-0.19	0.18	0.37
Time varying loss provision v1	0.045	-0.50	0.26	-0.20
Time varying loss provision v2	0.044	-0.50	0.21	-0.30
Total Spread	**0.015**	**0.13**	**-0.13**	**-0.03**
Time varying risk premium	0.013	0.14	-0.20	-0.05
Time varying loss provision v1	0.028	-0.02	-0.16	-0.37
Time varying loss provision v2	0.027	-0.02	-0.20	-0.42

Loan Spread Measurement

- Main finding about **positive duration** holds.

- Less emphasis though important ($\phi_0 > c$ or $\phi_0 < c$)

- Conceptually, why is it better *not* to use concurrent credit loss provision?

- Empirically, how is ρ_b constructed (e.g., what is the risk premium applied, time-varying or not, all sector or finance sector, etc.)?

Conclusion

- Useful empirical measures/estimation
  - A lower bound for bank interest rate risk
  - FV does not hedge equity value

- Clarifies important concepts

- Further evidence for banks' exposure to interest rate risk