

# Shared Borrowers, Shared Stress: The Credit-Line Channel of Contagion

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# New York Times

## NATIONAL EDITION

Rain and snow showers continue from Boston to Philadelphia as a storm moves off shore today. Showers and mountain snow persist in the West. Weather map, Page A24.

ompany

SATURDAY, MARCH 11, 2023

Prices in Canada may be higher

\$4.00



## Labor Market Keeps Riding Its Hot Streak

*U.S. Adds 311,000 Jobs  
as Some Sectors Slow*

By LYDIA DePILLIS

The labor market continued its energetic expansion in February, extending a hotter-than-expected streak that has created abundant job opportunities while frustrat-

## U.S. TAKES OVER CRUCIAL LENDER IN TECH WORLD

*BIGGEST BUST SINCE '08*

Investors Batter Stocks of  
Other Banks Catering  
to Start-Up Clients

## Motivation

- 13 March 2023: Silicon Valley Bank (SVB) collapses  
*NYT: [...] a financial contagion appeared to spread through parts of the financial sector [...]*  
*Investors dumped stocks of [banks] [...] which cater to start-up clients and have similar investment portfolios.*
- Can we predict the implications?
- Should SVB be bailed out or not?

## What we do

1. Introduce the credit line channel of contagion:  
Two banks are linked if they lend to the same firm
2. Construct measures of systemic risk
3. Compute these measures using loan-level data from the Fed (FR Y14)
4. Show that the channel is quantitatively important

## Next steps

1. Case Study: The collapse of Silicon Valley Bank in March 2023
2. Compare with established measures of systemic risk (CoVaR, SRISK)

## Why we do this

- main measures of systemic risk are based on market data, can detect that a crisis has arrived
- our measure use pre-crisis data to predict consequences of crisis (which banks *would* suffer, how bad would it be)

# Measuring systemic risk

## connectedness of banks $b$ with $a$

- How does a shock to bank  $a$  impact  $b$ ?
- single entry of the contagion matrix  $C$

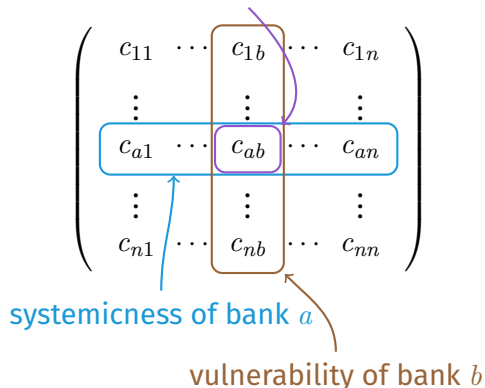
## systemicness of bank $a$

- How does a shock to  $a$  impact the system?
- row of the contagion matrix  $C$

## vulnerability of bank $b$

- How does a system-wide shock impact  $b$ ?
- column of the contagion matrix  $C$

## connectedness of banks $a$ and $b$



## Literature on Measuring Systemic Risk

| Paper                               | Scope               | Method   |
|-------------------------------------|---------------------|--|
| Greenwood et al. (2015, JFE)        | syst. & vuln.       | structural (fire sales)                        |
| Duarte and Eisenbach (2021, JF)     | syst. & aggr. vuln. | structural (fire sales)                        |
| Acharya et al. (2017, RFS)          | vulnerability       |  |
| Brownlees and Engle (2017, RFS)     | vulnerability       |  |
| Adrian and Brunnermeier (2016, AER) | systemicness        |  |
| Diebold and Yilmaz (2014, JE)       | connectedness       | reduced-form (VAR)                             |
| Denbee et al. (2021, JFE)           | connectedness       | structural (interbank)                         |
| Elsinger et al. (2006, MS)          | connectedness       | structural (interbank & correlated portfolios) |

Terminology follows Greenwood et al. (2015, “vulnerability” vs “systemicness”) and Diebold and Yilmaz (2014, “connectedness”).

## What this paper adds to the literature

- This paper measures **connectedness** in a structural way
- other such papers use interbank lending (which dried out after 2007)
- ... and correlated loan portfolios Elsinger et al. (2006)
- Elsinger et al. (2006):
  1. overlapping loan portfolios are more important than interbank lending
  2. idea: correlation of default risk on the loans
  3. similarity: banks are linked if they to the same sector
  4. difference: need a shock in the real sector, whereas our mechanism doesn't

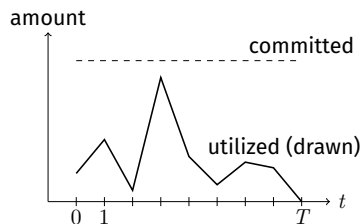


## **Mechanism: Shared Borrowers, Shared Stress**

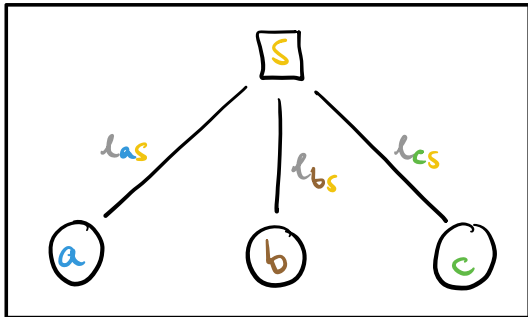
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## Background: How (revolving) credit lines work

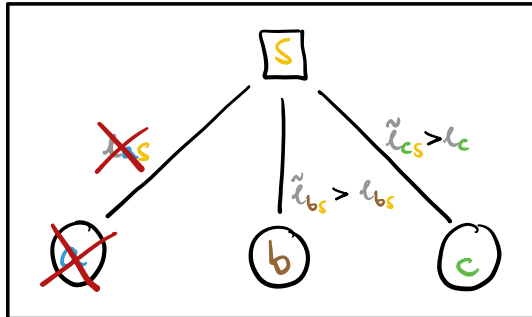
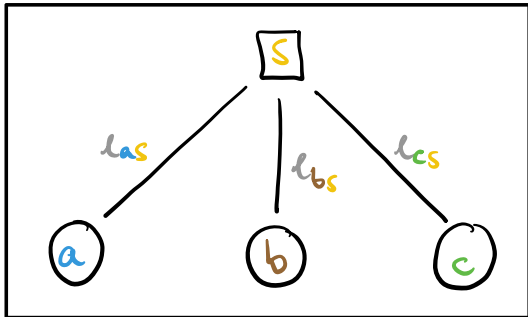
- bank commits a certain amount for  $T$  periods
- firm can draw down and repay at their will
- used for short-term liquidity needs and as buffer
- utilization is usually way below 50%
- credit lines account for 30% of corporate debt



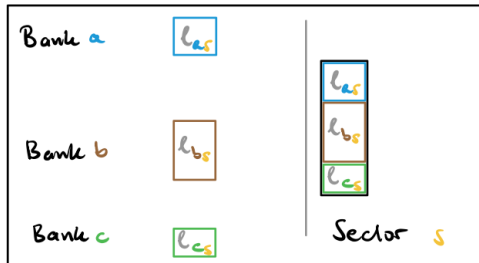
## A sector has credit lines with multiple banks



## A sector has credit lines with multiple banks — one of them defaults

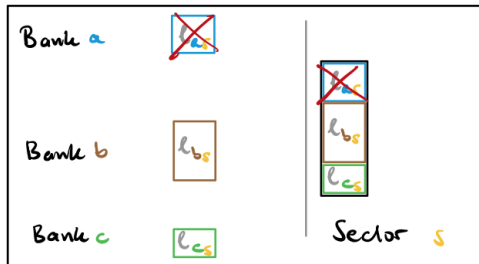


## The Credit-Line Channel of Contagion



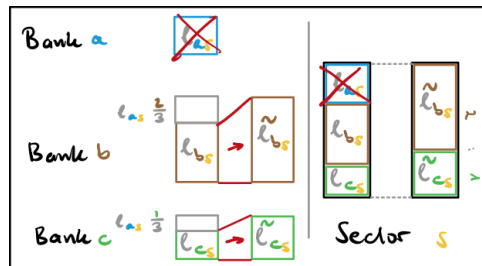
- Sector  $s$  has credit lines with multiple banks ( $a, b, c$ )

# The Credit-Line Channel of Contagion



- Sector  $s$  has credit lines with multiple banks ( $a, b, c$ )
- Bank  $a$  defaults  $\implies$  Sector  $s$  has liquidity shortfall of  $l_{as}$

# The Credit-Line Channel of Contagion



- Sector  $s$  has credit lines with multiple banks ( $a, b, c$ )
- Bank  $a$  defaults  $\implies$  Sector  $s$  has liquidity shortfall of  $\ell_{as}$
- Sector  $s$  uses credit lines with Banks  $b$  and  $c$  to compensate  
 $\implies$  **unexpected outflow** for  $b$  and  $c$

“Shared Borrowers, Shared Stress”

# The Credit-Line Channel of Financial Contagion

- the unexpected outflow to Sector  $s$  is  $\tilde{\ell}_{bs} - \ell_{bs}$
- suppose that  $a$  and  $b$  have multiple common borrowers, then the total outflow is

$$\text{total outflow}_{a \rightarrow b} = \sum_{s'} \tilde{\ell}_{bs'} - \ell_{bs'}$$

- against what should this outflow be compared?
  - utilized credit lines
  - cash & reserves (as a proxy high-quality liquid assets)
- let's define two measures of connectedness of bank  $a$  and  $b$

$$c_{ab} = \frac{\text{total outflow}_{a \rightarrow b}}{\text{cash \& reserves}_b}$$

$$\tilde{c}_{ab} = \frac{\text{total outflow}_{a \rightarrow b}}{\text{total utilized}_b}$$



## Why Cash & Reserves

- Regulation requires holding *high quality liquid assets* (HQLA) to survive 30 days of stress
- ~> compare additional outflow to cash and reserves (a proxy of HQLA)

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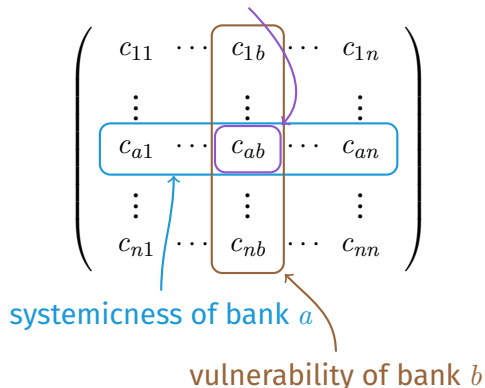
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## **Data**

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# Data

- loan-level corporate lending data (FR Y14)
  - loan amount, type of loan (term loan vs credit lines), borrower characteristics
  - covers *bank holding companies* with assets  $>$  \$100 billion ( $\approx$  20 banks)
  - available 2013–2025
  - ⇒ build bank-industry-quarter panel of (utilized/unutilized) credit lines
- balance sheet data (FR Y9C)
  - includes total assets, cash & reserves, ...
  - covers *bank holding companies* with assets  $>$  \$3 billion ( $\gg$  20 banks)

## Data: Summary statistics

| Variable  | Median | Q25   | Q75   |
|---|--------|-------|-------|
| <i>FR Y14 (loan-level data; 20 largest banks)</i>   |        |       |       |
| committed credit lines                              | 55.0   | 30.6  | 120.5 |
| unutilized credit lines                             | 31.4   | 13.5  | 63.3  |
| utilized credit lines                               | 27.9   | 12.6  | 41.9  |
| <i>FR Y9C (balance sheet data, many more banks)</i> |        |       |       |
| cash and reserves                                   | 31.8   | 9.3   | 92.2  |
| total assets  | 279.4  | 157.8 | 706.7 |

Notes: Values in billion USD. Summary statistics for a single (unspecified) year.

~> unutilized credit lines in the same ballpark as cash and reserves

## Results

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## Results: Overview

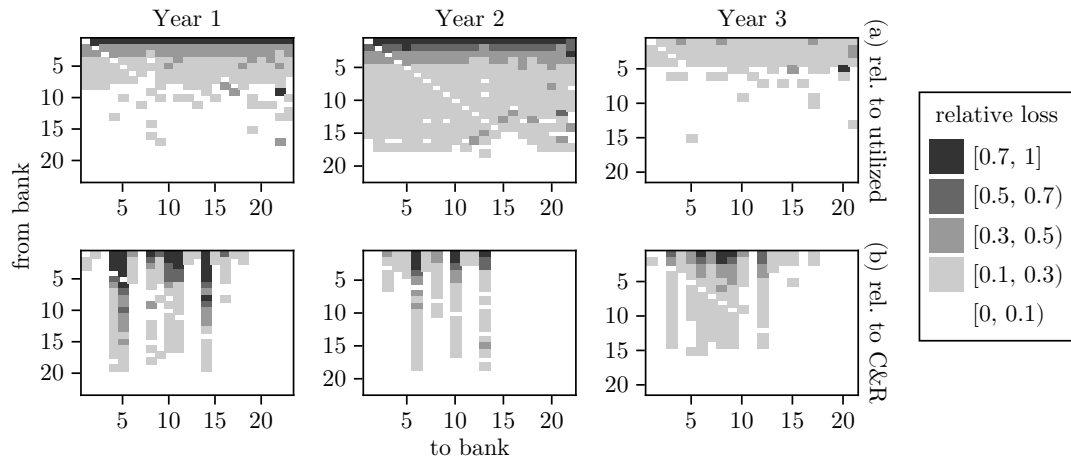
- Contagion matrix
- Systemicity
- Vulnerability

# The Contagion Matrix

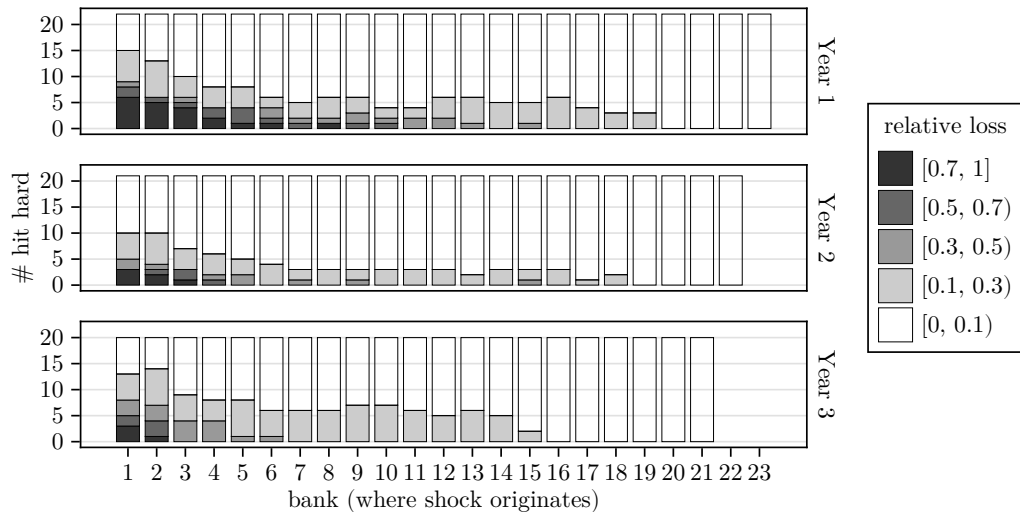
- Interpretation: How strong is the propagation from one to another bank?
- Measure: additional liquidity outflow of bank  $j$  if bank  $i$  reduces their lending
- What baseline to use?
  - utilized credit lines?
  - cash & reserves? relevant for regulators (cf HQLA)



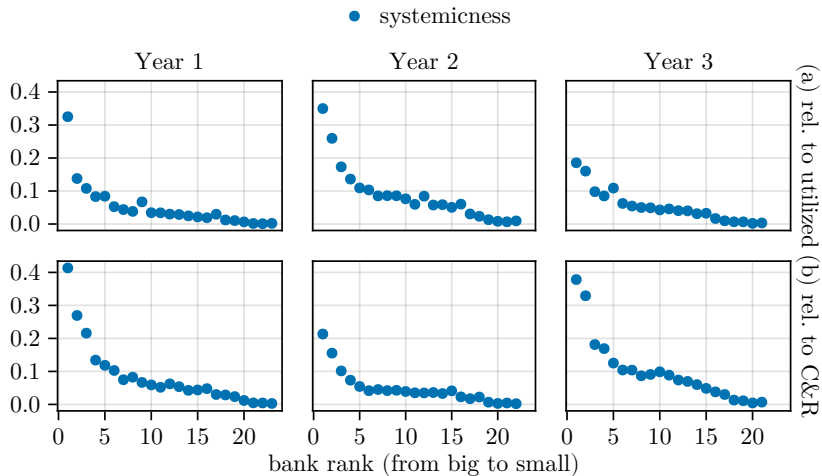
# Contagion matrix



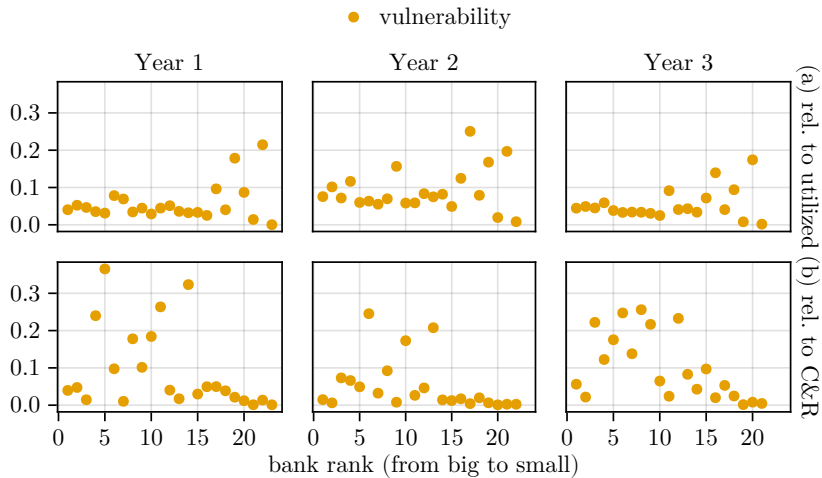
## Systemicness 1



## Systemicness 2 (average propagation)



# Vulnerability



## Conclusion

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### References

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ACHARYA, V. V., L. H. PEDERSEN, T. PHILIPPON, AND M. RICHARDSON (2017):  
“Measuring systemic risk,” *Review of Financial Studies*, 30, 2–47.

ADRIAN, T. AND M. K. BRUNNERMEIER (2016): “CoVaR,” *American Economic Review*,  
106, 1705.

BROWNLEES, C. AND R. F. ENGLE (2017): “SRISK: A conditional capital shortfall  
measure of systemic risk,” *Review of Financial Studies*, 30, 48–79.

## Literature ii

DENBEE, E., C. JULLIARD, Y. LI, AND K. YUAN (2021): “Network risk and key players: A structural analysis of interbank liquidity,” *Journal of Financial Economics*, 141, 831–859.

DIEBOLD, F. X. AND K. YILMAZ (2014): “On the network topology of variance decompositions: Measuring the connectedness of financial firms,” *Journal of Econometrics*, 182, 119–134.

DUARTE, F. AND T. M. EISENBACH (2021): “Fire-sale spillovers and systemic risk,” *Journal of Finance*, 76, 1251–1294.

ELSINGER, H., A. LEHAR, AND M. SUMMER (2006): “Risk assessment for banking systems,” *Management science*, 52, 1301–1314.

GREENWOOD, R., A. LANDIER, AND D. THESMAR (2015): “Vulnerable banks,” *Journal of Financial Economics*, 115, 471–485.