Canary in the Coal Mine: Bank Liquidity Shortages and Local Economic Activity

Rajkamal Iyer
Imperial College and CEPR

Shohini Kundu
UCLA Anderson

Nikos Paltalidis
Durham University

Motivation

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- Gradual build-up of risk across regions in an economy $\Rightarrow$ national downturns or financial crises

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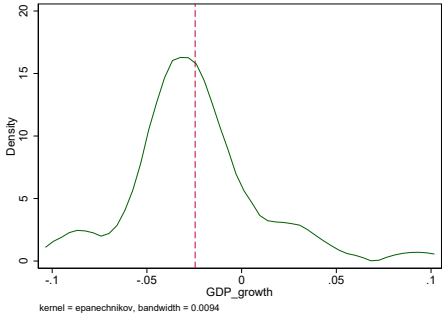
- Gradual build-up of risk across regions in an economy ⇒ national downturns or financial crises
  - 32 out of 51 states experienced a GDP drop $> 2\%$ during GFC; other states experienced less severe declines or positive growth



Density of Annual State GDP Growth in 2009

State Recessions State Recessions

Real-Time Measure of Economic and Financial Risks

Exploit spatial variation in bank liquidity shortages

Banks play a pivotal role across business cycles

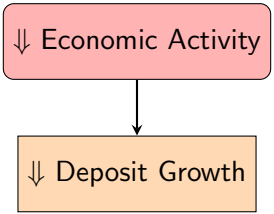
1. Source of funding
2. Source of savings

$\Rightarrow$ Fluctuations in business cycles have an impact on banks' liquidity positions

Liquidity Conditions and Business Cycles

⇓ Economic Activity

Liquidity Conditions and Business Cycles



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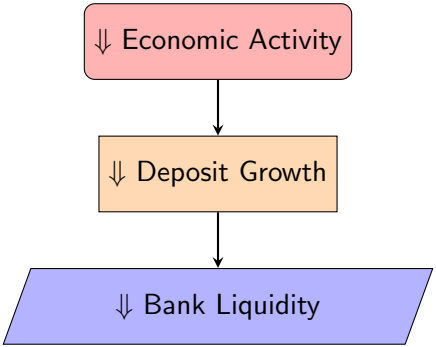

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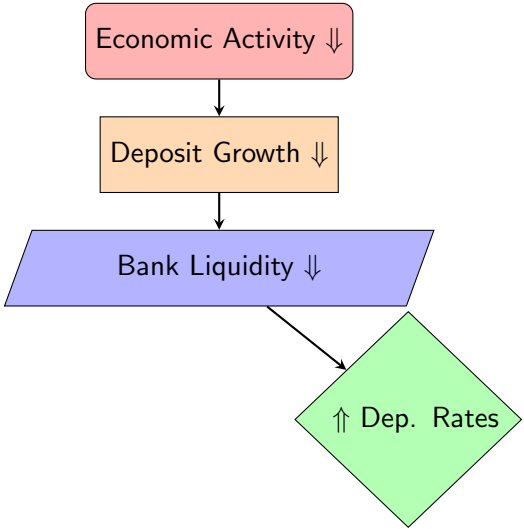
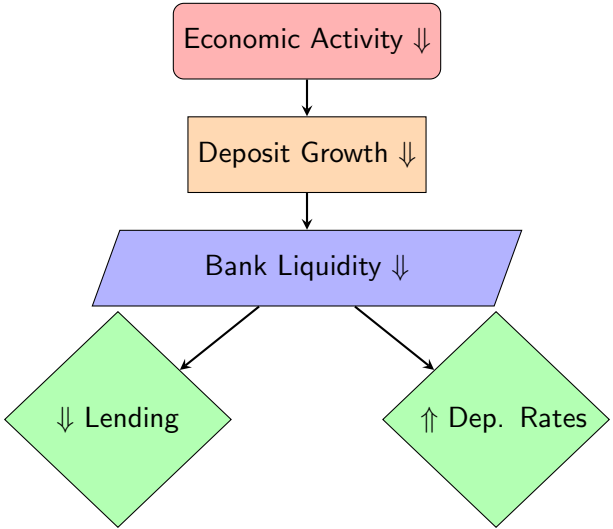


Liquidity Conditions and Business Cycles



State of the Art in Predicting Economic Contractions

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  - Can predict local economic activity
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  - Can predict economic activity with a high degree of accuracy
  - Can predict economic activity in periods without monetary policy changes, credit booms, or imminent national recessions

State of the Art in Predicting Economic Contractions

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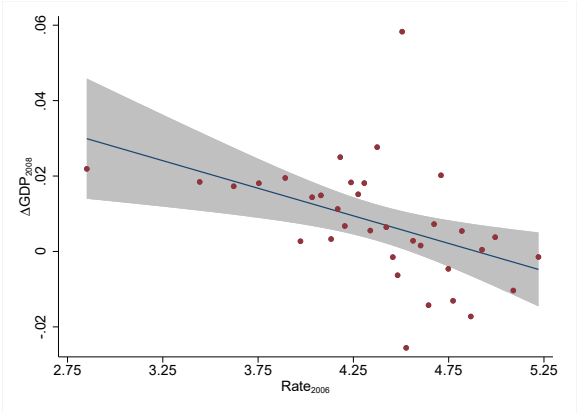
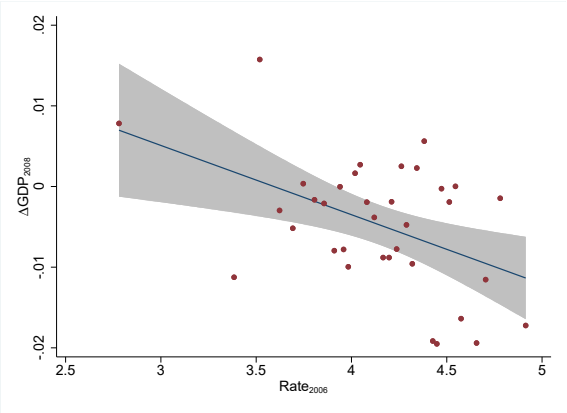
- **We highlight how banks change composition of deposits and rely more on insured deposits.**
  - Movement of insured and uninsured deposits at the onset of an economic contraction
  - Riskier banks substitute more to insured deposits
  - Raises concerns of moral hazard arising from deposit insurance

Deposit Rates and Economic Activity

2006 Deposit Rates Predict 2008 GDP Growth

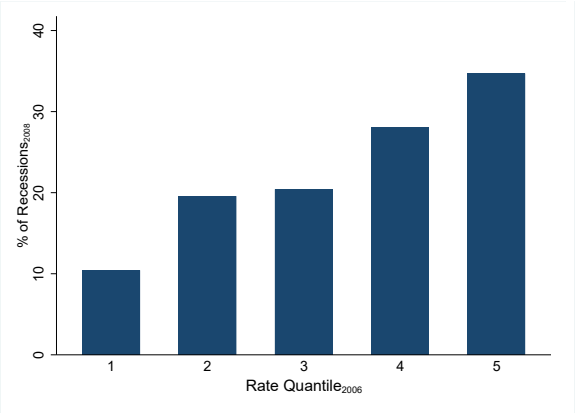


(a) County

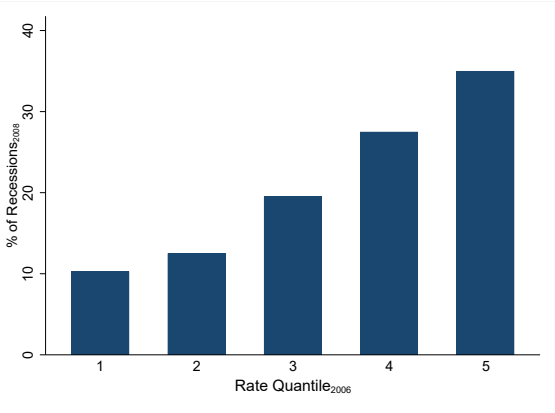


(b) State

2006 Deposit Rates Predict Large Drops in GDP in 2008



(a) County



(b) State

Bank Deposit Rates and Economic Activity

Summary Statistics

County deposit rates are a salient indicator of economic activity:

1. GDP growth
2. New business formation
3. Early-stage delinquencies

$$Y_{c,t+k} = \beta_1 \cdot Rate_{c,t} + \alpha_c + \alpha_t + \epsilon_{c,t}$$

- Focus on metropolitan (metro) counties as these areas exhibit a competitive banking structure
- Metro counties comprise nearly 60% of the national GDP

Deposit Rates and GDP Growth

Higher deposit rates ⇒ lower economic activity

Δln(GDP)	1 Year Ahead	2 Years Ahead	3 Years Ahead	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	-0.0012	-0.0044***	-0.0037***	-0.0031	-0.0073**	-0.0138***
	(0.0008)	(0.0007)	(0.0006)	(0.0032)	(0.0035)	(0.0040)
County FIPS FE	✓	✓	✓	✓	✓	✓
Year FE				✓	✓	✓
N	4,578	4,292	4,029	4,578	4,292	4,029
R^2	0.1069	0.1196	0.1183	0.2668	0.2757	0.2796

- 1 SD ↑ in deposit rate → 0.44-0.73 pp ↓ in GDP growth two years ahead
- 1 SD ↑ in deposit rate → 0.37-1.38 pp ↓ in GDP growth three years ahead

Deposit Rates and Business Formation

Higher deposit rates ⇒ lower new business formation

ln(Applications)	1 Year Ahead	2 Years Ahead	3 Years Ahead	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	-0.0488***	-0.0541***	-0.0755***	0.0055	-0.0111	-0.0277
	(0.0033)	(0.0033)	(0.0036)	(0.0146)	(0.0169)	(0.0171)
County FIPS FE	✓	✓	✓	✓	✓	✓
Year FE				✓	✓	✓
N	3,923	3,640	3,378	3,923	3,640	3,378
R^2	0.9797	0.9795	0.9804	0.9933	0.9935	0.9935

- 1 SD ↑ in deposit rate → 4.89% ↓ in business formation one year ahead
- 1 SD ↑ in deposit rate → 5.41% ↓ in business formation two years ahead
- 1 SD ↑ in deposit rate → 7.55% ↓ in business formation three years ahead

Deposit Rates and Mortgage Delinquency Rate

Higher deposit rates ⇒ higher early-stage delinquency rate

Delinquency Rate (30-89 days)	1 Year Ahead	2 Years Ahead	3 Years Ahead	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	0.4066***	0.3447***	0.2800***	0.0564*	0.0858**	0.0767*
	(0.0151)	(0.0149)	(0.0147)	(0.0339)	(0.0363)	(0.0424)
County FIPS FE	✓	✓	✓	✓	✓	✓
Year FE				✓	✓	✓
N	2,356	2,337	2,146	2,356	2,337	2,146
R^2	0.5594	0.5253	0.5321	0.9280	0.9263	0.9239

- 1 SD ↑ in deposit rate → 0.41 pp ↑ in early-stage delinquency one year ahead
- 1 SD ↑ in deposit rate → 0.34 pp ↑ in early-stage delinquency two years ahead
- 1 SD ↑ in deposit rate → 0.28 pp ↑ in delinquency three years ahead

Robustness

Additional Findings:

- Effects are magnified with 1MCD10K – higher-frequency measure of liquidity shortages
  ▸ GDP ▸ New Biz. ▸ Delin.
- Higher deposit rate ⇒ higher unemployment rate ▸ Unemployment
- Higher deposit rate ⇒ higher late-stage delinquency rate ▸ 90+ Delin.
- Higher deposit rate ⇒ higher CPI growth ▸ CPI Growth

Deposit Rates Predict in Cross-Section in 2006: ▸ GDP Growth

Deposit Rates Predict in Periods with no MP Changes: ▸ 2010-2015

Deposit Rates Predict after Accounting for Credit Growth: ▸ 2010-2015

Predicting Annual County Recessions

$\mathbb{1}_{Recession}$	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	0.0232***	0.0541***	0.0474***
	(0.0049)	(0.0053)	(0.0058)
County FIPS FE	✓	✓	✓
N	4,337	4,037	3,793
pseudo R^2	0.0780	0.1022	0.0949
AUC	0.7016	0.7302	0.7231
Overall test statistic, χ^2	284.8578	382.0780	313.1834
p-value	0.0492	0.0000	0.0009

Increases in deposit rate increase the likelihood of an impending recession

- 1 SD ↑ in deposit rate → 5.41 pp ↑ probability of recession two years ahead
- 1 SD ↑ in deposit rate → 4.74 pp ↑ probability of recession three years ahead
- 1 SD ↑ in deposit rate → 2.32 pp ↑ probability of recession one year ahead

▸ Uninsured Rates

Validation from a Quasi-Natural Experiments: Natural Disasters and Fracking

Natural Disasters and Deposit Rates

- Predictive power of deposit rates reflects the gradual build-up of liquidity shortages
- Therefore, deposit rates should have little or no predictive power when contractions in an economy arise due to sudden shocks
- Natural disasters identify the start of a downturn

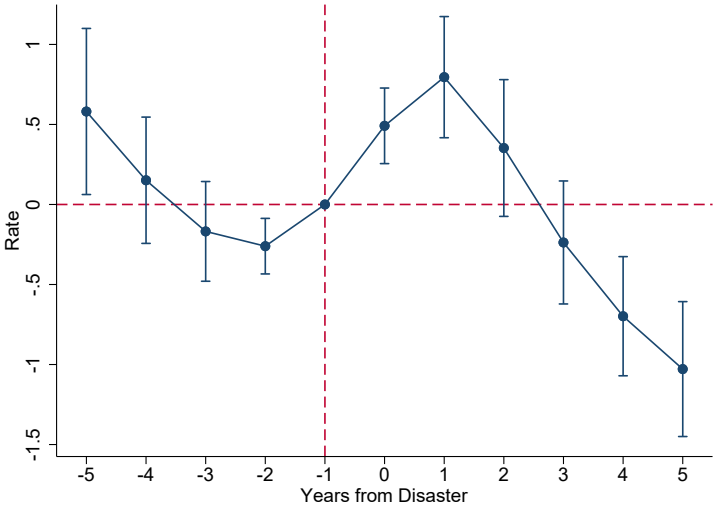
How do natural disasters impact deposit rates?

1. No increase in deposit rates prior to natural disasters – only after
2. Deposit rates cannot predict recessions arising from unanticipated shocks

Hence, deposit rates effectively capture the liquidity stress of banks during economic contractions

Deposit Rates around Natural Disasters

Regressions Margins: Rate for Disaster Counties by Year from Event



Deposit Growth Declines after Natural Disasters

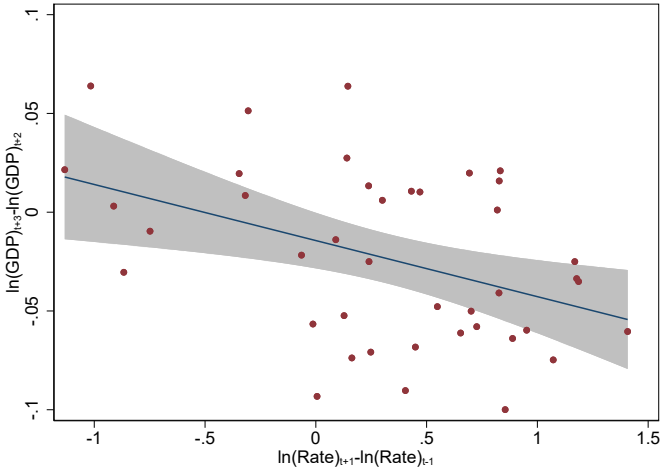
Δ ln(Dep Amt)	t-3	t-2	t-1	t	t+1	t+2	t+3
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$\mathbb{1}_{Disaster}$	0.0010	-0.0129	0.0031	0.0223	-0.0521***	-0.0084	-0.0035
	(0.0165)	(0.0167)	(0.0176)	(0.0213)	(0.0132)	(0.0116)	(0.0109)
Bank $\times$ County FE	✓	✓	✓	✓	✓	✓	✓
N	402,770	453,031	510,636	578,629	598,952	548,604	488,958
R^2	0.2202	0.2183	0.2110	0.2062	0.2072	0.1604	0.1478

- After natural disasters, deposit growth $\downarrow$ 5.21 pp

Ex Ante Deposit Rate Cannot Predict Disaster-Induced Recessions

$\mathbb{1}_{Recession}$	(1)	(2)	(3)
	1 Year Ahead	2 Years Ahead	3 Years Ahead
$\mathbb{1}_{Disaster} \times$ Rate $\times$ Shock	-0.1256	0.0173	0.0274
	(0.0869)	(0.0682)	(0.0739)
$\mathbb{1}_{Disaster} \times$ Rate	0.0963***	0.0806***	0.0520***
	(0.0157)	(0.0166)	(0.0165)
Rate	0.0250***	0.0133***	-0.0071***
	(0.0024)	(0.0025)	(0.0026)
Shock	-0.0500	0.0948	0.3429***
	(0.0729)	(0.0634)	(0.0626)
County FIPS FE	✓	✓	✓
N	32950	30743	28594
pseudo R^2	0.0836	0.0812	0.0795
AUC	0.6957	0.6921	0.6899
Overall test statistic, χ^2	2764.9614	2472.5013	2235.2807
p-value	0.0000	0.0000	0.0001

Ex Post Deposit Rate Change Predicts Future GDP Growth



- Deposit rate change after disaster predicts economic activity two years later

Liquidity Windfalls Reduce Deposit Rates

Shale gas discoveries during boom between 2003 and 2009 $\Rightarrow$ wealth windfall

Rate	(1)	(2)	(3)	(4)
	Current Year	1 Year Ahead	2 Years Ahead	3 Years Ahead
ln(Shale Gas) $\times$ Boom	-0.0408*	-0.0301*	-0.0255*	-0.0229
	(0.0224)	(0.0168)	(0.0154)	(0.0140)
ln(Shale Gas)	0.0068	0.0024	0.0048	0.0067
	(0.0130)	(0.0093)	(0.0086)	(0.0088)
County FIPS FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
N	6,048	5,923	5,842	5,454
R^2	0.9568	0.9601	0.9618	0.9630

- Increase in shale gas production during the fracking boom reduces deposit rates

Validation from a Quasi-Natural Experiment: Import Competition

Import Competition and Banks' Rate Setting Power

Use Barrot, Loualiche, Plosser, Sauvagnat (2022) data on shipping costs at the commuting zone (CZ) level in 1998 to examine effect of import competition on deposit rates within bank.

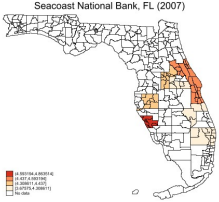
Do banks exhibit varying rate changes in regions with higher exposure to increased import competition?

1. Restrict sample to pre-GFC period of 2001-2007
2. High-frequency bank-CZ deposit data at the month-year level
3. Bank increase deposit rates in areas that are more vulnerable to import competition

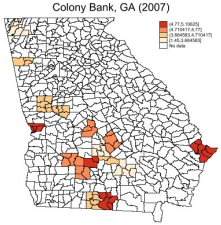
$$\text{Deposit Rate}_{b,z,t} = \beta_1 \cdot \text{Shipping Costs}_z + X_z + \alpha_{b,s,t} + \epsilon_{b,z,t}$$

Hence, deposit rates effectively captures the liquidity stress of banks during economic contractions

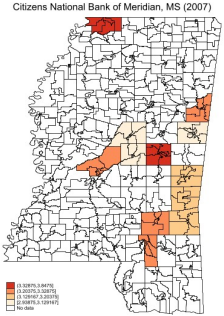
Single-State Banks' Deposit Rates in 2007



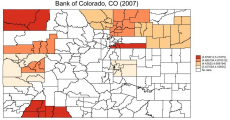
(a) Seacoast Bank



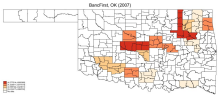
(b) Colony Bank



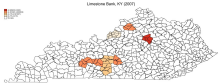
(c) Citizens Nat. Bank of Meridian



(d) Bank of Colorado



(e) BancFirst



(f) Limestone Bank

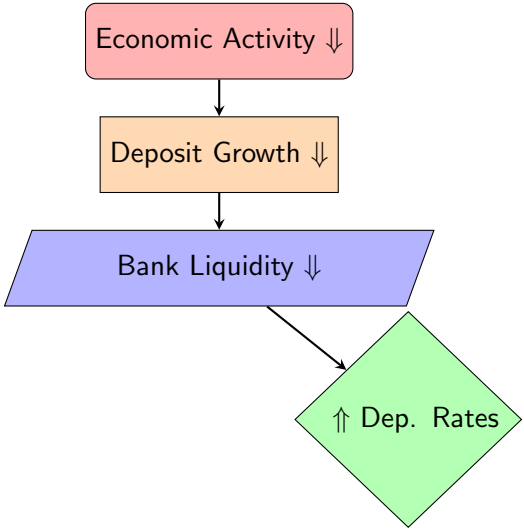
Higher Shipping Costs Lower Within-Bank Deposit Rates

Across-CZ

Rate	(1)	(2)	(3)	(4)	(5)	(6)
Shipping Costs	-0.0264***	-0.0205***	-0.0207***	-0.0181***	-0.0166***	-0.0130***
	(0.0055)	(0.0047)	(0.0047)	(0.0045)	(0.0045)	(0.0047)
log Employment						0.0085
						(0.0131)
Manufacturing Employment (%)						-0.0121*
						(0.0063)
log Income						0.0288*
						(0.0158)
log Debt						-0.0098
						(0.0142)
Δ_{91-99}HMDA Loan Orig.					-0.0090	0.0064
					(0.0062)	(0.0075)
Δ_{91-99} Net CH Import		-0.0045	-0.0048	-0.0038	-0.0033	0.0014
		(0.0053)	(0.0052)	(0.0051)	(0.0051)	(0.0052)
Bank × Month-Year FE	✓	✓	✓			
State FE		✓				
State × Month-Year FE			✓			
Bank × Month-Year × State FE				✓	✓	✓
Quintiles HP Growth						✓
N	350,251	350,250	350,187	263,644	263,644	263,644
R^2	0.9070	0.9114	0.9141	0.9345	0.9345	0.9348

Bank Liquidity and Business Cycles

Do Banks that Increase Deposit Rates Experience Liquidity Stress?



Aggregate County Deposit Growth

Δ ln(Deposits)	(1)	(2)	(3)
F1.Recession	-0.0038***		
	(0.0008)		
F2.Recession		0.0000	
		(0.0008)	
F3.Recession			0.0028***
			(0.0008)
County FIPS FE	✓	✓	✓
Year FE	✓	✓	✓
N	57,896	54,838	51,782
R^2	0.0005	0.0000	0.0003

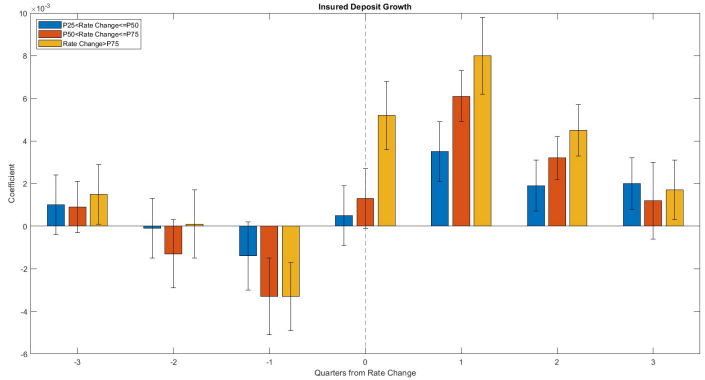
Counties that approach a recession experience lower deposit growth relative to other counties

Empirical Design: Bank-Level

$$\Delta ln(Y)_{b,t+k} = \beta_0 + \beta_1 \mathbb{1}_{P25<\text{Dep Rate Change}\leq P50,b,t} + \beta_2 \mathbb{1}_{P50<\text{Dep Rate Change}\leq P75,b,t} + \beta_3 \mathbb{1}_{\text{Dep Rate Change}>P75,b,t} + \alpha_t + \epsilon_{b,t}$$

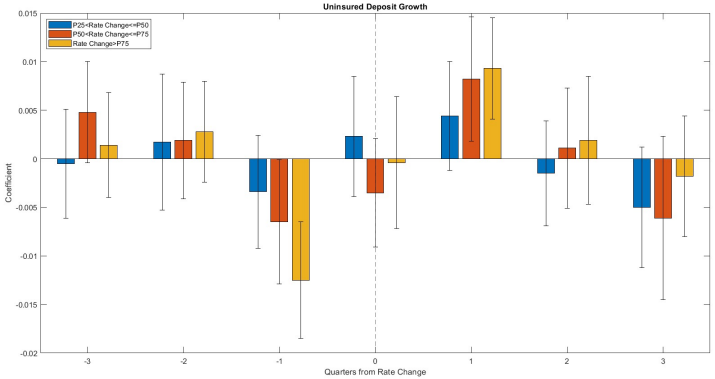
- $\mathbb{1}_{Px<\text{Dep Rate Change}\leq Px}$ is a quartile indicator for banks' quarterly changes in the deposit rate
- k ranges from -3 to $+3$

Insured Deposit Growth Declines before Deposit Rate Changes



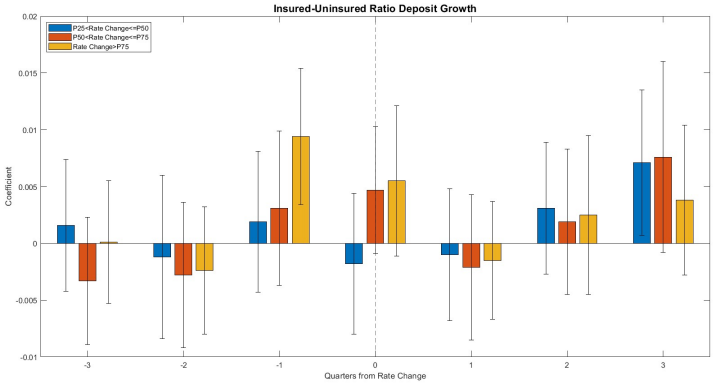
- Insured deposit growth declines in the quarters preceding rate changes, regardless of change in deposit rates ▸ Table
- ⇑ deposit rate on insured deposits → growth rate on insured deposits ⇑
- Aggregate county deposit growth declines as a county heads into a recession

Uninsured Deposit Growth Declines before Deposit Rate Changes



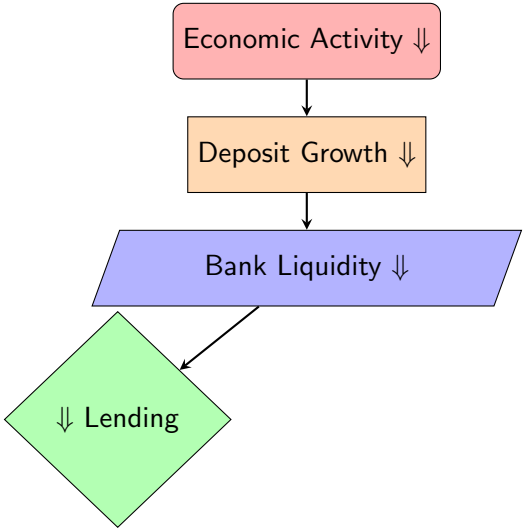
- Banks that experience greater decline in uninsured growth, raise deposit rates more in the following quarters ▸ Table

Banks Increase Reliance on Insured Deposits

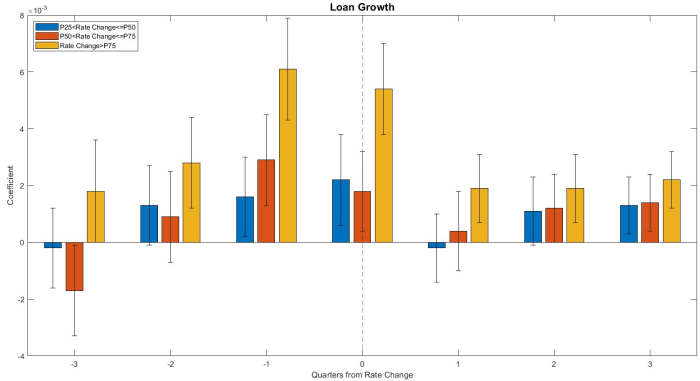


- Generally, growth in the ratio of insured to uninsured deposits exhibit little TS or XS variation
- Banks in the fourth quartile experience a significant increase in ratio growth in the quarter before rates are raised ▸ Table

Do Banks Alter their Lending Activity as a Response to Liquidity Stress?



Loan Growth and Deposit Rate Changes

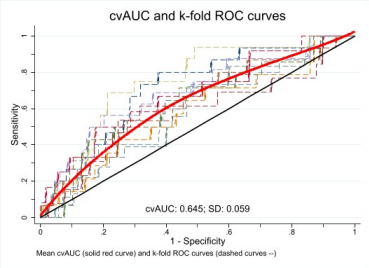


- Banks in the fourth quartile report higher lending growth ▸ Table
- No difference in NPL growth across rate changes ▸ Table

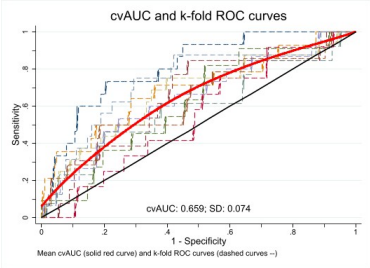
State Level Economic and Financial Risks

Out-of-Sample Findings

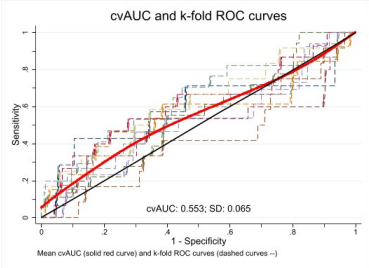
Predictive model generalizes well to independent datasets and reports high model prediction performance ▸ State ▸ Logit ▸ Forecasting 2022 GDP



(a) Recession in 4 Quarters: AUC = 0.65



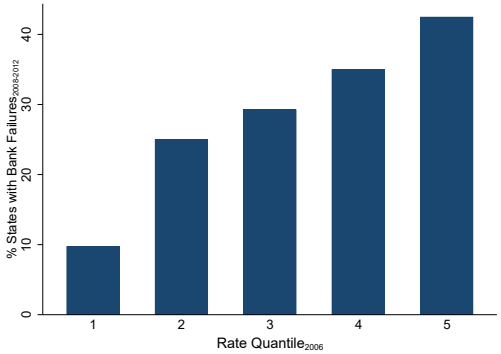
(b) Recession in 8 Quarters: AUC = 0.66



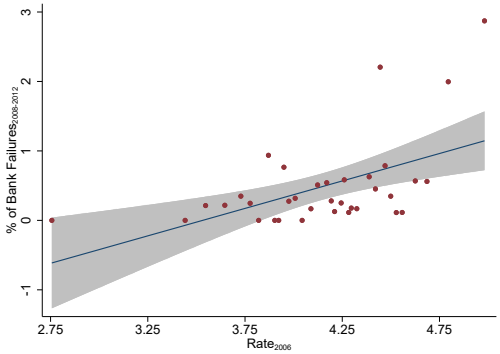
(c) Recession in 12 Quarters: AUC = 0.55

Bank deposit rates can accurately predict recessions years in advance

2006 State Deposit Rates Predict Bank Failures (2008-2012)



(a) Extensive Margin



(b) Intensive Margin

- A 1 SD ↑ in state deposit rates in 2006 ⇒ 18.5 percentage points ↑ in the likelihood that a state experiences any bank failure during the crisis period
- A 1 SD ↑ in state deposit rates in 2006 ⇒ 0.66 pp (0.43 SD) ↑ in the share of failed banks in a state

Horse Race: Deposit Rates vs. Other Indicators

Deposit rates are forward-looking and exhibit better predictive power compared to other variables

- Credit growth and recessions ▸ SBL ▸ Mtg. ▸ Tot.
- Deposit rates, credit growth, and recessions ▸ SBL ▸ Mtg. ▸ Tot.
- Deposit growth and recessions ▸ Dep. Logit ▸ Dep. OLS
- Deposit rates, deposit growth, and recessions ▸ Dep. Logit ▸ Dep. OLS

Conclusion

1. **Bank liquidity conditions predict business cycles**
   - Predict recessions and depth of county and state using deposit rates on insured deposits across banks
   - Predicts changes in economic activity, reflecting liquidity shortages
   - Predicts changes in economic activity that are not accompanied by a credit boom

2. **Mechanism: liquidity squeezes**
   - As economic growth slows, deposit growth slows
   - In response, banks either increase deposit rates

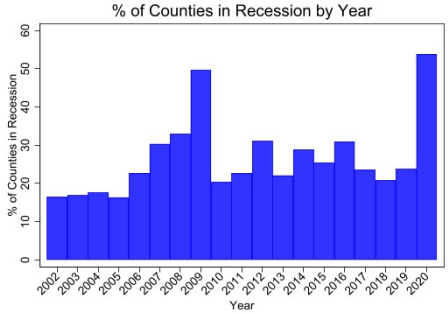
3. **Granular indicator of recessions with policy implications**
   - Allows for prediction of localized downturns
   - Market-based measure is easy to construct and is thus, a useful early warning signal of an impending recession
   - Riskier banks increase reliance on insured deposits as they approach a downturn, raising concerns of moral hazard arising from deposit insurance schemes

Appendix

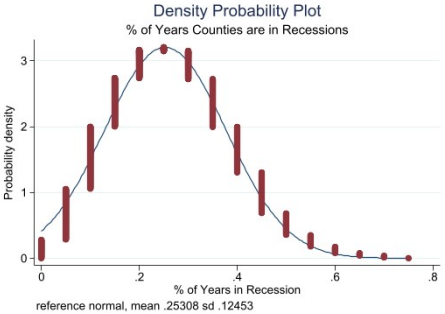
Recessions across Counties and Time

Back

On average, 27% of counties are in recession



(a) % of States in Recession



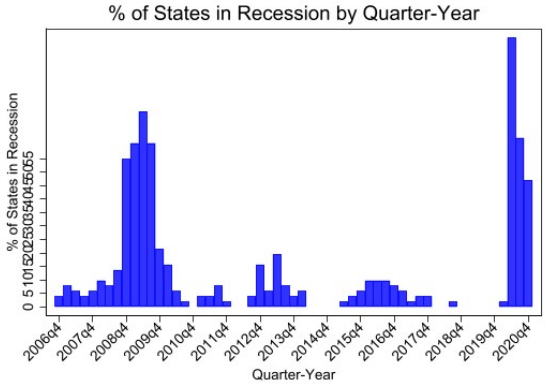
(b) % of Recessions within States

- Between 2005 and 2009, % of counties in recession ↑ from 16% to 50%; Between 2010 and 2019, 20-30% of counties in recession; During COVID-19 recession, 53% of counties in recession
- On average, counties were in recessions 25% of years with a standard deviation of 12.45%

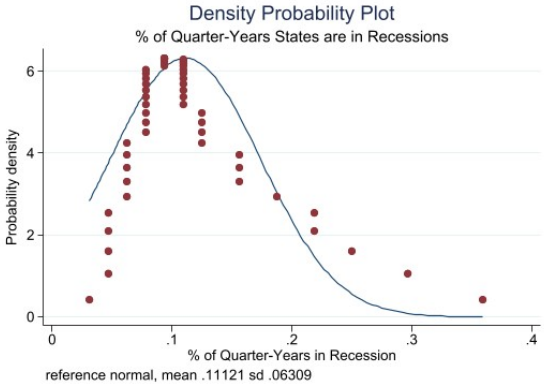
State Recessions

Recessions across States and Time

Back



(a) % of States in Recession

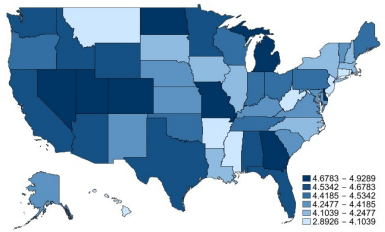


(b) % of Recessions within States

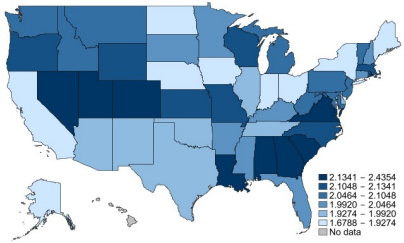
- States were in recessions 5.05% of quarters in the sample period (2005-2020) with a standard deviation of 3.12%

Deposit Rates across States and Time

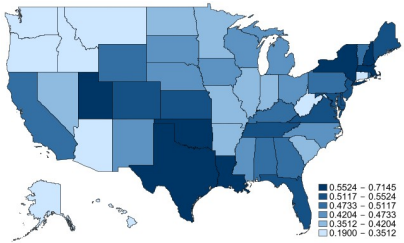
Back



(a) 2006Q4



(b) 2009Q1



(c) 2017Q1

1MCD10K Rates and GDP Growth

Back

Higher deposit rates ⇒ lower economic activity

Δln(GDP)	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	-0.0047	-0.0070**	-0.0023**
	(0.0041)	(0.0029)	(0.0011)
County FIPS FE	✓	✓	✓
N	1,251	1,100	966
R^2	0.0125	0.0291	0.0032

1MCD10K Rates and Business Formation

Back

Higher deposit rates ⇒ lower new business formation

ln(Applications)	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	-0.0493***	-0.0444***	-0.0585***
	(0.0056)	(0.0077)	(0.0066)
County FIPS FE	✓	✓	✓
N	1,344	1,183	1,050
R^2	0.0465	0.0390	0.0734

1MCD10K Deposit Rates and Mortgage Delinquency Rate

Back

Higher deposit rates ⇒ higher early-stage delinquency rate

Delinquency Rate (30-89 days)	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	0.4292***	0.3703***	0.3651***
	(0.0417)	(0.0412)	(0.0392)
County FIPS FE	✓	✓	✓
N	1,059	1,000	883
R^2	0.1951	0.1592	0.1783

Deposit Rates and CPI Growth

Back

Higher deposit rates ⇒ higher unemployment rate

CPI (% Chg.)	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	0.1878***	-0.2053***	-0.1123
	(0.0588)	(0.0707)	(0.0812)
County FIPS FE	✓	✓	✓
N	2,570	2,559	2,426
R^2	0.0208	0.0118	0.0034

Deposit Rates and Unemployment Rate

Back

Higher deposit rates ⇒ higher unemployment rate

Unemp. Rate	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	-0.0943*	0.5304***	1.0448***
	(0.0539)	(0.0535)	(0.0599)
County FIPS FE	✓	✓	✓
N	4,830	4,542	4,278
R^2	0.0025	0.0775	0.3006

Deposit Rates and Late-Stage Delinquency Rate

Back

Higher deposit rates ⇒ higher late-stage delinquency rate

Delinquency Rate (90+ days)	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	0.4478***	0.6718***	0.6402***
	(0.0577)	(0.0556)	(0.0461)
County FIPS FE	✓	✓	✓
N	2,329	2,312	2,126
R^2	0.0914	0.2114	0.2458

2006 Deposit Rates and GDP Growth

Back

Higher deposit rates ⇒ lower GDP growth

Δln(GDP)	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	0.0162**	-0.0158**	-0.0025
	(0.0068)	(0.0071)	(0.0060)
N	240	241	238
R^2	0.0169	0.0181	0.0005

2006 Deposit Rates and CPI Growth

Back

Higher deposit rates ⇒ higher CPI growth

CPI (% Chg.)	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	-0.0668	-0.3187**	-0.6433*
	(0.1991)	(0.1537)	(0.3371)
N	124	123	124
R^2	0.0011	0.0498	0.0820

Deposit Rates and Unemployment Rate: 2010-2015

Back

Higher deposit rates ⇒ higher unemployment rate

Unemp. Rate	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	7.2292***	6.9339***	6.4179***
	(0.3908)	(0.4469)	(0.3838)
County FIPS FE	✓	✓	✓
N	1,478	1,456	1,441
R^2	0.4602	0.5109	0.5745

Deposit Rates and Late-Stage Delinquency Rate: 2010-2015

Back

Higher deposit rates ⇒ higher late-stage delinquency rate

Delinquency Rate (90+ days)	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	2.2212***	2.4753***	2.0014***
	(0.1648)	(0.1909)	(0.1968)
County FIPS FE	✓	✓	✓
N	1,085	1,073	1,067
R^2	0.3467	0.4628	0.4526

[TXT] cc-est2009-agesex

Deposit Rates and GDP Growth: 2010-2015

Back

Higher deposit rates ⇒ lower economic activity

Δln(GDP)	1 Year Ahead	2 Years Ahead	3 Years Ahead	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	-0.0144	-0.0306***	-0.0097	0.0158	-0.0505***	-0.0198
	(0.0095)	(0.0076)	(0.0115)	(0.0241)	(0.0153)	(0.0202)
County FIPS FE	✓	✓	✓			
Year FE				✓	✓	✓
N	1,456	1,436	1,423	1,456	1,436	1,423
R^2	0.0029	0.0143	0.0019	0.0007	0.0082	0.0016

- 1 SD ↑ in deposit rate → 3.06-5.05 pp ↓ in GDP growth two years ahead

Deposit Rates and Business Formation: 2010-2015

Back

Higher deposit rates ⇒ lower new business formation

ln(Applications)	1 Year Ahead	2 Years Ahead	3 Years Ahead	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	-0.1251***	-0.2568***	-0.4099***	0.0444	-0.0127	-0.1247**
	(0.0223)	(0.0298)	(0.0388)	(0.0364)	(0.0521)	(0.0627)
County FIPS FE	✓	✓	✓	✓	✓	✓
Year FE				✓	✓	✓
N	1,478	1,456	1,441	1,478	1,456	1,441
R^2	0.0579	0.1528	0.2633	0.0022	0.0002	0.0134

Deposit Rates and Mortgage Delinquency Rate: 2010-2015

Back

Higher deposit rates ⇒ higher early-stage delinquency rate

Delinquency Rate (30-89 days)	1 Year Ahead	2 Years Ahead	3 Years Ahead	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	1.2526***	1.3158***	0.8789***	0.1335	0.0800	0.0119
	(0.0575)	(0.0662)	(0.0552)	(0.0960)	(0.1044)	(0.0876)
County FIPS FE	✓	✓	✓	✓	✓	✓
Year FE				✓	✓	✓
N	1,085	1,073	1,067	1,085	1,073	1,067
R^2	0.4521	0.5956	0.5176	0.0067	0.0027	0.0001

Additional results 2010-2015: Unemployment 90+ Delin.

Deposit Rates Predict Economic Activity with Credit Growth: SBL

Back

No. Robust to small business lending growth...

Δln(GDP)	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	-0.0023	-0.0059***	-0.0058***
	(0.0015)	(0.0014)	(0.0014)
Δ ln(SBL)	0.0022**	0.0019	-0.0012
	(0.0010)	(0.0012)	(0.0020)
County FIPS FE	✓	✓	✓
N	4,299	4,027	3,767
R^2	0.0041	0.0187	0.0122

- 1 SD ↑ in deposit rate → 0.59 pp ↓ in GDP growth two years ahead

Deposit Rates Predict Economic Activity with Credit Growth: Mortgages

Back

and mortgage lending growth...

Δln(GDP)	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	-0.0021	-0.0059***	-0.0060***
	(0.0015)	(0.0014)	(0.0015)
Δ ln(Mortgages)	0.0007	0.0029***	0.0022**
	(0.0006)	(0.0007)	(0.0009)
County FIPS FE	✓	✓	✓
N	4,299	4,027	3,767
R^2	0.0023	0.0210	0.0133

Deposit Rates Predict Economic Activity with Credit Growth: Total Credit

Back

...and total lending growth

Δln(GDP)	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	-0.0021	-0.0059***	-0.0060***
	(0.0015)	(0.0014)	(0.0015)
Δ ln(Total)	0.0004	0.0028***	0.0009
	(0.0006)	(0.0008)	(0.0013)
County FIPS FE	✓	✓	✓
N	4,299	4,027	3,767
R^2	0.0022	0.0209	0.0121

- 1 SD ↑ in deposit rate → 0.59 pp ↓ in GDP growth two years ahead

Predicting Annual County Recessions: Uninsured Rates

Back

$\mathbb{1}_{Recession}$	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	0.0453***	0.0759***	0.0385***
	(0.0087)	(0.0108)	(0.0127)
County FIPS FE	✓	✓	✓
N	1,979	1,677	1,500
pseudo R^2	0.1026	0.1119	0.0868
AUC	0.7317	0.7403	0.7086
Overall test statistic, χ^2	180.4015	171.1807	114.3634
p-value	0.7656	0.8051	1.0000

Increase in deposit rates increasesthe likelihood of an impending recession

Predicting Annual County Recessions: All Counties

Back

$\mathbb{1}_{Recession}$	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	0.0076***	0.0272***	0.0150***
	(0.0023)	(0.0024)	(0.0025)
County FIPS FE	✓	✓	✓
N	35,438	33,038	30,854
pseudo R^2	0.0800	0.0825	0.0803
AUC	0.6919	0.6944	0.6908
Overall test statistic, χ^2	2705.3303	2744.4082	2460.0860
p-value	0.0000	0.0000	0.0000

Increase in deposit rates increasesthe likelihood of an impending recession

Predicting Annual County Recessions: Urban and Rural Counties

Back

$\mathbb{1}_{Recession}$	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	0.0051**	0.0226***	0.0096***
	(0.0025)	(0.0026)	(0.0027)
County FIPS FE	✓	✓	✓
N	31,082	28,983	27,044
pseudo R^2	0.0741	0.0754	0.0740
AUC	0.6828	0.6844	0.6814
Overall test statistic, χ^2	2254.0163	2226.0640	2014.4377
p-value	0.0000	0.0000	0.0001

Increase in deposit rates increasesthe likelihood of an impending recession

Change in Deposit Rate and Bank Characteristics in 2007 and 2008

Back

Δ ln(Rate)	(1)	(2)
	2007	2008
ln(Assets)	-0.0100***	-0.0128***
	(0.0019)	(0.0037)
Equity/Assets	-0.0024	0.0081***
	(0.0016)	(0.0026)
Cash/Assets	0.0100***	-0.0042
	(0.0035)	(0.0061)
Deposits/Assets	-0.0035*	-0.0314***
	(0.0021)	(0.0045)
Loan/Assets	0.0130***	0.0286***
	(0.0045)	(0.0089)
Hedging/Assets	0.0003	0.0035
	(0.0013)	(0.0037)
Dividends/Assets	-0.0020	-0.0166***
	(0.0014)	(0.0027)
Income/Assets	-0.0090***	-0.0238***
	(0.0028)	(0.0050)
Securities/Assets	0.0146***	0.0148*
	(0.0043)	(0.0086)
LLLP/Assets	0.0146***	0.0148*
	(0.0043)	(0.0086)
Constant	-0.0603***	-0.4946***
	(0.0037)	(0.0073)
N	5,255	5,325
R^2	0.0149	0.0481

Banks with ↑ rates have ↓ size, have ↑ credit-to-deposit ratio, ↓ income, and ↑ loan loss provisions

Higher Shipping Costs Lower Deposit Rates Across Commuting Zones

Back

Rate	(1)	(2)	(3)
Shipping Costs	-0.0343***	-0.0238**	-0.0260***
	(0.0088)	(0.0096)	(0.0093)
log Employment			0.0098
			(0.0121)
Manufacturing Employment (%)			-0.0157**
			(0.0077)
log Income			0.0192
			(0.0129)
log Debt			-0.0414***
			(0.0153)
Δ_{91-99}HMDA Loan Orig.			-0.0205**
			(0.0091)
Δ_{91-99} Net CH Import		-0.0013	-0.0007
		(0.0068)	(0.0060)
Month-Year FE	✓	✓	
State FE		✓	
State-Month-Year FE			✓
N	51,982	51,982	51,663
R^2	0.9374	0.9481	0.9574

Insured Deposit Growth Declines before Deposit Rate Changes

Back

Δln(Insured)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	t-3	t-2	t-1	t	t+1	t+2	t+3
$\mathbb{1}_{P25<\text{Dep Rate Change}\leq P50}$	0.0010	-0.0001	-0.0014*	0.0005	0.0035***	0.0019***	0.0020***
	(0.0007)	(0.0007)	(0.0008)	(0.0007)	(0.0007)	(0.0006)	(0.0006)
$\mathbb{1}_{P50<\text{Dep Rate Change}\leq P75}$	0.0009	-0.0013	-0.0033***	0.0013*	0.0061***	0.0032***	0.0012
	(0.0006)	(0.0008)	(0.0009)	(0.0007)	(0.0006)	(0.0005)	(0.0009)
$\mathbb{1}_{\text{Dep Rate Change}>P75}$	0.0015**	0.0001	-0.0033***	0.0052***	0.0080***	0.0045***	0.0017**
	(0.0007)	(0.0008)	(0.0008)	(0.0008)	(0.0009)	(0.0006)	(0.0007)
Quarter-Year FE	✓	✓	✓	✓	✓	✓	✓
N	234,296	238,782	243,571	243,714	238,978	234,508	230,172
R^2	0.0484	0.0548	0.0533	0.0535	0.0568	0.0597	0.0611

- Insured deposit growth declines in the quarters preceding rate changes, regardless of change in deposit rates
- ⇑ deposit rate on insured deposits → growth rate on insured deposits ⇑
- Aggregate county deposit growth declines as a county heads into a recession

County Dep. Growth

Uninsured Deposit Growth Declines before Deposit Rate Changes

Back

Panel B: Uninsured Deposit Growth							
Δln(Uninsured)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	t-3	t-2	t-1	t	t+1	t+2	t+3
$\mathbb{1}_{P25<\text{Dep Rate Change}\leq P50}$	-0.0005	0.0017	-0.0034	0.0023	0.0044	-0.0015	-0.0050
	(0.0028)	(0.0035)	(0.0029)	(0.0031)	(0.0028)	(0.0027)	(0.0031)
$\mathbb{1}_{P50<\text{Dep Rate Change}\leq P75}$	0.0048*	0.0019	-0.0065**	-0.0035	0.0082**	0.0011	-0.0061
	(0.0026)	(0.0030)	(0.0032)	(0.0028)	(0.0032)	(0.0031)	(0.0042)
$\mathbb{1}_{\text{Dep Rate Change}>P75}$	0.0014	0.0028	-0.0125***	-0.0004	0.0093***	0.0019	-0.0018
	(0.0027)	(0.0026)	(0.0030)	(0.0034)	(0.0026)	(0.0033)	(0.0031)
Quarter-Year FE	✓	✓	✓	✓	✓	✓	✓
N	233,084	237,548	242,312	242,464	240,887	239,551	238,319
R^2	0.0689	0.0703	0.0700	0.0703	0.0703	0.0706	0.0708

- Banks that experience greater decline in uninsured growth, raise deposit rates more in the following quarters

Banks Increase Reliance on Insured Deposits

Back

$\Delta ln(\frac{\text{Insured}}{\text{Uninsured}})$	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	t-3	t-2	t-1	t	t+1	t+2	t+3
$\mathbb{1}_{P25<\text{Dep Rate Change}\leq P50}$	0.0016	-0.0012	0.0019	-0.0018	-0.0010	0.0031	0.0071**
	(0.0029)	(0.0036)	(0.0031)	(0.0031)	(0.0029)	(0.0029)	(0.0032)
$\mathbb{1}_{P50<\text{Dep Rate Change}\leq P75}$	-0.0033	-0.0028	0.0031	0.0047*	-0.0021	0.0019	0.0076*
	(0.0028)	(0.0032)	(0.0034)	(0.0028)	(0.0032)	(0.0032)	(0.0042)
$\mathbb{1}_{\text{Dep Rate Change}>P75}$	0.0001	-0.0024	0.0094***	0.0055	-0.0015	0.0025	0.0038
	(0.0027)	(0.0028)	(0.0030)	(0.0033)	(0.0026)	(0.0035)	(0.0033)
Quarter-Year FE	✓	✓	✓	✓	✓	✓	✓
N	228,690	233,080	237,696	242,462	240,885	239,376	238,072
R^2	0.0825	0.0828	0.0822	0.0819	0.0810	0.0813	0.0815

- Generally, growth in the ratio of insured to uninsured deposits exhibit little TS or XS variation
- Banks in the fourth quartile experience a significant increase in ratio growth in the quarter before rates are raised

Loan Growth and Deposit Rate Changes

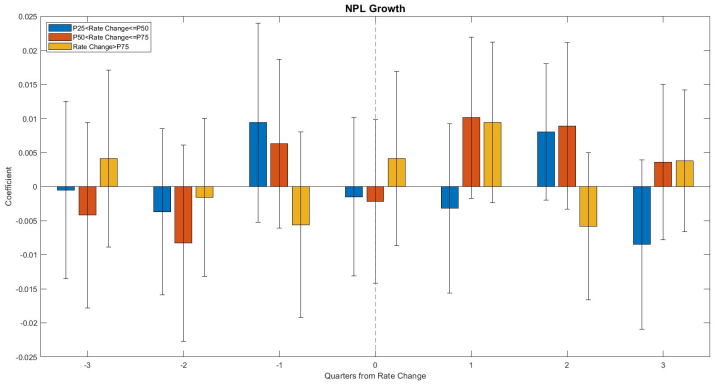
Back

Δln(Loans)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	t-3	t-2	t-1	t	t+1	t+2	t+3
$\mathbb{1}_{P25<\text{Dep Rate Change}\leq P50}$	-0.0002	0.0013*	0.0016**	0.0022***	-0.0002	0.0011*	0.0013**
	(0.0007)	(0.0007)	(0.0007)	(0.0008)	(0.0006)	(0.0006)	(0.0005)
$\mathbb{1}_{P50<\text{Dep Rate Change}\leq P75}$	-0.0017**	0.0009	0.0029***	0.0018**	0.0004	0.0012**	0.0014**
	(0.0008)	(0.0008)	(0.0008)	(0.0007)	(0.0007)	(0.0006)	(0.0005)
$\mathbb{1}_{\text{Dep Rate Change}>P75}$	0.0018**	0.0028***	0.0061***	0.0054***	0.0019***	0.0019***	0.0022***
	(0.0009)	(0.0008)	(0.0009)	(0.0008)	(0.0006)	(0.0006)	(0.0005)
Quarter-Year FE	✓	✓	✓	✓	✓	✓	✓
N	212,897	217,267	221,913	222,368	218,083	213,718	209,460
R^2	0.0226	0.0223	0.0221	0.0229	0.0262	0.0307	0.0317

- During periods of normal economic growth, banks in the fourth quartile report higher lending growth

Non-Performing Loan Growth and Deposit Rate Changes

Back



- No difference in NPL growth across rate changes Table

Non-Performing Loan Growth and Deposit Rate Changes

Back

Δln(NPL)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	t-3	t-2	t-1	t	t+1	t+2	t+3
$\mathbb{1}_{P25<\text{Dep Rate Change}\leq P50}$	-0.0005	-0.0037	0.0094	-0.0015	-0.0032	0.0080	-0.0085
	(0.0065)	(0.0061)	(0.0073)	(0.0058)	(0.0062)	(0.0050)	(0.0062)
$\mathbb{1}_{P50<\text{Dep Rate Change}\leq P75}$	-0.0042	-0.0083	0.0063	-0.0022	0.0101*	0.0089	0.0036
	(0.0068)	(0.0072)	(0.0062)	(0.0060)	(0.0059)	(0.0061)	(0.0057)
$\mathbb{1}_{\text{Dep Rate Change}>P75}$	0.0041	-0.0016	-0.0056	0.0041	0.0094	-0.0058	0.0038
	(0.0065)	(0.0058)	(0.0068)	(0.0064)	(0.0059)	(0.0054)	(0.0052)
Quarter-Year FE	✓	✓	✓	✓	✓	✓	✓
N	165,314	168,233	171,285	171,690	169,033	166,507	164,031
R^2	0.0064	0.0063	0.0063	0.0062	0.0063	0.0064	0.0064

- No difference in NPL growth across rate changes

SBL Growth and Recessions

Back

$\mathbb{1}_{Recession}$	1 Year Ahead	2 Years Ahead	3 Years Ahead
Δ ln(SBL)	-0.0072	0.0085	0.0148**
	(0.0058)	(0.0059)	(0.0063)
County FIPS FE	✓	✓	✓
N	4,072	3,809	3,566
pseudo R^2	0.0741	0.0740	0.0749
AUC	0.6928	0.6938	0.6899
Overall test statistic, χ^2	248.1919	238.7799	232.8698
p-value	0.4311	0.5101	0.5817

Mortgage Growth and Recessions

Back

$\mathbb{1}_{Recession}$	1 Year Ahead	2 Years Ahead	3 Years Ahead
Δ ln(Mortgages)	0.0015	-0.0127**	-0.0085
	(0.0057)	(0.0053)	(0.0055)
County FIPS FE	✓	✓	✓
N	4,072	3,809	3,566
pseudo R^2	0.0737	0.0747	0.0738
AUC	0.6918	0.6938	0.6943
Overall test statistic, χ^2	249.4026	239.6547	227.4217
p-value	0.4099	0.4941	0.6778

Total Credit Growth and Recessions

Back

$\mathbb{1}_{Recession}$	1 Year Ahead	2 Years Ahead	3 Years Ahead
Δ ln(Total)	0.0044	-0.0061	-0.0040
	(0.0058)	(0.0054)	(0.0056)
County FIPS FE	✓	✓	✓
N	4,072	3,809	3,566
pseudo R^2	0.0738	0.0738	0.0734
AUC	0.6910	0.6920	0.6954
Overall test statistic, χ^2	250.7341	236.1117	225.9201
p-value	0.3870	0.5588	0.7029

Deposit Rates, SBL Growth, and Recessions

Back

$\mathbb{1}_{Recession}$	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	0.0289***	0.0601***	0.0531***
	(0.0051)	(0.0053)	(0.0057)
Δ ln(SBL)	-0.0097*	0.0014	0.0079
	(0.0059)	(0.0059)	(0.0062)
County FIPS FE	✓	✓	✓
N	4,072	3,809	3,566
pseudo R^2	0.0817	0.1104	0.1019
AUC	0.7040	0.7382	0.7294
Overall test statistic, χ^2	288.3356	400.8888	324.5189
p-value	0.0330	0.0000	0.0002

Deposit Rates, Mortgage Growth, and Recessions

Back

$\mathbb{1}_{Recession}$	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	0.0281***	0.0609***	0.0543***
	(0.0050)	(0.0053)	(0.0057)
Δ ln(Mortgages)	0.0013	-0.0158***	-0.0108*
	(0.0059)	(0.0056)	(0.0057)
County FIPS FE	✓	✓	✓
N	4,072	3,809	3,566
pseudo R^2	0.0809	0.1122	0.1023
AUC	0.7051	0.7394	0.7306
Overall test statistic, χ^2	295.3578	406.3929	338.6055
p-value	0.0169	0.0000	0.0000

Deposit Rates, Total Credit Growth and Recessions

Back

$\mathbb{1}_{Recession}$	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	0.0280***	0.0608***	0.0544***
	(0.0050)	(0.0053)	(0.0057)
Δ ln(Total)	0.0034	-0.0105*	-0.0076
	(0.0060)	(0.0058)	(0.0059)
County FIPS FE	✓	✓	✓
N	4,072	3,809	3,566
pseudo R^2	0.0810	0.1112	0.1019
AUC	0.7051	0.7386	0.7309
Overall test statistic, χ^2	295.5007	402.9462	335.3096
p-value	0.0167	0.0000	0.0000

Deposit Growth and Recessions

Back

$\mathbb{1}_{Recession}$	1 Year Ahead	2 Years Ahead	3 Years Ahead
Δ ln(Deposit)	-0.1467***	0.0043	0.0986*
	(0.0504)	(0.0505)	(0.0515)
County FIPS FE	✓	✓	✓
N	4,337	4,037	3,793
pseudo R^2	0.0750	0.0724	0.0738
AUC	0.6981	0.6823	0.6913
Overall test statistic, χ^2	267.6699	240.1727	236.2742
p-value	0.1749	0.5029	0.5377

Deposit Rates, Deposit Growth and Recessions

Back

$\mathbb{1}_{Recession}$	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	0.0242***	0.0544***	0.0469***
	(0.0049)	(0.0053)	(0.0058)
Δ ln(Deposit)	-0.0200***	-0.0051	0.0078
	(0.0063)	(0.0060)	(0.0062)
County FIPS FE	✓	✓	✓
N	4,337	4,037	3,793
pseudo R^2	0.0805	0.1023	0.0952
AUC	0.7037	0.7302	0.7229
Overall test statistic, χ^2	301.1634	384.4420	314.1366
p-value	0.0118	0.0000	0.0009

Deposit Growth and Economic Activity

Back

Δln(GDP)	1 Year Ahead	2 Years Ahead	3 Years Ahead
Δ ln(Deposits)	0.0018	-0.0001	-0.0004
	(0.0013)	(0.0007)	(0.0008)
County FIPS FE	✓	✓	✓
N	4,545	4268	4008
R^2	0.0008	0.0000	0.0000

Deposit Rates, Deposit Growth and Economic Activity

Back

Δln(GDP)	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	-0.0013	-0.0048***	-0.0045***
	(0.0013)	(0.0014)	(0.0013)
Δ ln(Deposits)	0.0020	0.0005	0.0001
	(0.0013)	(0.0007)	(0.0008)
County FIPS FE	✓	✓	✓
N	4,545	4,268	4,008
R^2	0.0013	0.0109	0.0066

Summary Statistics (2001-2020) Back

	N	P25	Median	P75	Mean	SD
Monthly Bank Deposit Rate	464,467	0.4900	1.1875	2.4800	1.6288	1.3670
Monthly Bank Dep. Rate SD	263,575	0.0859	0.1768	0.3246	0.2353	0.2060
Annual Deposit Rate	39,732	0.5000	1.1914	2.5436	1.6333	1.3416
Annual County Dep. Rate SD	39,428	0.0348	0.1399	0.2874	0.2036	0.2270
Annual County GDP Growth	59,127	-2.2974	1.2247	4.5548	1.2544	7.8028
Quarterly State Deposit Rate	3,247	0.3859	0.6785	1.9781	1.3265	1.3075
Quarterly State Dep. Rate SD	3,247	0.1959	0.3067	0.4862	0.3517	0.1813
Quarterly State GDP Growth	3,197	-0.2554	0.4171	1.0521	0.3084	1.7906

State Deposit Rates Predict State Economic Activity

Back

State GDP data available at quarterly frequency from 2005 – constructed as a weighted average of the county deposit rate, weighted by the 2004 county GDP

Δln(GDP)	4 Qtrs Ahead	8 Qtrs Ahead	12 Qtrs Ahead	4 Qtrs Ahead	8 Qtrs Ahead	12 Qtrs Ahead
Rate	-0.0010***	-0.0011***	-0.0005**	-0.0031*	-0.0047***	-0.0069***
	(0.0002)	(0.0002)	(0.0002)	(0.0017)	(0.0018)	(0.0020)
State FE	✓	✓	✓	✓	✓	✓
Quarter-Year FE				✓	✓	✓
N	3,040	2,836	2,632	3,040	2,836	2,632
R^2	0.0043	0.0052	0.0012	0.0013	0.0030	0.0065

Increase in state deposit rates is associated with a decline in economic activity

Predicting Quarterly State Recessions

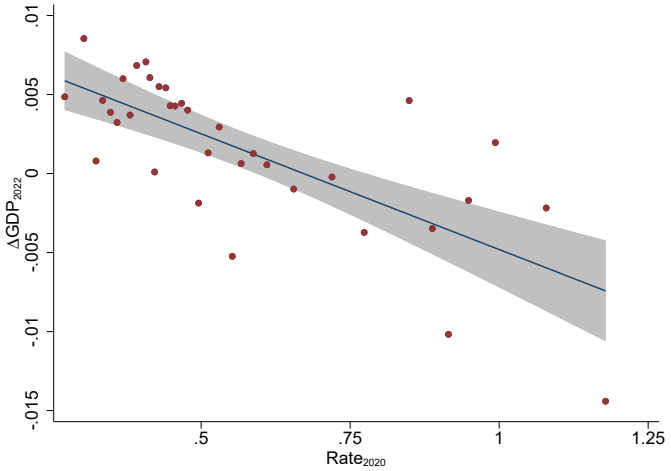
Back

$\mathbb{1}_{Recession}$	(1)	(2)	(3)
	4 Qtrs Ahead	8 Qtrs Ahead	12 Qtrs Ahead
Rate	0.0240***	0.0250***	0.0146***
	(0.0034)	(0.0039)	(0.0037)
State FE	✓	✓	✓
N	3,040	2,836	2,632
pseudo R^2	0.0829	0.0849	0.0562
AUC	0.7393	0.7291	0.6864
Overall test statistic, χ^2	126.0803	97.2976	60.8829
p-value	0.0000	0.0001	0.1619

Increase in state deposit rates increase the likelihood of an impending state recession

Out-of-Sample: Predicting 2022 State GDP Growth

Back



Higher 2020 state deposit rates predict lower 2022 state GDP growth