FEDERAL RESERVE BANK of ST. LOUIS

CENTRAL TO AMERICA'S ECONOMY®

Discussion of Economic Conditions
Financial Markets Overview

US firms, bank credit, and rising interest rates

Miguel Faria-e-Castro
Senior Economist, Federal Reserve Bank of St. Louis

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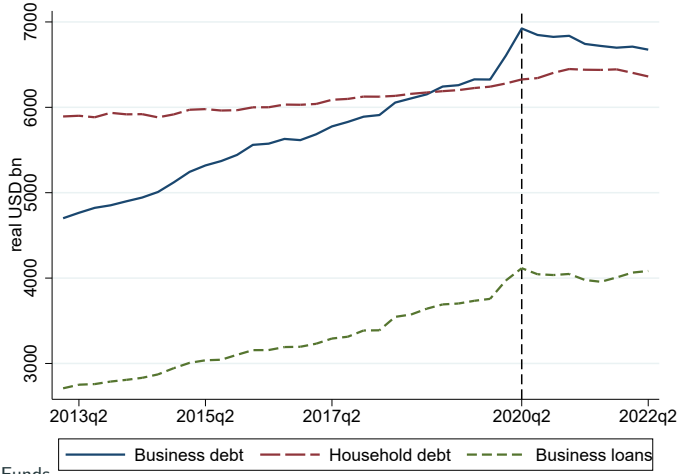
These slides have been screened to ensure that no confidential bank or firm-level data have been revealed as per S&R NAMS regulations.

Corporate debt surpassed household debt prior to the pandemic



Sources: FRED, Flow of Funds

This presentation

Question: How vulnerable are US nonfinancial firms to rising interest rates?

Data: Use FR Y-14Q confidential micro-data on firm loans and financials.

- Stress-testing regulatory data, universe of loan facilities >$1 million for $\sim$ 30 large BHCs
- Close to 80% of total Commercial & Industrial (C&I) lending in the US ▸ coverage details

Approach:

1. Facts on the composition of bank lending in the US
2. How have firm financials evolved during the pandemic and the recovery?
3. Are firm balance sheets prepared for rising interest rates?

Findings:

- US firm financial conditions better in many respects than in 2019
- US firms resilient to interest rate increases in spite of large shares of variable-rate debt

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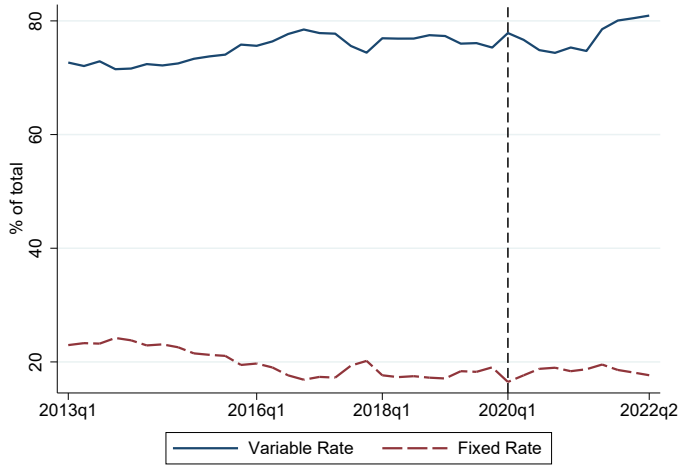
80% of loans are variable (or mixed) rate ⇒ very different from households



Source: Y-14Q.

Y-14Q, Firm Financials, and Rate Hikes

lending by industry

Y-14Q contains annual data on firm financials.

- Unique source of financial data for non-Compustat (private) firms in the US
- 286,000 unique firms for the 2014-22 period

firm count

1. Document changes in the distribution of firm financials
2. "Stress test" firm financials with respect to interest rate hikes

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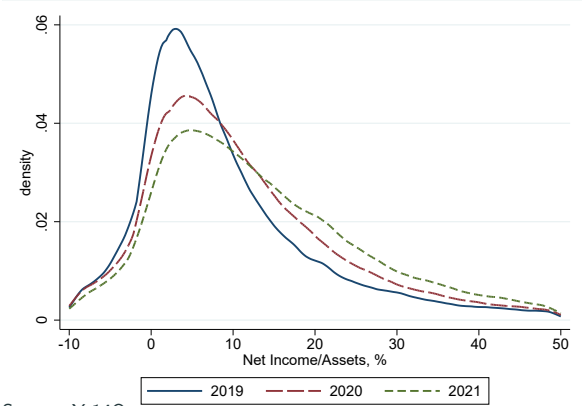
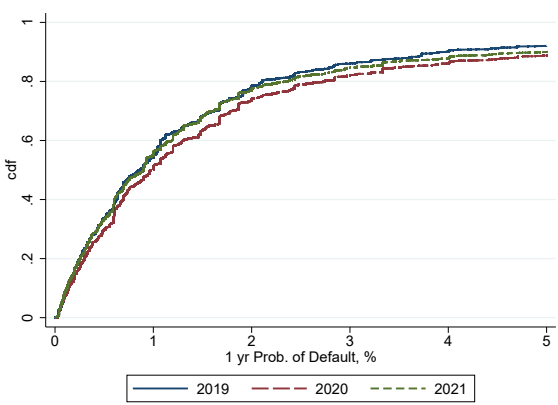
Return on assets and default probabilities, 2019-2021

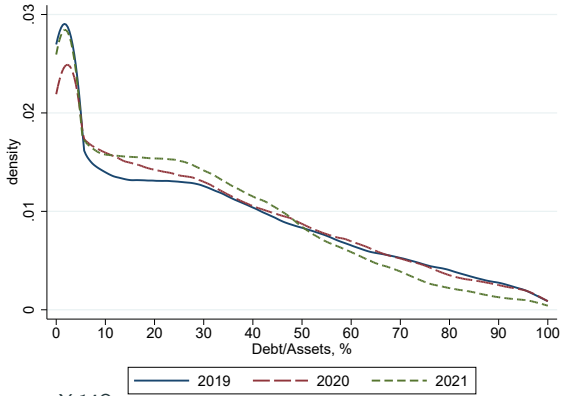
Distribution of RoA improved with respect to 2019, default probabilities mostly back to 2019 levels.

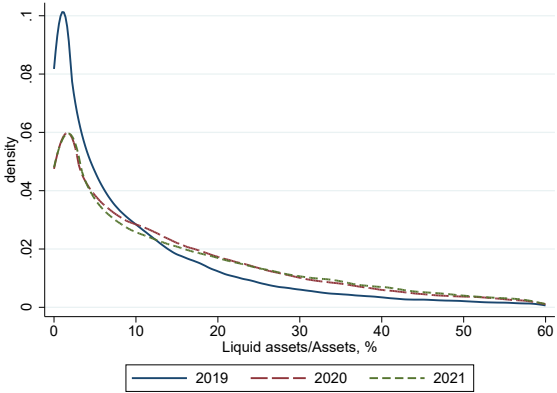




Source: Y-14Q.

Firms are (i) less leveraged and (ii) hold more liquid assets (Ebsim, Faria-e-Castro & Kozlowski, 2022).





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Stress testing US firms

- Majority of debt is variable-rate ⇒ firms are exposed to interest rate hikes
- Consider effect of rising federal funds rate on:
  1. Firm net income
  2. How many firms become insolvent?
  3. How many firms become illiquid?
- Scenarios:
  - Tightening as of Oct. 2022, 2.56%
  - Median SEP value at the end of 2022, 4.4%
  - Median SEP value at the end of 2023, 4.6%

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Impact on firm financials: baseline

Assume that impact on net income at time τ is given by

$$\text{Net Income}_\tau = \text{Net Income}_{2021} - \Delta FFR_\tau \times (\text{Variable-Rate Debt}_{2021} + \psi \times \text{Non-Variable-Rate Debt}_{2021})$$

where $\psi = 0.18$ ▸ passthrough estimates

	Data, 2021	2.6% FFR (Oct. 22)	4.4% FFR (22)	4.6% FFR (23)
Median Δ Int. Exp.		+15.56%	+38.19%	+39.25%
% firms with Net Income < 0	14.74%	15.86%	16.79%	16.83%
% of insolvent firms	8.72%	8.97%	9.06%	9.06%
% of illiquid firms	16.46%	16.73%	16.89%	16.90%

Definitions:

- Firm is insolvent when Equity + Net Income < 0
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- Firm financials look resilient even in the 4.4% and 4.6% scenarios

- These are **back-of-the-envelope calculations**

  1. **Overestimates**: do not account for changing firm behavior

     - Need to account for optimal response of quantity and type of borrowing

     - Composition elasticities are small in practice ▸ behavior estimates, ▸ 2015-19 tightening

  2. **Underestimates**: do not account for changing (deteriorating?) macro conditions ▸ sales impact

Conclusion & Policy Implications

- Business debt surpassed household debt in the recent past, spiked during pandemic
- $>80\%$ of business loans are variable-rate
  - Nonfinancial firms much more exposed to monetary policy tightening than households
- US firm financial conditions better in many respects than in 2019
  - Higher RoA, lower leverage, higher liquidity ratios
- US firms resilient to interest rate hikes in spite of large shares of variable-rate debt
  - Δ % of firms with negative profits: $+2.09$ pp
  - Δ % of insolvent firms: $+0.34$ pp
  - Δ % of illiquid firms: $+0.44$ pp
  - Changes are small even for the central SEP scenario, $FFR = 4.4\%$

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APPENDIX

Y-14Q coverage

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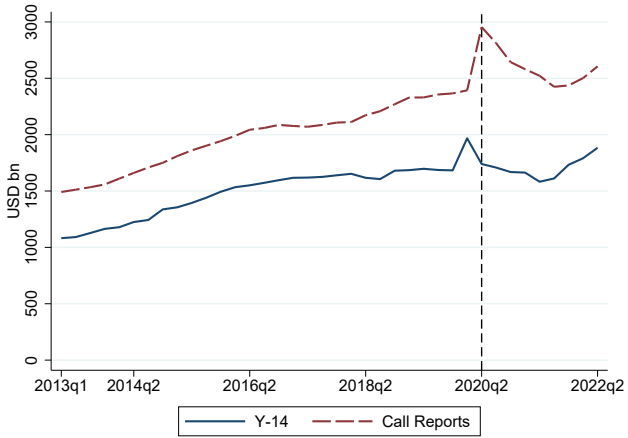
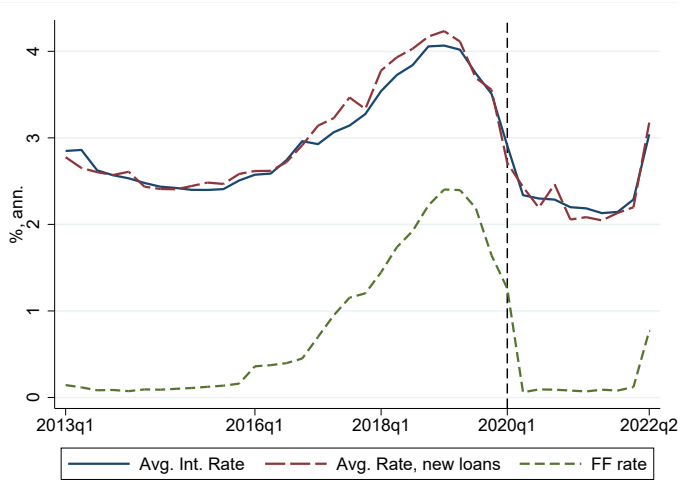


Source: Call Reports, Y-14Q.

- "Perfect" coverage for large BHC lending
- Close to 80% total C&I lending

C&I Lending: interest rates

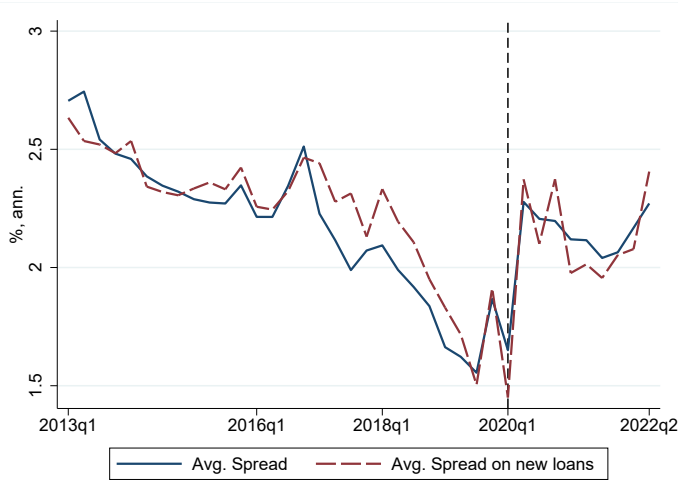
back



Source: Y-14Q.

C&I Lending: interest rate spreads

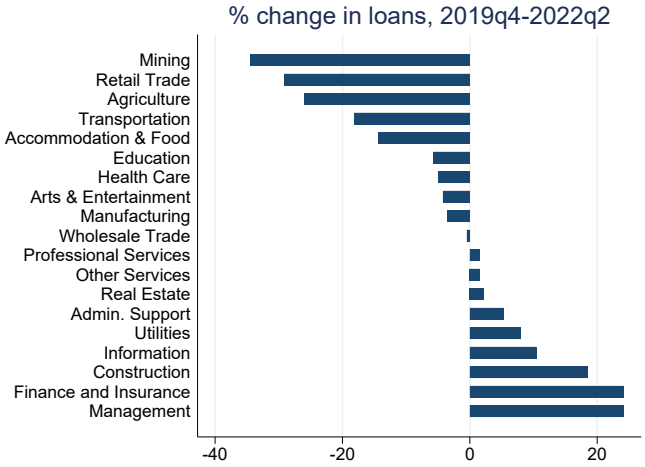
back



Source: Y-14Q.

Lending by Industry, NAICS2

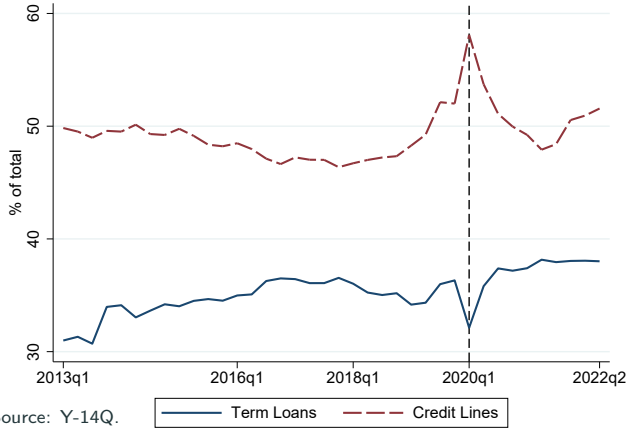
back



Source: Y-14Q.

C&I Lending: utilized credit lines more important than term loans

back

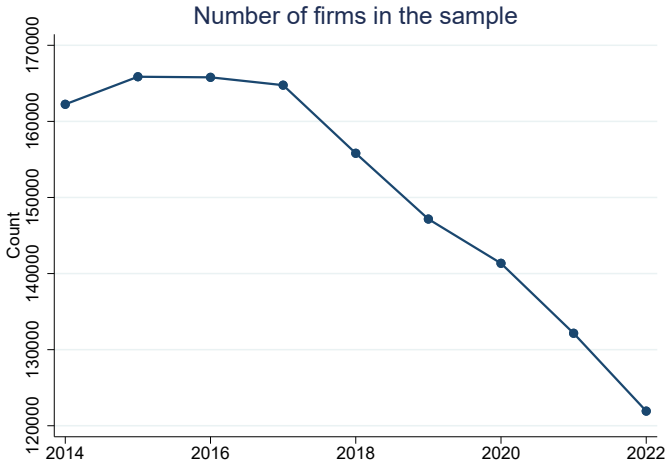


Source: Y-14Q.

- Credit lines $\sim$ 50% of utilized exposures
- CL utilization $\uparrow$ during the pandemic
- Term loans around $\sim$ 35%
- Others: capitalized lease obligations, standby letters of credit, etc.

Firm count per year

back

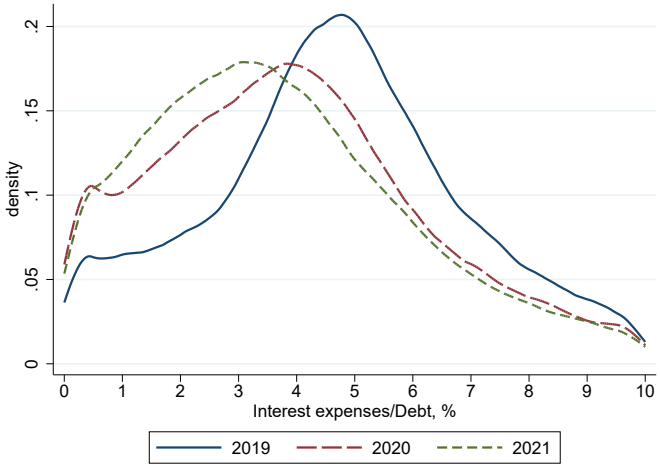


Source: Y-14Q.

Average interest rates, 2019-2021

back

Firms are paying lower rates on their debt.

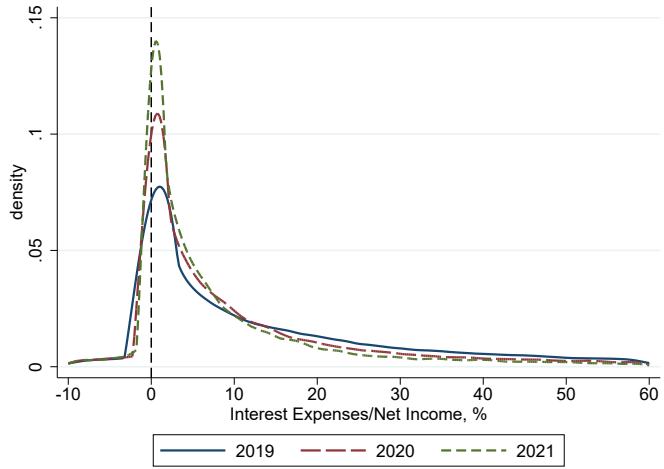


Source: Y-14Q.

Interest Expenses to Net Income

back

Interest expenses to net income ratio more concentrated around zero.



- FFR rose from 0.12% in Nov. 2015 to 2.40% in July 2019
- Median interest expenses rose by 59.7% between 2015 and 2019
- Median total debt rose by 26.4%
- Median net income grew by 35%

	Data, 2015	2.40% FFR, 2019
Median impact on interest expenses		+59.7%
Share of firms with Net Income < 0	16.04%	17.51%
Share of insolvent firms	10.13%	10.68%
Share of illiquid firms	19.61%	17.93%

Interest rate passthrough

back

Estimate the following regression:

$$R_{i,t} = \alpha_i + \beta FFR_t + \epsilon_{i,t}$$

where $R_{i,t}$ is the average interest rate on loans for firm i

	(1) Avg. Int. Rate	(2) New Int. Rate	(3) Non Var. Int. Rate
FFR	0.595^{***}	0.776^{***}	0.180^{***}
	(0.001)	(0.005)	(0.002)
Observations	3511266	185996	1433526
Adjusted R^2	0.507	0.390	0.553
Firm FE	Yes	Yes	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Behavioral response to changes in rates

back

Estimate the following regression:

$$\phi_{i,t} = \alpha_i + \beta FFR_t + \epsilon_{i,t}$$

where $\phi_{i,t}$ is firm i's share of variable rate debt

	(1)
FFR	-0.133***
	(0.015)
Observations	3511266
Adjusted R^2	0.828
Firm FE	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Impact on firm financials: effect on sales

back

Assume that impact on net income at time τ is given by

$$\text{Net Income}_\tau = \text{Net Income}_{2021} - \Delta FFR_\tau \times (\text{Variable-Rate Debt}_{2021} + \psi \times \text{Non-Variable-Rate Debt}_{2021}) + \Delta FFR_\tau \times \beta_{\text{FFR}} \times \text{Sales}_{2021}$$

where $\psi = 0.18$ and $\beta_{\text{FFR}} = -1.3$ from estimating

$$\frac{\Delta \text{Sales}_{i,t}}{\text{Sales}_{i,t-1}} = \alpha_i + \beta_{\text{FFR}} FFR_t + \beta_{\text{GDP}} \frac{\Delta Y_t}{Y_{t-1}} + v_{i,t}$$

	Data, 2021	2.6% FFR (Oct. 22)	4.4% FFR (22)	4.6% FFR (23)
% firms with Net Income < 0	14.76%	25.53%	47.15%	48.15%
% of insolvent firms	8.72%	9.68%	11.71%	11.86%
% of illiquid firms	16.44%	17.73%	21.38%	21.57%