Failing Banks

Sergio Correia (Fed Board)
Stephan Luck (NY Fed)
Emil Verner (MIT Sloan)

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the Federal Reserve Bank of New York or the Federal Reserve Board.

Motivation

- Bank failures are an endemic feature of banking
  - 20% of all national banks in existence between 1863 and 1934 failed
  - 15% of all commercial banks in existence between 1935 and 2023 failed
- Bank failures often lead to real economic disruptions

  Bernanke (1983)
- Systemic banking crises are associated with severe macroeconomic downturns

  Reinhart and Rogoff (2009)

Why Do Banks Fail?

- **Liquidity-driven failures** due to self-fulfilling panic runs
  - Diamond and Dybvig (1983)...
  - Original cause of bank failure: **depositor behavior**
- **Insolvency-driven failures**
  - Realized credit risk, interest rate risk, or fraud can cause insolvency
  - Original cause of bank failure: **weak fundamentals**
- **Panic runs based on deteriorating solvency**
  - Allen and Gale (1998), Goldstein and Pauzner (2005)...
  - Original cause of bank failure: **weak fundamentals**, but **amplified by coordination failures**
  - Affects weak but solvent banks due to flighty depositors

Which types of failures are most empirically relevant?

This Paper

- **Challenge:** government interventions make liquidity-driven failures less likely
- **This paper:** study the history of **failing banks in the United States from 1863-2023**

→ New dataset with **balance sheets for most banks** in the U.S. since the Civil War

- 38,630 distinct banks
- 4,764 bank failures
- Sample before/after Federal Reserve System and deposit insurance

Main Finding

1. **Facts** about failing banks
   (i) **Deteriorating solvency** several years before failure
   (ii) Increasing **reliance on expensive/non-core funding**

2. **Bank failures are highly predictable** based on deteriorating fundamentals
   - Predictability extends to pre-FDIC/pre-FRS sample
   - Failures with runs are easier to predict than failures without runs
   - Aggregate waves of bank failures are predictable

$\Rightarrow$ Deterioration of bank fundamentals is a necessary condition for failure
   - To the extent that runs matter for failure, they only happen in very weakest banks
   - Runs happen late, and depositors appear slow to react, even before deposit insurance

Data and Context

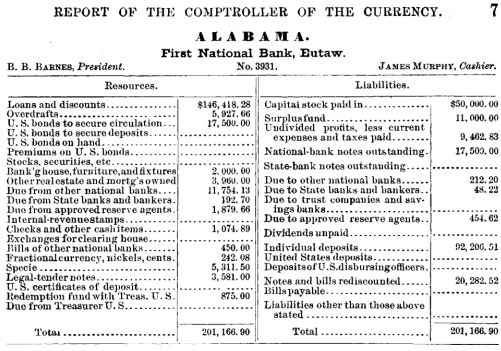
Data

Bank fundamentals:

- OCC Call Reports of national banks, 1863-1941
  - Source: OCC's Annual Report to Congress
  - 1865-1904: Carlson, Correia, and Luck (2022)
  - 1905-1941: digitized for this project
    - OCR methods by Correia and Luck (2023)
- FFIEC Call Report, 1959-2023
  - Extend data back from 1976 to 1959

Bank failures:

- Definition of failure: receivership
- OCC list of failing banks, 1863-1941
- FDIC list of failing banks, 1935-2023



REPORT OF THE COMPTROLLER OF THE CURRENCY. 7

ALABAMA.

First National Bank, Eutaw.

B. B. BARNES, *President*. No. 3931. JAMES MURPHY, *Cashier*.

Resources.		Liabilities.	
Loans and discounts	$146,448.28	Capital stock paid in	$50,000.00
Overdrafts	5,927.66	Surplus fund	11,000.00
U. S. bonds to secure circulation	17,500.00	Undivided profits, less current expenses and taxes paid	9,462.83
U. S. bonds to secure deposits		National-bank notes outstanding	17,500.00
U. S. bonds on hand		State-bank notes outstanding	
Premiums on U. S. bonds		Due to other national banks	212.20
Stocks, securities, etc.		Due to State banks and bankers	48.22
Bank'g house, furniture, and fixtures	2,000.00	Due to trust companies and savings banks	
Other real estate and mortg's owned	3,960.00	Due to approved reserve agents	454.62
Due from other national banks	11,754.13	Dividends unpaid	
Due from State banks and bankers	192.70	Individual deposits	92,206.51
Due from approved reserve agents	1,879.66	United States deposits	
Internal-revenue stamps		Deposits of U. S. disbursing officers	
Checks and other cash items	1,074.89	Notes and bills rediscounted	20,282.52
Exchanges for clearing house		Bills payable	
Bills of other national banks	450.00	Liabilities other than those above stated	
Fractional currency, nickels, cents	242.08		
Specie	5,311.50		
Legal-tender notes	3,581.00		
U. S. certificates of deposit			
Redemption fund with Treas. U. S.	875.00		
Due from Treasurer U. S.			
Total	201,166.90	Total	201,166.90

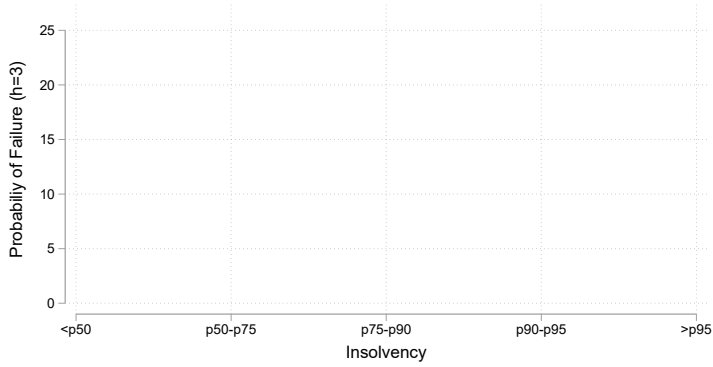
Predicting Bank Failures

Consider the conditional probability of failure

$$\mathbb{P}(\text{Failure}_{b,t+1\to t+3} | \text{Insolvency}_{b,t}, \text{Funding Vulnerability}_{b,t}),$$

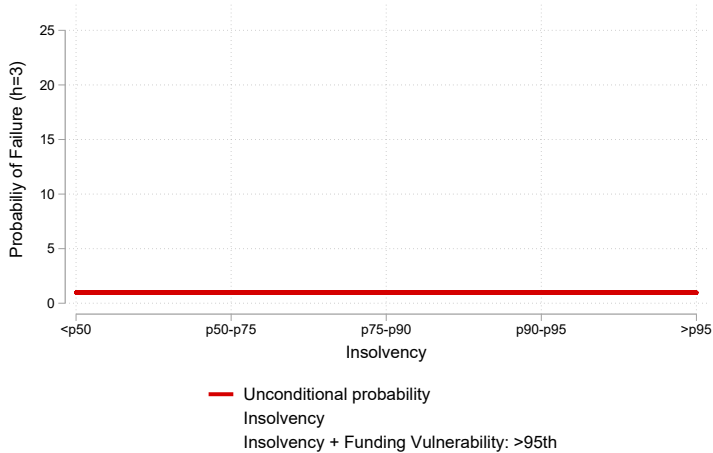
- Insolvency_{bt}: proxy distance to default
  - Capitalization
  - Income
  - Non-performing assets
- $\text{Funding Vulnerability}_{bt}$: reliance on expensive funding
  - Wholesale funding
  - Time deposits
    - More sensitive to federal funds rate (Drechsler, Schnabl, and Savov, 2017)
    - More sensitive to bank risk (Martin, Puri, and Ufier, 2022)

Conditional Probability of Failure: 1959-2023

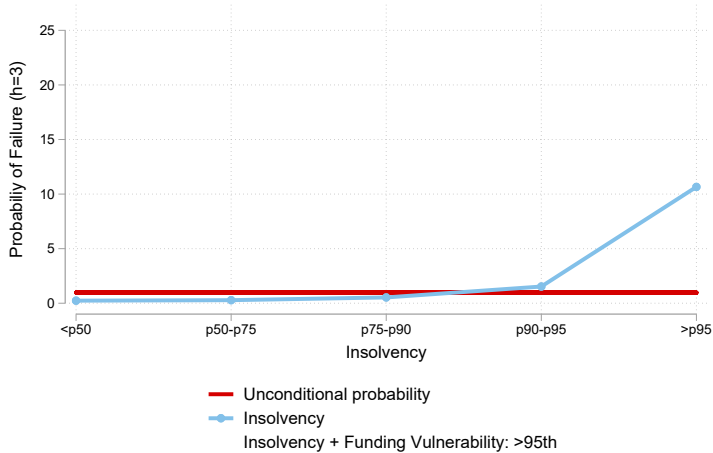


Unconditional probability
Insolvency
Insolvency + Funding Vulnerability: >95th

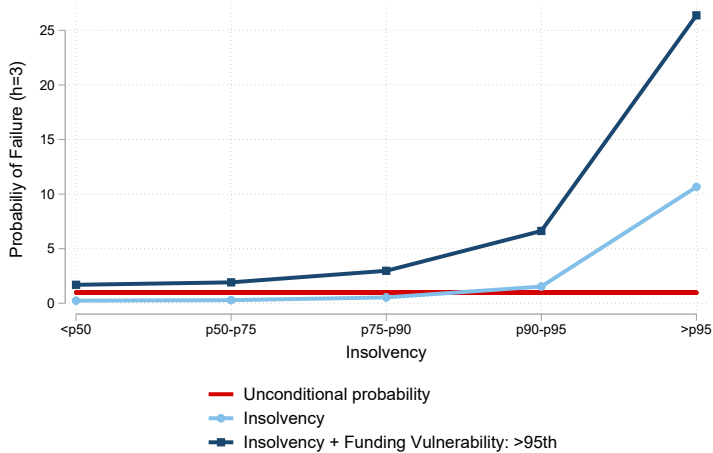
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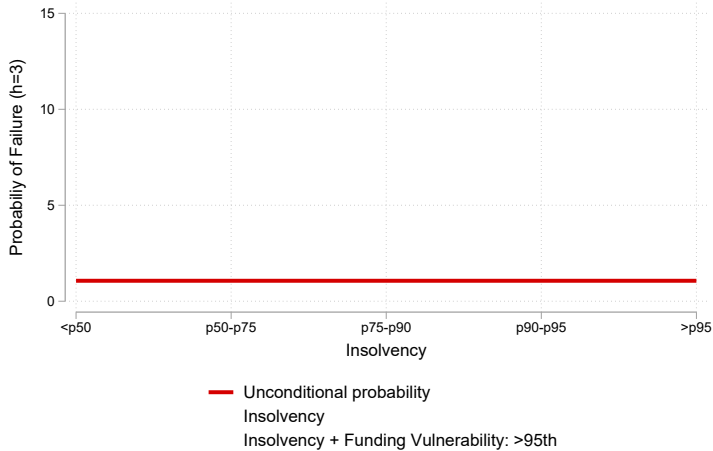
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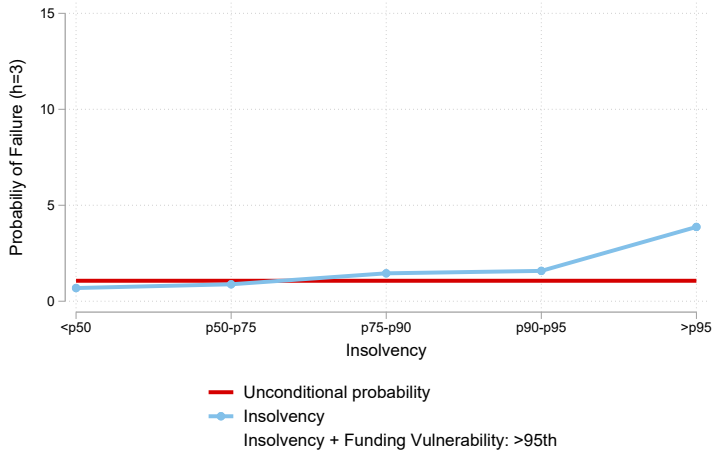
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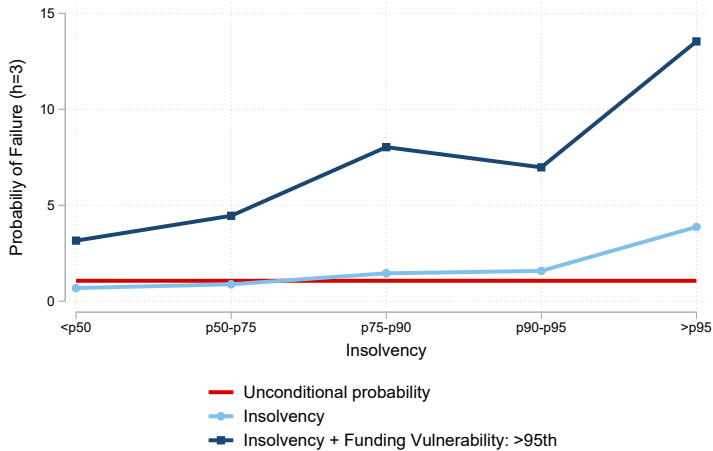
Conditional Probability of Failure: 1865-1904



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Conditional Probability of Failure: 1865-1904



Prediction Framework

- Predictive model:

$$\text{Failure}_{b,t+1\to t+s} = \alpha + \beta_1 \times \text{Insolvency}_{b,t} + \beta_2 \times \text{Funding Vuln.}_{b,t} + \beta_3 \times \text{Insolvency}_{b,t} \times \text{Funding Vuln.}_{b,t} + \epsilon_{b,t+1\to t+s}$$

- What does predictability say about the nature of bank failures?
  - $\to$ Purely liquidity-driven, self-fulfilling failures not predictable by fundamentals
  - $\to$ Fundamental-based panics less predictable than insolvency-driven failures

- Predictability metric: Area Under the Receiver Operating Characteristics Curve (AUC)
  - AUC$=0.50 \to$ Naive predictor (coin toss)
  - AUC$>0.50 \to$ Informative predictor
  - Benchmark: predicting financial crises AUC ≈ 0.74
    - Greenwood, Hanson, Shleifer, Sorensen, 2022

Bank Failures Are Highly Predictable

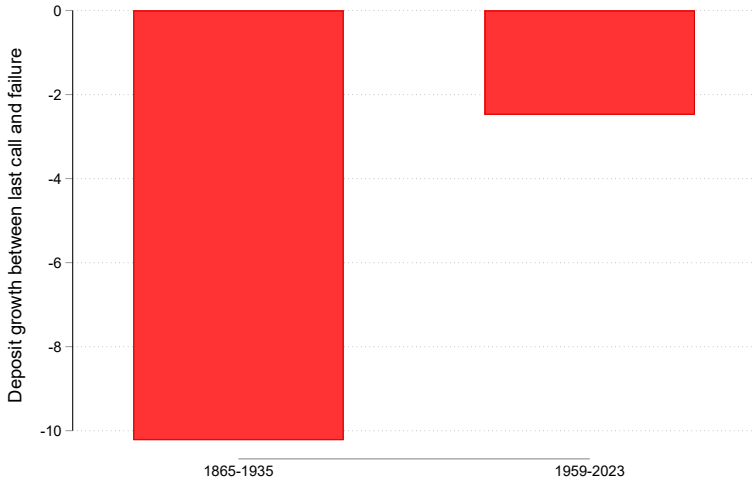
AUC Statistics: One-Year Horizon

Sample	AUC In-sample	AUC Out-of-sample
NB Era (1880-1904)	0.840	0.836
Early Fed (1914-1928)	0.888	0.806
Great Depr. (1929-1934)	0.818	0.690
Modern Era (1959-2023)	0.951	0.938

Failures With Runs

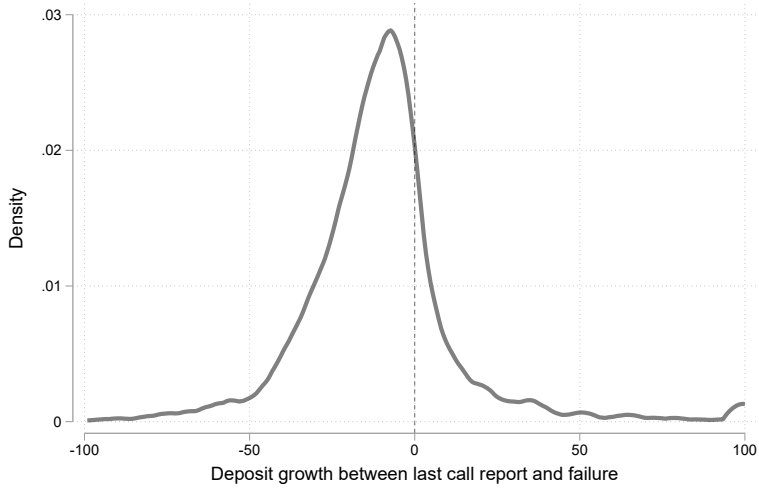
Deposit Outflows in Failing Banks Were Large Before Deposit Insurance

... But Small After



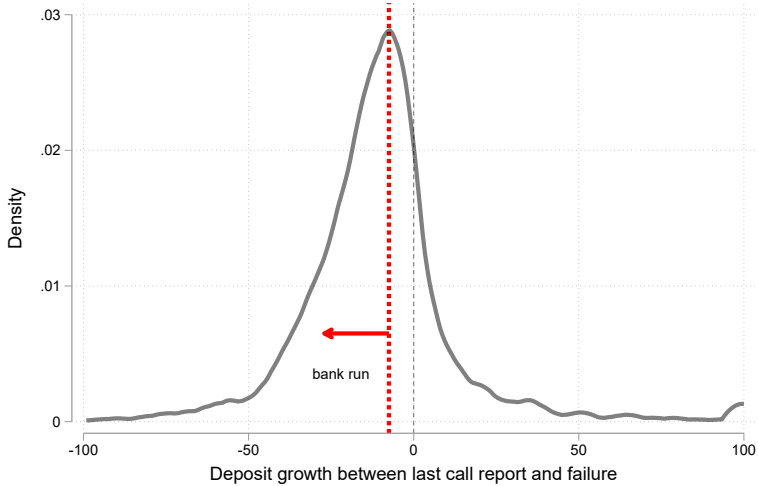
Deposit outflow distribution

Deposit Outflows Before 1935



- Define failures with runs as those with deposit outflow $>7.5\%$

Deposit Outflows Before 1935



- Define failures with runs as those with deposit outflow $>7.5\%$

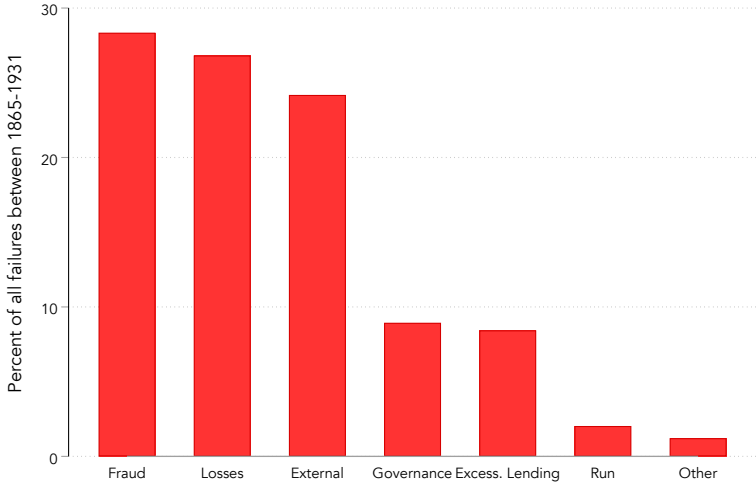
Failures With Runs Are Easier to Predict Than Other Failures

	AUC	
Sample	With Run	No Run
NB Era (1880-1904)	0.892	0.798
Early Fed (1914-1928)	0.902	0.861
Great Depr. (1929-1934)	0.820	0.816

- Failures with runs are not disconnected from bank fundamentals, even in historical context where failures due to non-fundamental runs are possible

Cause of Failure Assigned by OCC Examiner

Sample: Failures from 1865 to 1931



Predicting Aggregate Waves of Bank Failures

Does the Link between Fundamentals and Failures Hold During Crises?

$$\textit{FailureRate}_{t+1} = \alpha + \beta_1 \text{Avg. Predicted Failure}_{t+1|t} + \beta_2 \text{Banks-at-Risk}_{t+1|t} + \epsilon_{t+1}$$

Dependent variable	Failure Rate					
	(1)	(2)	(3)	(4)	(5)	(6)
Banks-at-Risk (*BaR*)	11.81***		8.34***	4.07***		1.58***
	(1.55)		(2.84)	(0.76)		(0.52)
Avg. predicted failure rate		3.94***	1.45		1.26***	0.93***
		(0.60)	(1.00)		(0.10)	(0.12)
N	35	35	35	52	52	52
R^2	0.64	0.57	0.66	0.69	0.84	0.89
Sample	1865-1935	1865-1935	1865-1935	1959-2023	1959-2023	1959-2023

Wrapping Up

Which Theories Best Fit the Facts?

- Purely liquidity-driven, self-fulfilling failures

  Diamond and Dybvig (1983), Allen and Gale (2000)...

  - Inconsistent with strong predictability based on weak fundamentals

- Panics based on fundamentals

  Allen and Gale (1998), Goldstein and Pauzner (2005), He and Xiong (2012)

  - To extent runs based on coordination failures matter, they require weak fundamentals
  - Challenges:
    - Despite high depositor loss rates, many failures without runs
    - And, while runs should happen immediately once signal is sufficiently strong ...
    - ... probability of failure between 13-40% not uncommon

  $\rightarrow$ Sleepy depositors, even before deposit insurance

- Insolvency-driven failures

  - Consistent with: predictability based on weak fundamentals; examiner-assigned cause of failure; failures in modern era without runs; low recovery rates

Conclusion

- **Objective:** What causes bank failures and banking crises?
- **Approach:** Study the close to complete history of (failing) banks in the U.S.
- **Main Finding:** Bank failures and runs are highly predictable based on fundamentals
- **Policy:** Focus on solvency versus "fire-fighting"

Bank failures are (almost) always and everywhere a phenomenon of deteriorating fundamentals.