Private Money, Sovereign Debt, and Information Sensitivity: Evidence from Stablecurrencies in the Antebellum U.S.

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Motivation

- Stablecoins – privately issued digital monies backed by safe assets – are an old idea in modern form.
- In the antebellum U.S.
  - Banks issued dollar-denominated notes backed by state bonds.
  - Bank notes widely circulated with varying discounts.

Motivation

- Stablecoins – privately issued digital monies backed by safe assets – are an old idea in modern form.
- In the antebellum U.S.
  - Banks issued dollar-denominated notes backed by state bonds.
  - Bank notes widely circulated with varying discounts.
- State fiscal policy/bond prices can impact bank note discounts.
  - Distinct debt financing schemes across states with public information
  - Eight states and one territory defaulted in 1840s.
- Two central questions:
  - How does publicly available information about sovereign financing impact the value of private money?
  - How does financial stress alter this relationship?

Our Paper

- Our approach:
  - Construct state-specific financing information measures from newspapers using textual analysis/machine learning.
  - Focus on the period of 1830 – 53.
- Two-step empirical strategy:
  - How does state financing news price into sovereign bond prices?
  - How do information-driven bond price movements transmit to bank note discount rates?

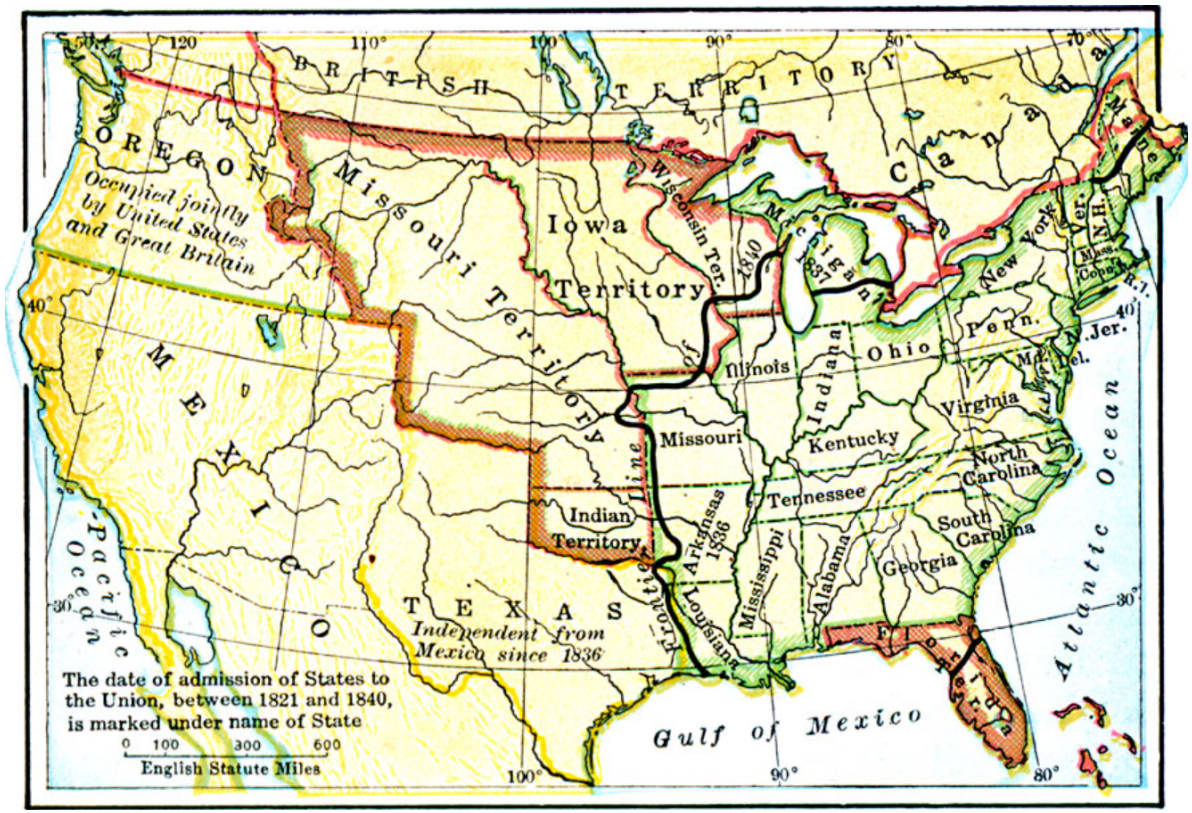
Findings

- Regime-dependent information sensitivity.
- Bond prices:
  - In tranquil periods, financing news has insignificant effect on bond prices.
  - During the 1840s crisis, news leads to large declines in bond prices, especially for defaulting states.
- Bank notes (stablecurrencies):
  - Information-driven bond price declines transmit to wider discounts.
- Implication: Stablecurrencies inherit the regime-dependent information sensitivity of the sovereign debt that backs them.

Historical Background

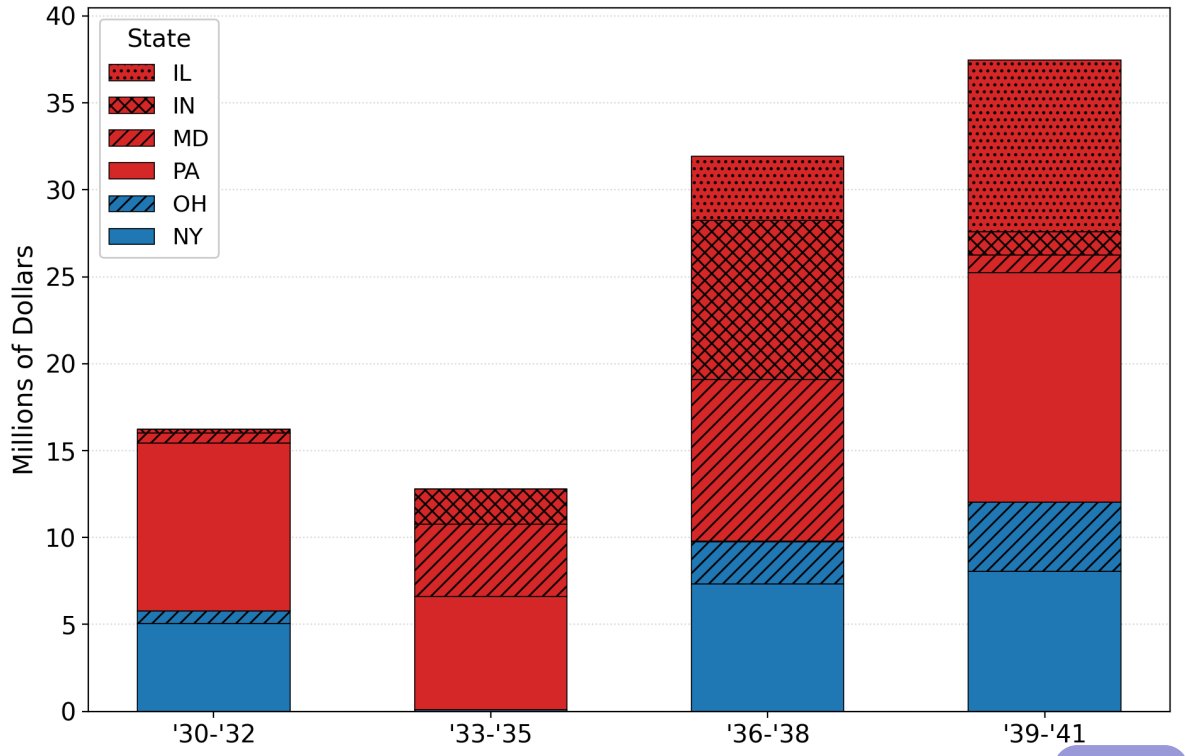
Rising State Debts

- By 1841, states had accumulated close to $200 million in debt – 86% of all U.S. debt (Wallis, 2000).
- Northeastern/western states: internal improvement projects
- Southwestern states: chartered state banks



Rising State Debts

- Eight states and one territory defaulted between 1841 and 1843.
- We focus on northeastern/western states:
  - Non-defaulters: NY, OH; Defaulters: PA, MD, IN, IL
  - A significant amount of debt authorized by both types.



Note: Debt outstanding in 1841 by year of authorization; from Wallis, Sylla, & Grinath (2004)

more

Heterogeneous Debt Financing Schemes

Annual Auditor's and Treasurer's reports reveal distinct debt financing schemes across states (Wallis et al, 2004):

- Non-Defaulters:
  - NY: early dedicated revenues; canal toll surplus; Stop and Tax, reinstated property tax in 1842.
  - OH: ad valorem property tax; auditor's authority to raise tax rates to service debt.
- Defaulters:
  - PA and MD: borrow as you go, paid interest with more borrowing; no property tax until 1845, property tax (1841) contested in MD.
  - IN and IL: expected to service debt with property tax revenues of an expanding tax base (land price). more

Banks and State Bonds

- The 1832 veto of the Second Bank of U.S. spurred a surge in state charter and free banks.
- Charter banks:
  - State govt subscription to bank capital (financed by state bonds).
  - Bank loans to state internal improvement projects.
  - Held large amounts of state bonds:

State	Banks' holding of state bonds
NY	bank purchase accounted for 16% of state bonds in 1840 (Wallis, 2001)
OH	"important source of demand for the state bonds" (Knodell, 2006)
PA	banks held more than 10% of state bonds in 1841 (Wallis, 2001)
MD	invested $1.5 million in public improvements (Sylla, Legler, & Wallis, 1987)
IN	20% of state bonds subscribed as bank capital (English, 1996)
IL	banks held 35% of state bonds by 1839 (Wallis, 2001; Knodell, 2006); 22% of state bonds subscribed as bank capital (English, 1996);

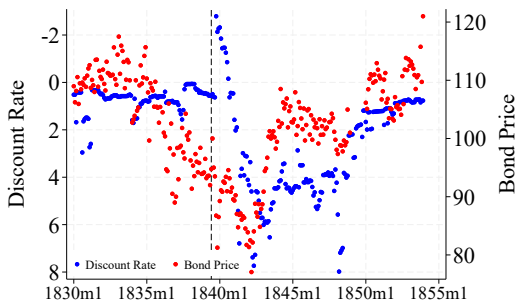
Banks and State Bonds

- Free banks (after 1837):
  - Free entry with a required level of capital, and issue bank notes/paper currencies redeemable in species.
  - Required to back note issuance with designated govt bonds.
  - Held 17% of state debt in 1841. (Jaremski, 2010)
- Bank notes:
  - Largest component of money supply.
  - Supposed to redeem in species, but had (varying) discount rates.
- **Implication:**
  - Direct link between state debt and bank notes.
  - A fall in a state's bond price impairs the capital and bank note recovery value.

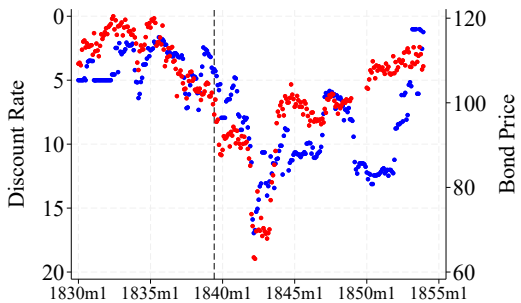
State Bond Prices and Bank Note Discount Rates (reverse)

⇓ bond prices associated with ⇑ bank note discounts.

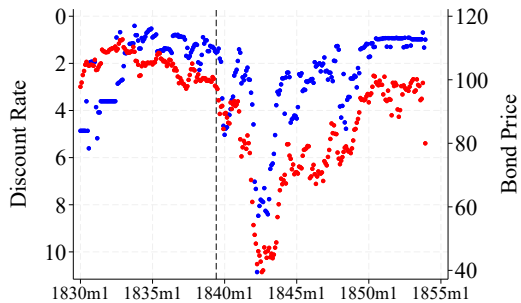
a. New York



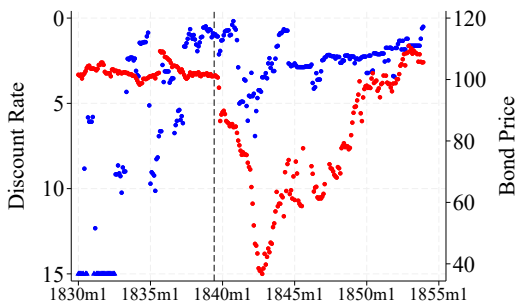
b. Ohio



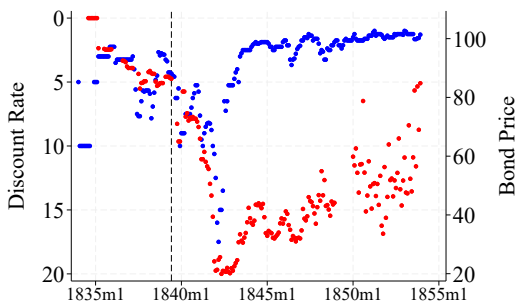
c. Pennsylvania



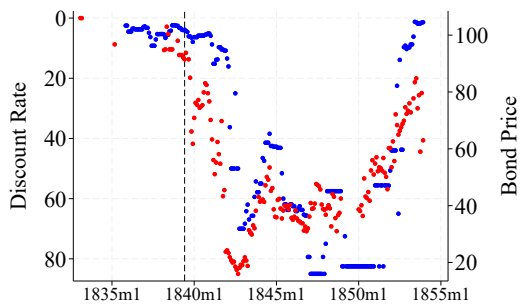
d. Maryland



e. Indiana



f. Illinois



Source: Sylla, Wilson & Wright (2002); Gorton and Weber (2018); Weber (2018).

Measuring News

Constructing the Information Measure

Corpus: Gale newspaper database

- Categories: business and finance, editorial and commentary, news.
- Our sample: Jan. 1830 – Dec. 1853, 1.8 million articles.
- Pre-processing

Dictionary approach: Keep articles containing the state name and at least one of: *stock(s)*, *debt(s)*, *bond(s)*, *securities*.

State-specific information index:

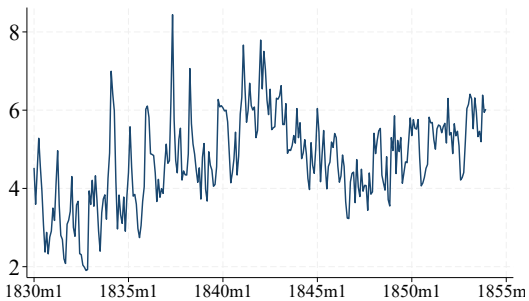
$$I_{s,t} = \frac{N^f_{s,t}}{N_{s,t}}$$

- $N^f_{s,t}$: financing-related articles for state s in month t.
- $N_{s,t}$: *all* articles mentioning state s in month t.

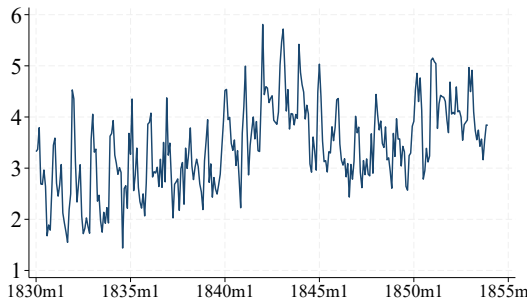
$\Rightarrow$ Scaling controls for the rise of the penny press.

State-Specific Financing Information $I_{s,t}$

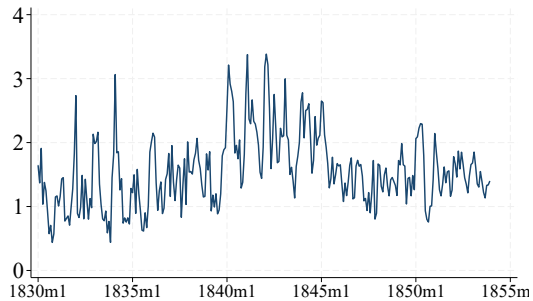
a. New York



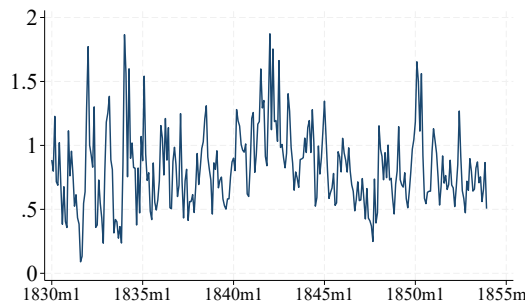
b. Ohio



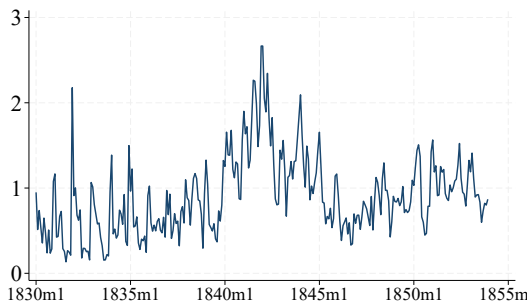
c. Pennsylvania



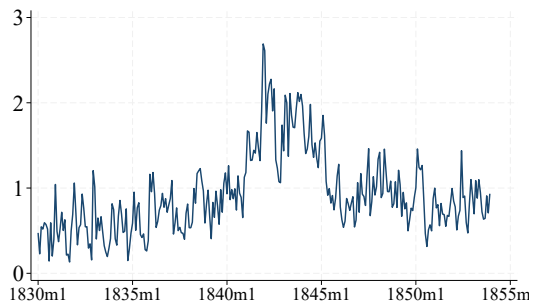
d. Maryland



e. Indiana



f. Illinois



Information shifts during the crisis are smaller than the sharp swings in bond prices/discounts.

K-Means Cluster Analysis

- Words in articles are linked by underlying topics.
- Use unsupervised machine learning (K-means).

Cluster	Top keywords
Legislature	bill, committe, senat, amend, resolut, vote
Banking	bank, cent, note, par, exchang, speci
Trade	market, flour, demand, firm, sold, ship
Fed govt	congress, whig, govern, great, peopl, act

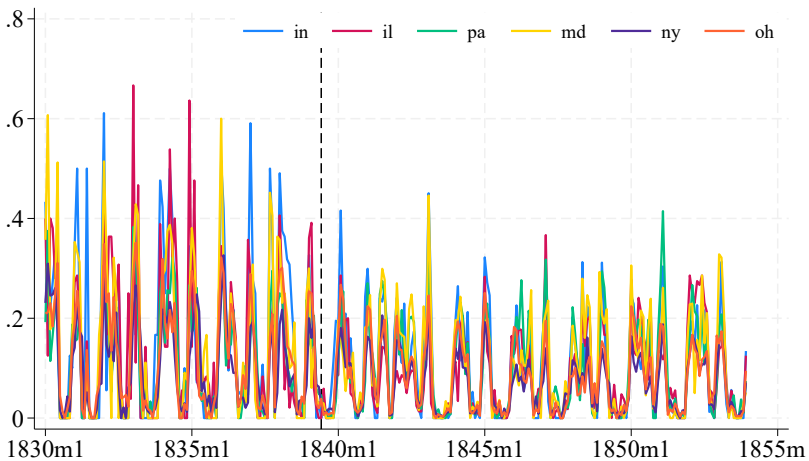
a. Legislature

b. Banking

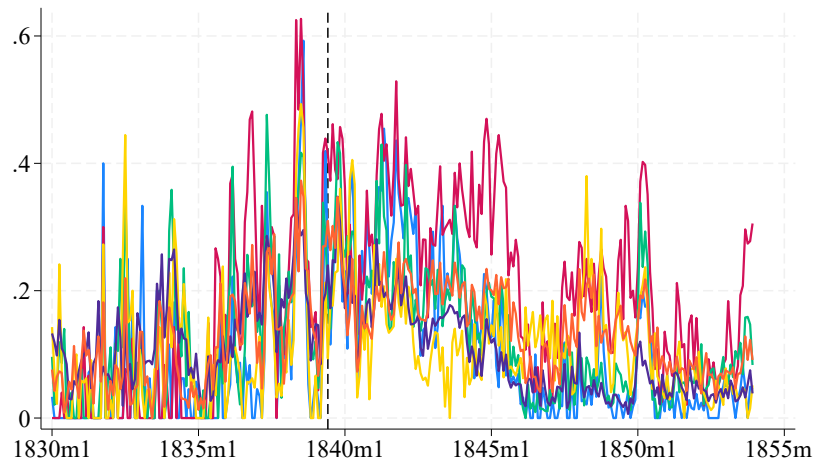
Heterogeneity by Cluster: Legislature vs. Banking

- Legislature: seasonal, tied to legislative calendar and Auditor/Treasurer reports.
- Banking: spikes around the Panic of 1837, the 1839 crisis, and state default episodes.

a. Legislature



b. Banking



Impact of News on Bond Prices

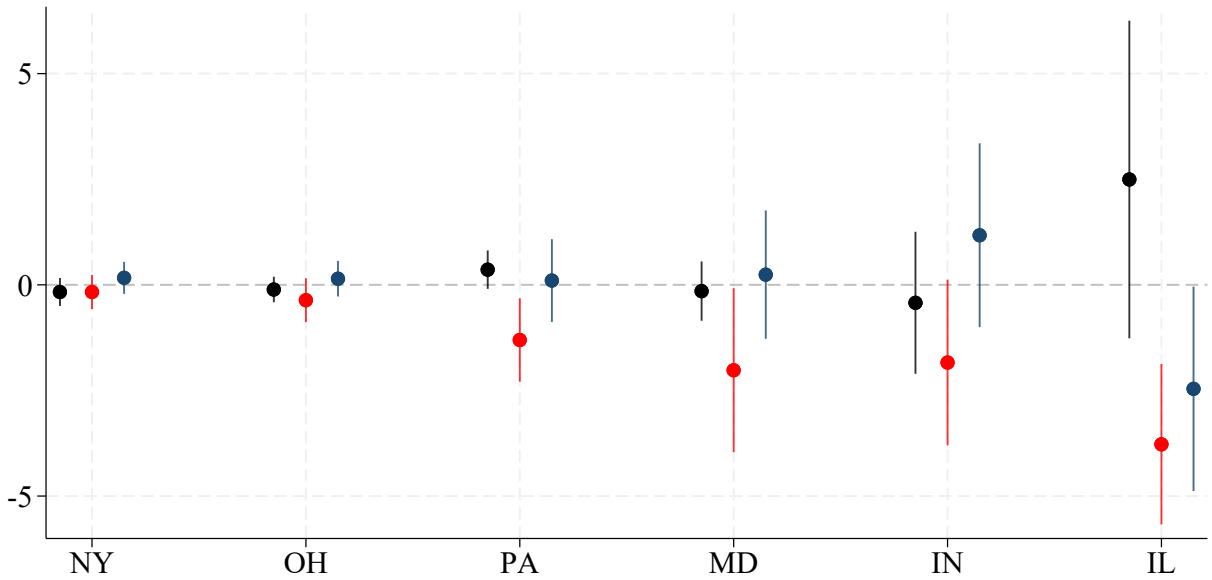
Empirical Specification: Bond Prices

How does state-specific financing news impact bond prices? Do the effects vary during vs. outside of the crisis?

$$\begin{aligned} p_{bs,t} - p_{bs,t-1} &= \alpha_t + \beta_b + \gamma_s^0 \left(I_{s,t-1} \, \mathbf{1}\{D_t = 0\} \right) \\ &\quad + \gamma_s^1 \left(I_{s,t-1} \, \mathbf{1}\{D_t = 1\} \right) \\ &\quad + \gamma_s^2 \left(I_{s,t-1} \, \mathbf{1}\{D_t = 2\} \right) + \varepsilon_{bs,t} \end{aligned}$$

- α_t: time fixed effects; β_b: bond fixed effects
- Regime indicator D_t: pre-crisis, crisis (Jun 1839 – Dec 1844), post-crisis.
- Bond prices: Sylla, Wilson, & Wright (2002) early U.S. securities database.
- Sample: 168 bonds across six states, monthly, 1830/1 - 1853/12.

First-Stage Estimates: Bond Prices Respond to News

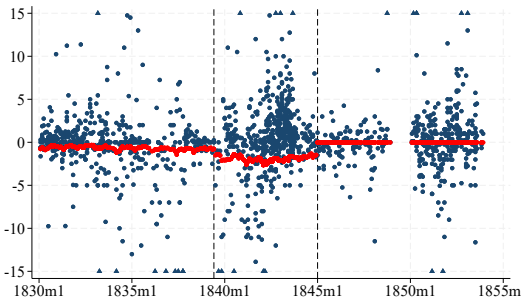


- Pre-crisis γ_s^0: small, statistically insignificant for all states.
- Crisis γ_s^1: **negative and significant for defaulters** (MD, PA, IN, IL).
- Post-crisis γ_s^2: reverts back – close to zero.
- Magnitudes during crisis: 1% rise in info $\Rightarrow$ \$1–\$2.3 more rapid decline in bond price. more

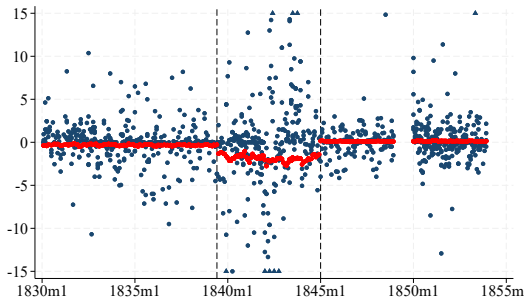
Observed vs. Information-Driven Bond Price Changes

Information explains a meaningful share *during* the crisis, especially for defaulters.

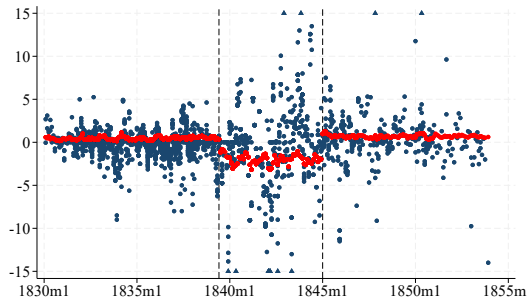
a. New York



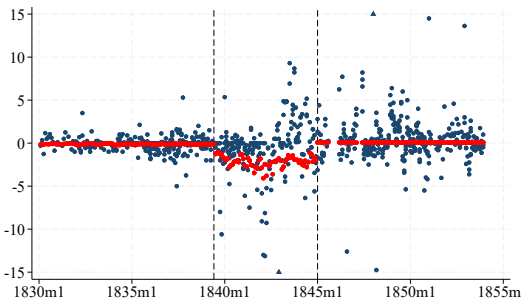
b. Ohio



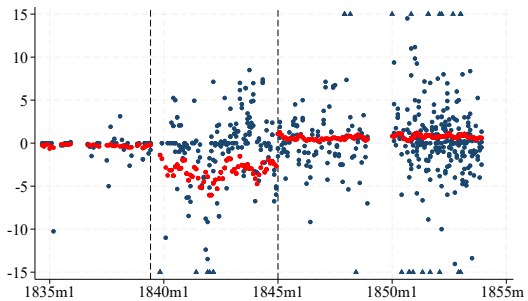
c. Pennsylvania



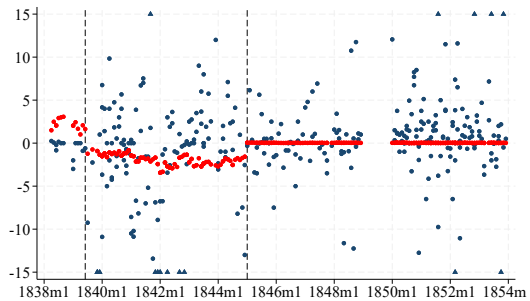
d. Maryland



e. Indiana



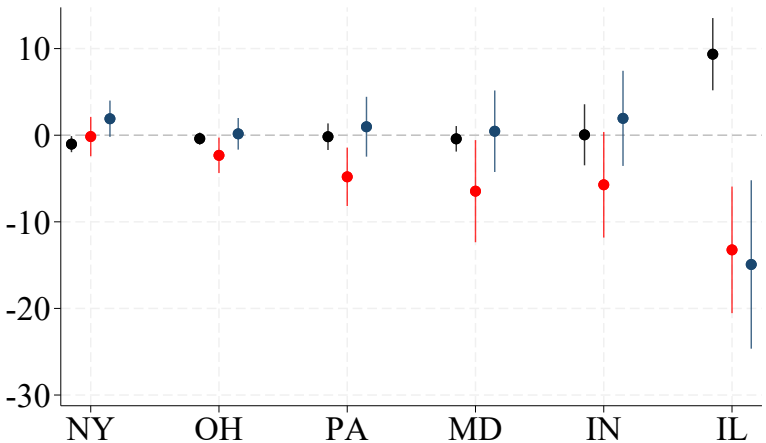
f. Illinois



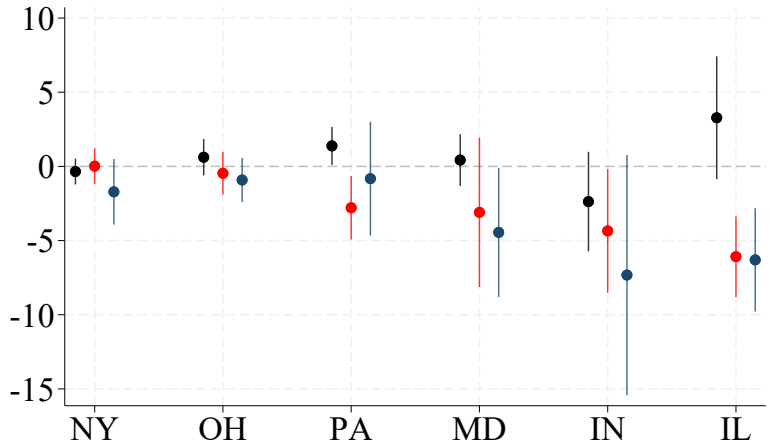
Note: Observed price changes (navy) vs. predicted from state-specific info (red).

Responses to Legislature and Banking Clusters

a. Legislature



b. Banking



- **Legislature**: closely mirror the baseline findings.
- **Banking**: negative and statistically significant for PA, IN, IL during crisis.

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Impact of Bond Prices on Bank Notes

Empirical Specification: Bank Note Discount Rates

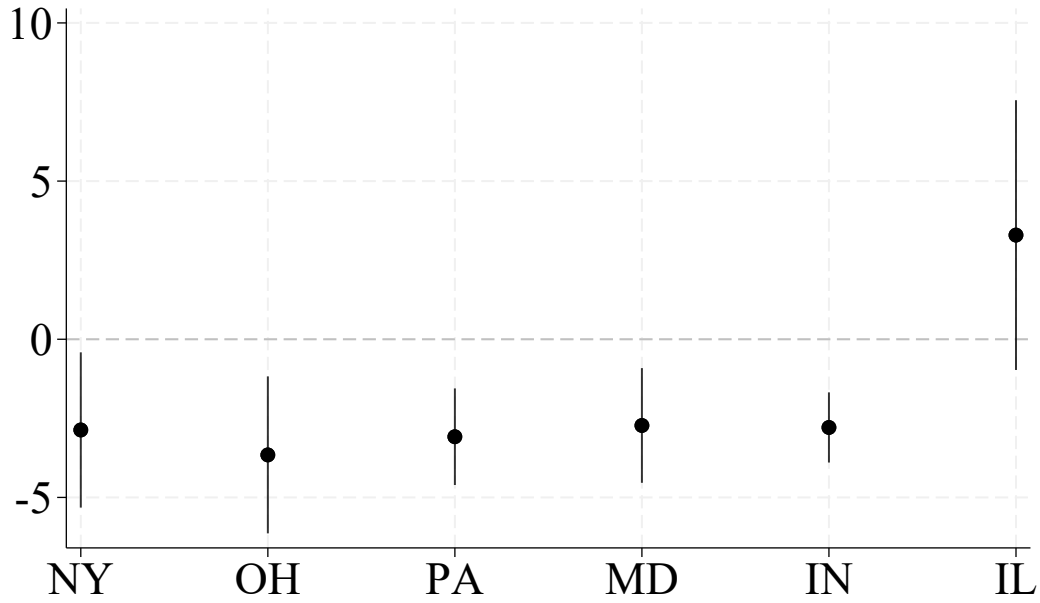
How do information-driven bond price movements transmit to bank note discount rates?

$$dr_{is,t} = \alpha_t + \beta_i + \theta_s \widehat{\Delta p}_{s,t} + \varepsilon_{is,t}$$

- $dr_{is,t}$: discount rate on bank notes issued by bank i in state s, month t.
- $\widehat{\Delta p}_{s,t}$: **information-driven** component of state bond price changes (predicted from first stage).
- α_t: time fixed effect; β_i: bank-level fixed effects.
- Discount rate data: Gorton and Weber (2018, Philadelphia); Weber (2018, New York).

Information-Driven Bond Prices Move Stablecurrencies

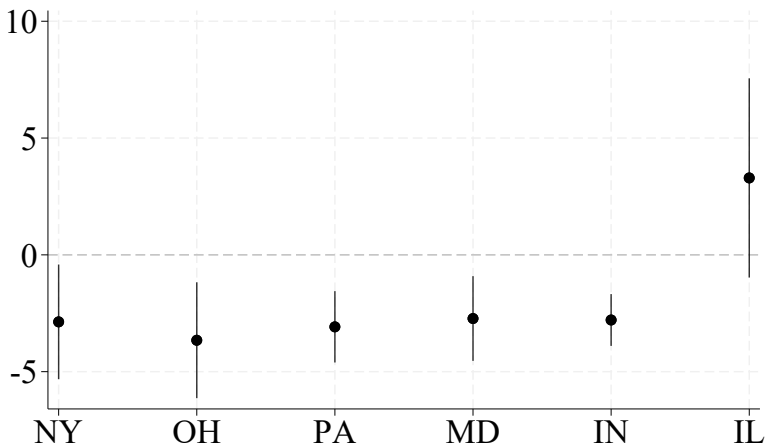
- Information-driven declines in bond prices $\Rightarrow$ higher discount rates; effects from $\sim$0.5 to 2 std. devs. more



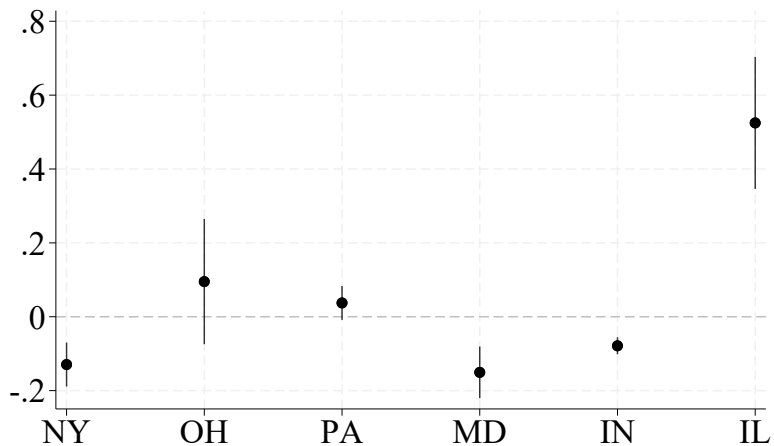
Information-Driven Bond Prices Move Stablecurrencies

- Information-driven declines in bond prices $\Rightarrow$ higher discount rates; effects from $\sim$0.5 to 2 std. devs. more
- Bond price residuals (orthogonal to news) have *much small effects*.

a. Predicted bond prices



b. Bond price residuals



Interpretation: Information-Sensitive Collateral

- **Collateral-based view of stablecurrencies:**
  - State bonds were dominant backing assets on bank balance sheets.
  - Adverse fiscal news $\Rightarrow$ lower recovery value $\Rightarrow$ higher prob. of non-redemption at par.
  - Note holders demand larger discounts.
- Direct empirical content for Gorton and Ordoñez (AER 2014):
  - Tranquil times: notes circulate as if information-insensitive.
  - Adverse aggregate shock: information *endogenously* produced; notes become information-sensitive; collateral crisis.

Conclusion

- We construct **state-specific information measures** from a corpus of 19th-century newspapers using machine-learning methods.
- Two main findings:
  1. State financing news prices into sovereign bonds only during the 1840s crisis.
  2. *Information-driven* bond movements transmit to stablecurrency discount rates; orthogonal movements do not.
- **Stablecurrencies inherit regime-dependent information sensitivity** from the sovereign debt that backs them.
- **Implication for modern stablecoins:** the resilience of asset-backed private money cannot be assessed in tranquil times – it depends on behavior *under stress*.

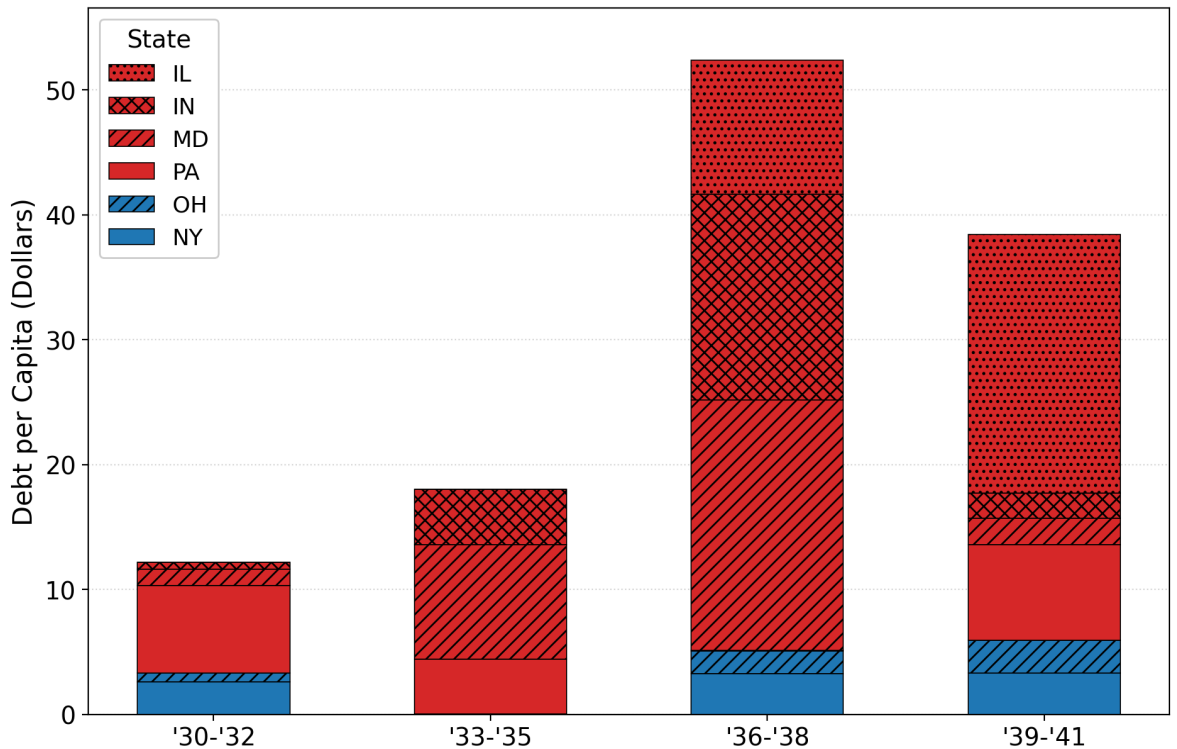
Appendix

Related Literature

- **Information-sensitive collateral and private money:** Gorton and Ordoñez (2014); Gorton (1996, 1999); Gorton and Zhang (2023).
- **State defaults of the 1840s:** Temin (1969); Wallis (2000, 2001, 2003); Wallis et al. (2004); Rousseau (2002).
- **Text as data and historical newspapers:** Gentzkow, Kelly and Taddy (2019); Beach and Hanlon (2023); Bybee et al. (2024); Correia et al. (forthcoming).
- **Rational inattention / information acquisition:** Sims (2003); Nieuwerburgh and Veldkamp (2010); Kacperczyk et al. (2016); Cole et al. (2025).

Rising State Debts

- Non-defaulters: NY, OH; Defaulters: PA, MD, IN, IL
- Non-defaulters + PA: much smaller debt per capita



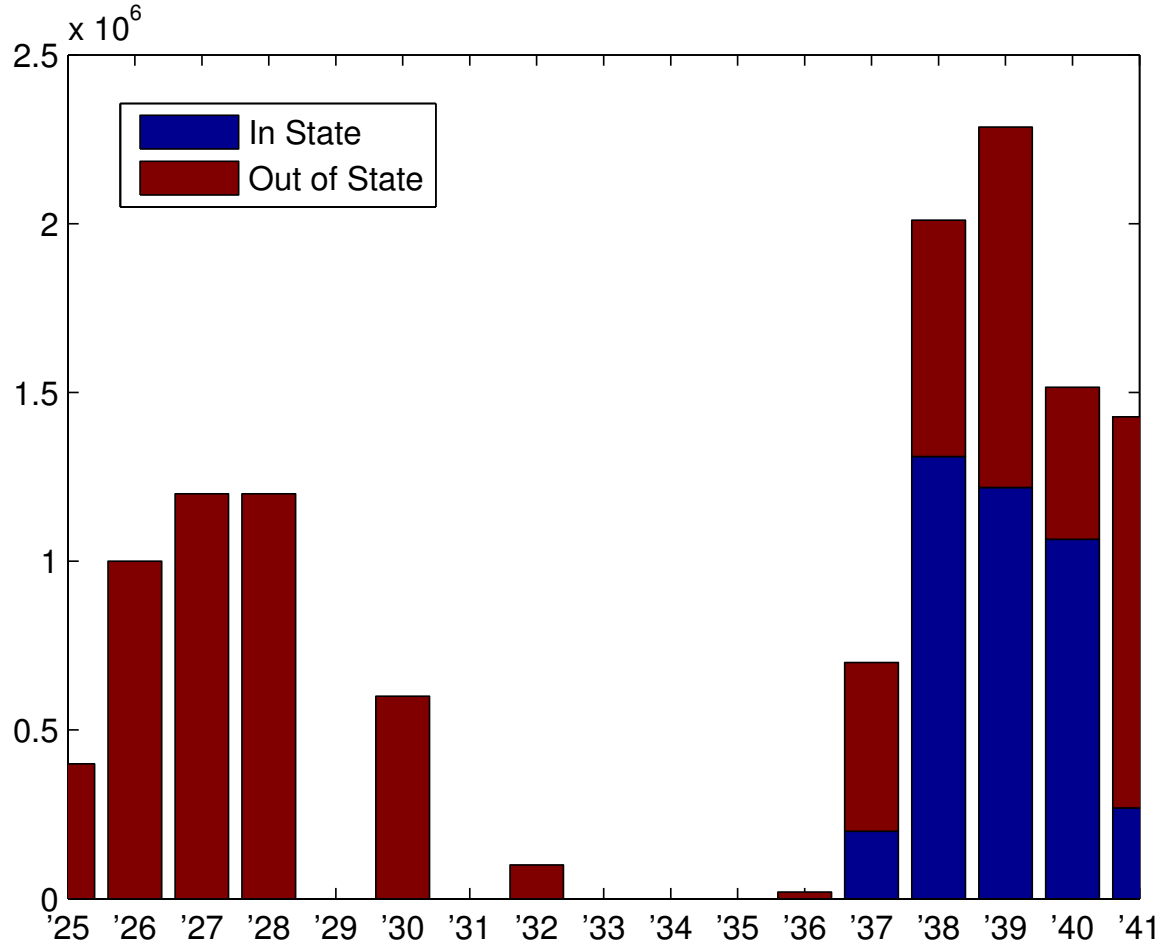
Note: Debt per capita in 1841 by year of authorization; from Wallis, Sylla, & Grinath (2004)

Defaulting vs. non-defaulting states

State	Start Issuance	Default Date
New York	1817	No default
Ohio	1825	No default
Maryland	1826	January 1842
Pennsylvania	1826	August 1842
Indiana	1836	January 1841
Illinois	1837	January 1842

return

Ohio Liabilities as of 1842 by year issued

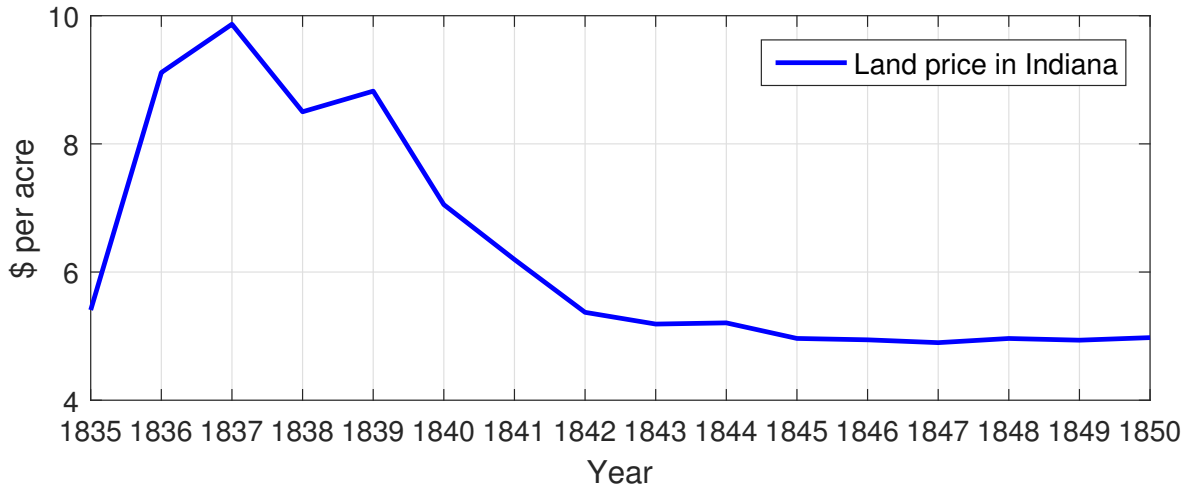


Source: Ohio Annual Report of the Auditor of State, 1842

return

Justifying State Debts: Indiana

- Increasing land values were a key factor underlying the massive state borrowing
- Expectation of property tax revenue (especially important for "new" states)



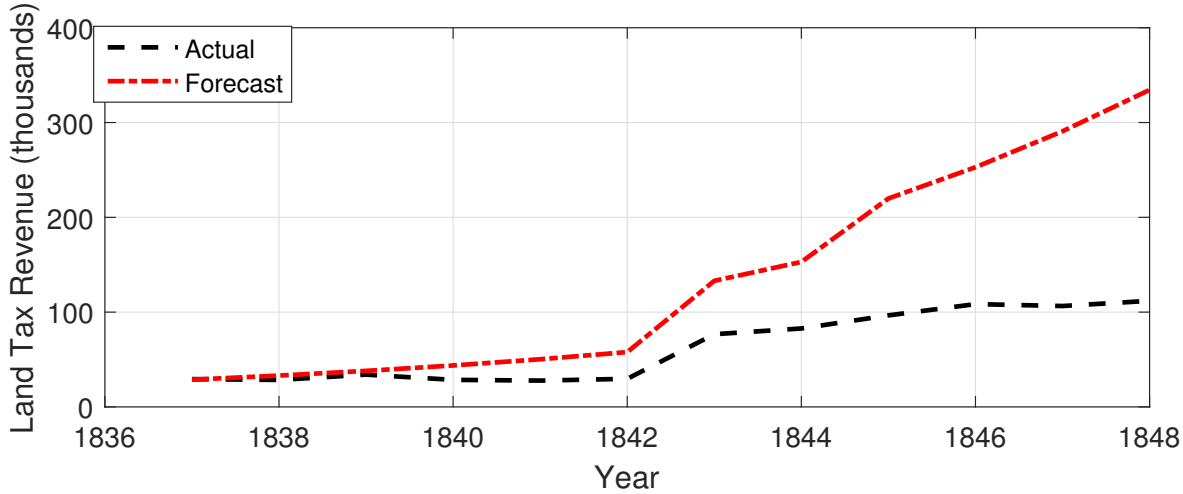
Source: Indiana Annual Auditor Reports for various years

- Early success of New York (1817) and Ohio (1825) canals

return

Indiana: Fiscal Forecasts

- Land taxes were crucial for Indiana: 40% of total tax revenue in 1835 vs. 84% in 1838
- Fiscal forecast assumptions in 1836 (to authorize $10 million bond):
  - Value of taxable property would grow at 15% annually (only 4.4% ex-post)
  - Set up a dedicated sinking fund with return of 9% (didn't happen before default)



Source: Wallis (2003), Indiana Report of the State Board of Internal Improvement (1836)

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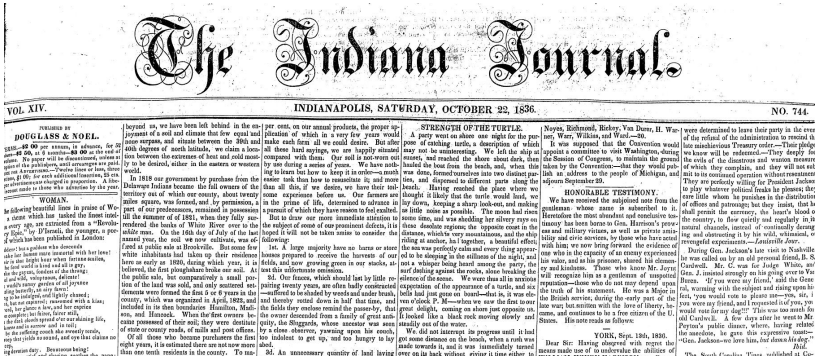
Sample Newspaper Issue

a. Headline



The Indiana Journal.

VOL. XIV. INDIANAPOLIS, SATURDAY, OCTOBER 22, 1836. NO. 744.

b. Issue metadata (XML)

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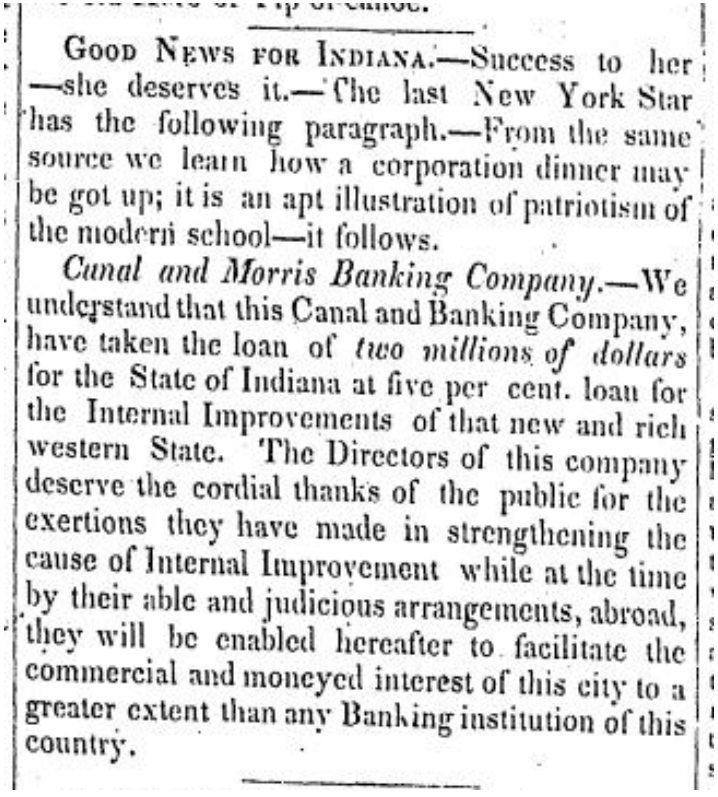
    <ti>Good News for Indiana</ti>
    <ct>News</ct>
  </article>
```

Indiana Journal, October 22, 1836

Sample Article (Indiana Journal, Oct. 22, 1836)

a. Digital image



GOOD NEWS FOR INDIANA.—Success to her —she deserves it.—The last New York Star has the following paragraph.—From the same source we learn how a corporation dinner may be got up; it is an apt illustration of patriotism of the modern school—it follows.

Canal and Morris Banking Company.—We understand that this Canal and Banking Company, have taken the loan of *two millions of dollars* for the State of Indiana at five per cent. loan for the Internal Improvements of that new and rich western State. The Directors of this company deserve the cordial thanks of the public for the exertions they have made in strengthening the cause of Internal Improvement while at the time by their able and judicious arrangements, abroad, they will be enabled hereafter to facilitate the commercial and moneyed interest of this city to a greater extent than any Banking institution of this country.

b. OCR text file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      it.-'Cihe last New York Star has the following paragraph.-From
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      cause of Internal Improvement while at the time by their able
      and judicious arrangements, abroad, they will be enabled
      hereafter to. facilitate the commercial and moneyed interest of
      this city to a greater extent than any Banking institution of this
      country. </ocrText>
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Article ID format: [newspaper-date-page-article]. *"The Canal and Morris Banking Company had bought two million dollars of Indiana bonds."*

Summary Statistics of Bond Price Changes and State News

	Mean	Std. Dev.	Min	Max	N
NY					
Bond price changes	0.122	4.466	-38.12	38.62	1449
State news	4.942	1.236	1.90	8.44	1449
OH					
Bond price changes	0.025	3.772	-27.31	27.25	1068
State news	3.465	0.886	1.44	5.81	1068
PA					
Bond price changes	-0.303	3.607	-48.75	33.03	2337
State news	1.599	0.624	0.44	3.38	2337
MD					
Bond price changes	-0.012	2.490	-25.00	15.75	826
State news	0.834	0.298	0.09	1.87	826
IN					
Bond price changes	-0.237	6.585	-44.00	37.38	607
State news	1.091	0.427	0.25	2.67	607
IL					
Bond price changes	-0.585	10.115	-65.50	78.00	329
State news	1.099	0.469	0.31	2.69	329

return

First-Stage Estimates: Bond Prices Respond to News

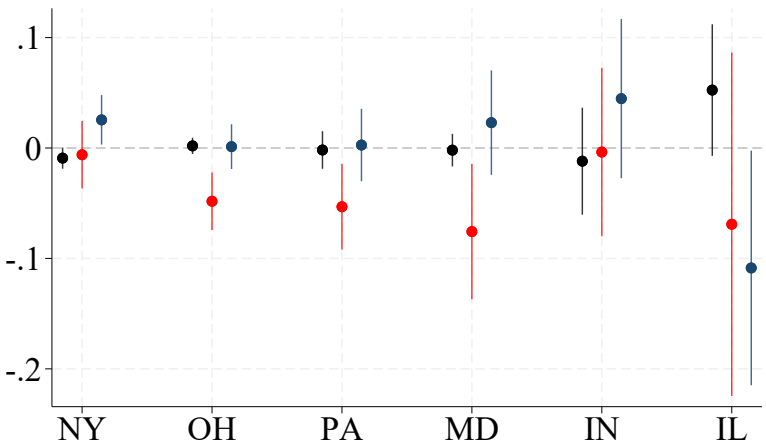
Table: Total Effects of State Financing Information

State	$\gamma_s^0 + \gamma_s^1$	p-value	$\gamma_s^0 + \gamma_s^2$	p-value
NY	-0.338	0.147	-0.003	0.989
OH	-0.474	0.125	0.034	0.891
PA	-0.945	0.081	0.462	0.410
MD	-2.169	0.056	0.093	0.909
IN	-2.265	0.022	0.749	0.604
IL	-1.280	0.474	0.033	0.985

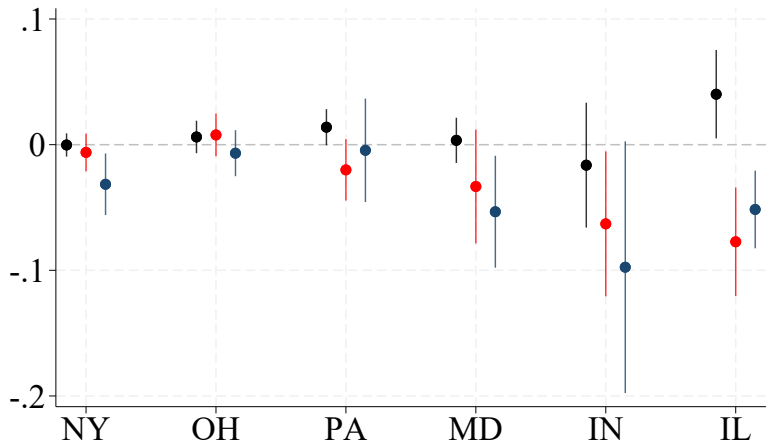
return

Joint Estimation: Legislature & Banking Together

a. Legislature



b. Banking



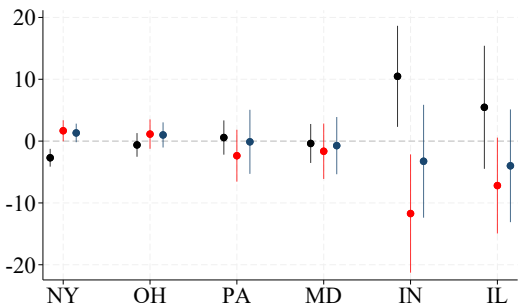
Once both clusters enter jointly:

- **Legislature** drives crisis-period declines for PA and MD – consistent with their borrow-don't-tax fiscal model.
- **Banking** drives crisis-period declines for IN and IL – more direct bank-state linkage.

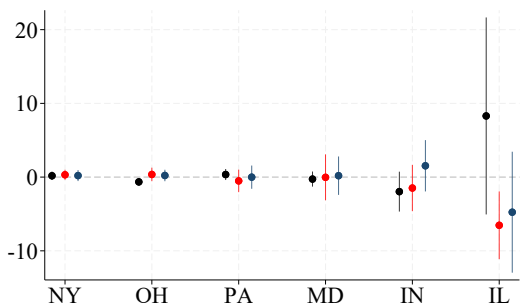
return

Other Clusters

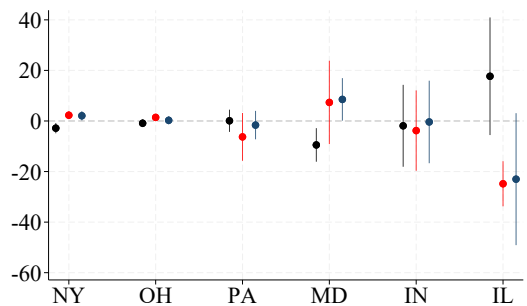
a. Trade



b.Fed Govt



c.Other



- Trade cluster has negative impact on IN and IL during crisis

return

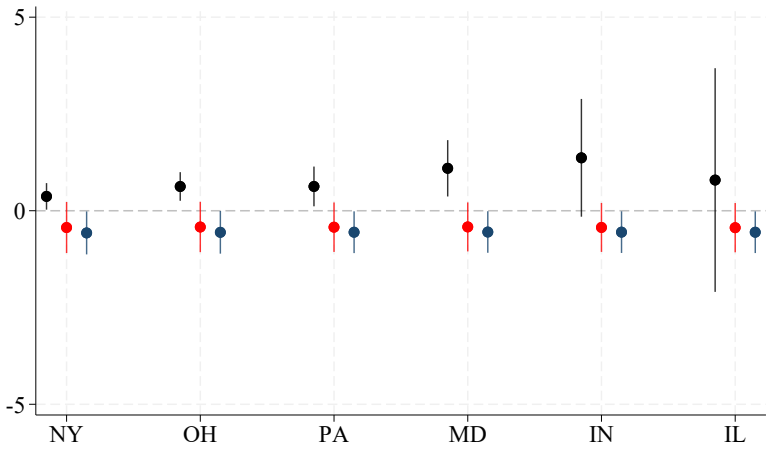
Summary of Discount Rates (1839/06 – 1844/12)

	Mean	Std. Dev.	Min	Max	N
NY					
Discount rate	3.491	12.207	-8.00	85.00	15844
Predicted bond prices	-1.893	0.313	-2.63	-0.78	15844
OH					
Discount rate	9.283	11.820	0.00	85.00	3194
Predicted bond prices	-1.793	0.417	-2.75	-0.27	3194
PA					
Discount rate	4.265	10.147	0.00	90.00	6122
Predicted bond prices	-1.946	0.617	-3.20	0.36	6122
MD					
Discount rate	2.532	6.843	-1.00	80.00	2324
Predicted bond prices	-2.099	0.667	-4.06	-0.11	2324
IN					
Discount rate	6.339	4.097	1.50	20.00	132
Predicted bond prices	-3.236	1.097	-6.04	-0.21	122
IL					
Discount rate	30.317	24.618	3.25	75.00	425
Predicted bond prices	-1.858	0.679	-3.44	1.64	408

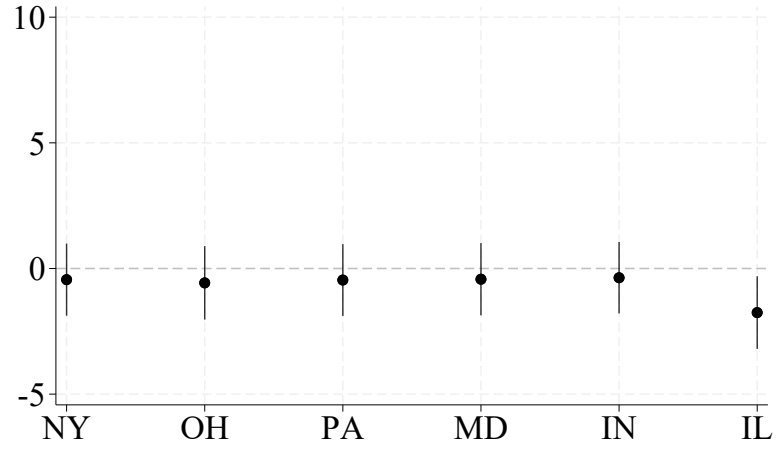
return

Placebo: Articles *Without* Financing Keywords

a. Bond prices and placebo news



b. Discount rates and predicted prices

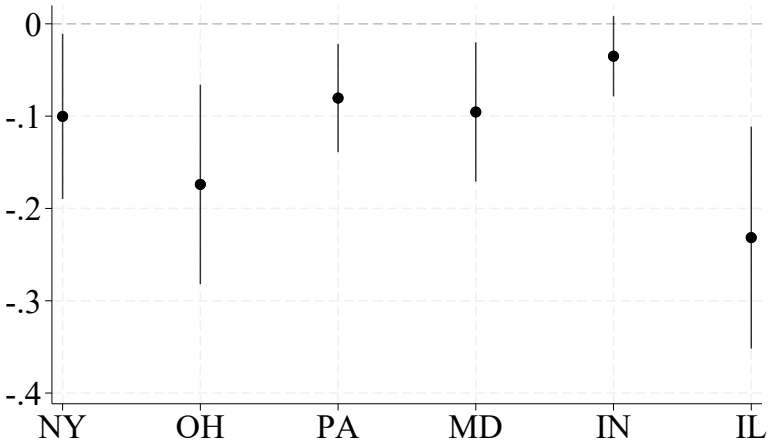


- Placebo measures use article counts *without* financing keywords.
- Estimates are statistically insignificant in both stages – it is the **content-specific information** that drives the results, not general media activity.

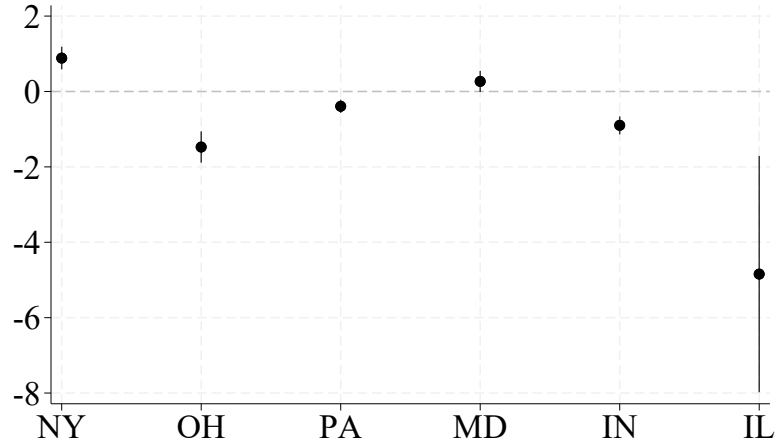
return

Alternative Specifications

a. $\Delta dr_{is,t}$ (changes)



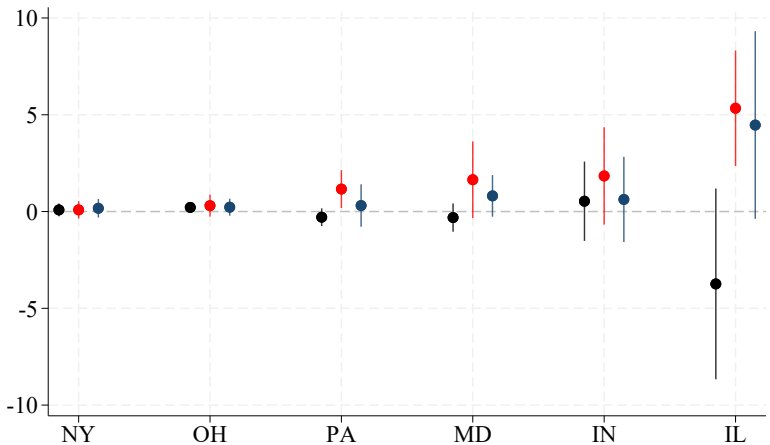
b. Bank balance sheet controls



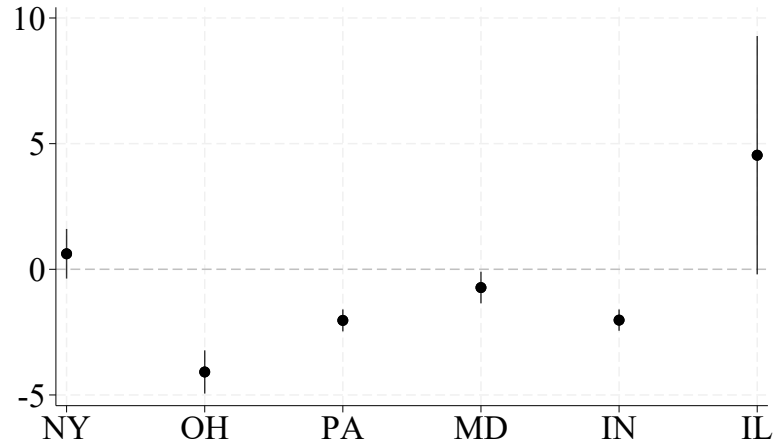
- **Left:** replace discount rate level with *change*; estimates remain negative & significant.
- **Right:** controls for capital ratio, loan share, reserve ratio, circulation share (Jaremski, 2000). Sample drops ∼40% but main message holds.

Sentiment-Weighted Information Measure

a. Bond prices and news



b. Discount rates and predicted prices



- Consider article sentiment (Loughran and McDonald, 2011).
- Both the **presence** *and* the **tone** of information matter; results consistent with baseline.