Sovereign Risk and Fiscal (In)attention: A Look at the U.S. State Default of the 1840s* (Preliminary & Incomplete)

Huixin Bi† Nora Traum‡

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Abstract

Between 1841 and 1843, nine U.S. states and territories defaulted. Open-market prices of state bonds were relatively stable in the fifteen years preceding this episode, while both defaulting and non-defaulting states experienced market premiums as defaults became imminent. We construct a novel measure of attention to the states' fiscal positions from the volume of contemporary U.S. and British newspaper articles related to fiscal policy. This measure exhibits a regime shift at the onset of the debt crisis, displaying a higher volume of articles about fiscal policy. In addition, the measure's ability to predict bond prices increases in the crisis period. Our results suggest investors' attention for fiscal fundamentals matters, and such inattention can help explain low risk premia in tranquil times. We develop a simple model of inattention to illustrate this mechanism.

Keywords: sovereign default; inattention; fiscal policy
JEL Codes: E62, H30, H360, N41

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†Research Department, Federal Reserve Bank of Kansas City; huixin.bi@kc.frb.org.
‡North Carolina State University; njtraum@ncsu.edu

1 Introduction

In good times, the interest rate spreads on long-term sovereign bonds often are low. Spreads can remain low despite large expansionary fiscal policies, but once a stress point arrives, spreads can rise quickly and markedly. The recent debt crisis in Europe illustrates this point and stimulated a debate over the degree to which sovereign bond prices reflect economic fundamentals.[1] Another example of this pattern is the sovereign debt crisis of the U.S. states in the early 1840s.[2] We revisit this historical episode to highlight an element of bond pricing with relevance for today: the role of investors' attention to fiscal fundamentals.

Our focus on the U.S. experience in the 1840s offers a unique opportunity for understanding sovereign defaults. Between 1841 and 1843, 8 of the 26 states and 1 territory at the time defaulted, while other states appeared on the brink of default. As shown in figure 1, open-market prices of state bonds were relatively stable in the fifteen years preceding the default crisis. However both defaulting (solid lines) and non-defaulting (dashed lines) states experienced market premiums in the crisis.

We document a build-up of state debt, as well as several legislated tax and expenditure changes, in the years preceding the crisis. Some states provided direct taxation to support debt financing, while others relied more heavily on the anticipation of future economic growth for debt financing. Were investors paying attention to fiscal conditions as they developed before and during the crisis? To understand the pricing behavior of bonds, we construct a novel measure of attention to states' fiscal policies using U.S. and British newspapers at the time. We estimate a Markov-switching process for this measure and demonstrate a regime shift in the measure in the early 1840s. Despite the proliferation of state debt in the years preceding default, our measure of fiscal information shows no discernable change until the onset of the debt crisis, after which more coverage of fiscal-related articles appeared and remained throughout subsequent years.

Using a panel of state bond prices, we then show our newspaper measure's ability to predict bond prices increases in the crisis period. Our result suggests investors' attention to fiscal fundamentals matters. Investors are less attentive to fiscal fundamentals and accept lower risk premiums in tranquil times, and become more attentive to the fiscal situation at the onset of a crisis, leading bond prices to reflect the perceived riskiness accordingly. Such behavior can rationalize how governments embark on policies in "good times" that in retrospect become unsustainable. Thus, not only do fiscal fundamentals carry consequence, but the *perception* of fiscal soundness matters.[3] We illustrate this mechanism in a simple, theoretical model of costly information processing.

By focusing on the states within a single country, our cross-sectional analysis controls for the cultural and general economic environment. Wallis, Sylla, and Grinath III (2004) argue that there

[1] See De Grauwe and Ji (2012) and Aizenman, Hutchison, and Jinjarak (2013) for views of mispricing in the Eurozone.

[2] See Sargent (2012) for further discussion on the similarities of historical U.S. experiences and the recent Eurozone crisis.

[3] A closely related issue is the perception of a government bailout. See section 3.3 for a discussion of bailout expectations in the 1840s crisis.

were distinct regional patterns to default, corresponding to the level of economic development of the states. Southern states defaulted and repudiated after handing state bonds to banking institutions that failed to uphold obligations to the states. Northern states defaulted after accumulating large debts on public improvement programs. Building on this view, we categorize states into two broad categories: states whose debts were mainly tied to state banking and states whose debts were mainly tied to internal improvement projects. Our current analysis focuses on the later category.

Prior to the states' defaults, the U.S. economy experienced two economic upheavals. First, several banks suspended convertibility of bank money to specie at par value for a year in 1837. Following a brief recovery, a second banking crisis developed in 1839 when banks south and west of New York suspended payment and prices fell by almost one half over the next four years.[4] Many in the literature argue these events provided the catalyst for default. Temin (1969) argues sources of capital were depleted after 1839, leading states to be in the unfortunate position of defaulting when they could no longer roll over interest payments. Wallis, Sylla, and Grinath III (2004) argue that unforeseen declines in land prices after 1839 were the ultimate cause for default. Other theories of the 1840s default suggest the state governments were truly irresponsible. Dewey (1968) and Kettell suggest that states were unwilling to raise taxes enough to service debts. Meyers (1957) argues that states were inexperienced, starting poorly designed projects that never resulted in their anticipated revenues. Our analysis complements these studies and reiterates the importance of fiscal policy for default.

Our findings contribute to a growing theoretical literature aimed at understanding the role of information and attention to crises. Mackowiak and Wiederholt (2014) develop a model where individuals can process only a finite amount of information to rationalize how low-probability events can result in poor decisions. Dang, Gorton, and Holmstrom (2012) develop a model where agents may develop private information about assets and demonstrate that bad news shocks can lead to reduced asset trade and a financial crisis. Bi and Leeper (2013) show the size of fiscal shocks significantly affect risk premia when investors must learn about fiscal policy. Paluszynski (2016) allows households to learn about the underlying income process in a default model and shows that the model's learning process can help account for the timing of Eurozone risk premia.

This paper is organized as follows. Section 2 provides a synopsis of the fiscal conditions of individual states before and during the debt crisis. Section 3 presents our measure of fiscal information and the empirical analysis. Section 4 presents a simple theoretical model to illustrate how investor attentiveness can explain the patterns observed in the data and section 5 concludes.

2 Historical Background

Two economic crises in 1837 and 1839 set the stage for the state defaults in the 1840s.[5] After 1839, credit quickly dissipated, banking failures pressured state finances, and declines in land values

[4] Temin (1969), Wallis (2001), Rousseau (2002), and Knodell (2006) provide thorough discussions of events surrounding these episodes.

[5] See the appendix for details of these two events.

lowered state tax bases. States that defaulted did so when their financial constraints temporarily availed no method for interest payments. At the time, states were the principal level of government in the United States. State debt accounted for 86% of total local, state, and federal debt in 1838 and 1841 [see Wallis (2000)].[6]

Figure 1 plots the average bond price for several states (with par value of $100) between January 1820 and December 1859. Prices for publicly traded government securities come from the price quotation database for the early U.S. securities markets from 1790 to 1860 [see Sylla, Wilson, and Wright (2002)]. This database compiled security prices from contemporary newspapers in seven markets: London, New York, Philadelphia, Boston, Baltimore, Richmond, and Charleston.[7] The majority of state bond trading occurred in the London, New York, Philadelphia (mainly for the state of Pennsylvania), and Baltimore (mainly for the state of Maryland) markets.

In this paper, we focus on seven states—Illinois, Indiana, Kentucky, Maryland, New York, Ohio, and Pennsylvania—due to the limited bond price data for the southern defaulting states, such as Arkansas and Mississippi. In addition, these seven states shared common fiscal goals and issued debt mostly for internal improvement projects.[8] As shown in figure 1, there was limited variation in the bond prices across states prior to 1840, as they fluctuate within the range of $90 to $120. All state bond prices dropped in 1840, plateaued in 1842, and began to recover in 1843. Thus, all states were punished by the market at the onset of the crisis, while the extent of discounting varied substantially across states. The three states that did not default (Ohio, Kentucky, and New York) witnessed a relatively modest reduction in their bond prices. Between January 1838 and January 1843, bond prices dropped by $30 for Ohio and less than $20 for New York. In contrast, states that did default (Indiana, Illinois, Pennsylvania and Maryland) experienced much deeper price cuts — prices dropped by almost $60 for Maryland and Pennsylvania, and close to $70 for Indiana and Illinois. Moreover, Indiana and Illinois bond prices did not return to pre-crisis levels until 1855, as seen from figure 1, despite the fact that Illinois resumed its debt payment in 1846 and Indiana in 1847, as shown in table 1.

U.S. Congress (1843) provides a survey of state borrowing for this period. The total outstanding debt for all U.S. states on September 1, 1841 was $198 million. Figure 2 shows the outstanding debt in 1841 by years of authorization for the seven states we consider. The period of 1836-38 witnessed a substantial increase in debt authorization from $15 million to about $35 million, and about two-thirds of the total debt in 1841 was authorized after 1836. These accumulations of large

[6] At the federal level, revenues were primarily from tariffs, while expenditures were largely for war financing. Political divisiveness kept the federal government from playing a substantial role in the development of United States infrastructure [see Wallis (2000)]. The federal government did not make routine transfers to states during this period, but in 1837 there was a one-time distribution of federal surplus revenues to the states.

[7] The database also includes price quotations for other securities in the Alexandria, Norfolk, and Richmond, VA markets, which were excluded from our analysis. Alexandria and Norfolk have no price listings for state debt. Richmond, VA has only two state bond listings over the period 1854-1858. The database is available online at http://eh.net/database/early-u-s-securities-prices/.

[8] Of the non-southern states, Maine and Massachusetts also amassed debt in this period. Most northeastern states had essentially zero debt, including Connecticut, Delaware, New Jersey, New Hampshire, Rhode Island, and Vermont. We exclude Michigan from the analysis as the state's policy more closely resembles that of the southern states, namely bank financing, see Wallis, Sylla, and Grinath III (2004).

State	Data	Resumed or Repudiated	Date
Indiana	January 1841	Resumed	July 1847
Illinois	January 1842	Resumed	July 1846
Maryland	January 1842	Resumed	July 1848
Pennsylvania	August 1842	Resumed	February 1845

Table 1: Dates of Defaults and Resumptions. Source: English (1996)

debts in the second half of 1830s coincided with the origination of several large-scale public works projects.

The states shared many similarities in their issuance of debt. All states placed restrictions on new bonds to be sold at or above par, although several states abandoned these rules in the crisis. Bonds were long-term, usually with maturities past 20-year, and almost all bonds had coupon payments of 5 or 6 percent [see Ratchford (1941), pg. 95]. Bonds could be payable locally (i.e., in-state notes) or not, with out-of-state redemption usually payable in New York notes or London sterling. Table 2 provides the percentage of several states' debt in the early 1840s payable in or out of state and shows over 50% of debt was denominated in "foreign" (out of state) units.

Greater disparity across states existed in bondholders. Table 2 displays the percentage of debt in the early 1840s and 1850s held in-state, out-of-state, and in foreign nations. Data for the 1840s primarily comes from state Auditor records of buyers of original issuances, whereas shares in the 1850s are based on estimates of contemporary bondholders from both primary and secondary markets. States that amassed larger debt levels relied more heavily on foreign nation creditors, predominantly in England. For instance, 84% of foreign holdings of Pennsylvania debt in 1842 was in England, while roughly 8% was in Holland [see the Pennsylvania Report of the Auditor General, July 2, 1842].[9] In-state creditors mainly were state banks.

How did these states anticipate honoring their debts? In the next section, we highlight some similarities and differences in the states' fiscal policies, paying particular attention to their debt financing plans.

[9]Holland was the second most important foreign creditor and substantially funded several states not included in our analysis, such as Michigan and Mississippi [see Wilkins (1989), pg. 77]. Southern states tended to have larger shares of foreign creditors than Northern and Western states. For instance, in 1853, estimates suggest foreign shares of Mississippi, Alabama, and Louisiana debt were 100, 98, and 83 percent respectively [see Wilkins (1989), pg. 77].

State	Year	Total Debt	Bondholder Share			Currency Share	
			In State	Out State	Foreign Country	In State	Out State
New York	1843	25,999,074.00[a]	0.54[a]	0.04	0.42		
Ohio	1841	12,459,034.00[b]	0.33[b]	0.63	0.04	0.11[e]	0.89
Kentucky	1842	5,563,500.00[c]	0.51[c]	0.49	0.00	0.22[c]	0.78
Pennsylvania	1842	34,454,356.47[d]	0.28[d]	0.03	0.69		
Maryland	1841	15,596,861.49				0.48[e]	0.52
Ohio	1853		0.33		0.67[f]		
Kentucky	1853		0.5		0.5[f]		
Pennsylvania	1853		0.34		0.66[g]		
Maryland	1853		0.45		0.55[g]		
Indiana and Illinois	1853		0.25		0.75[f]		

[a]: Reported in *Hunt's Merchants Magazine*, March 1848, pg. 252.
[b]: Annual Report of the Auditor of State, Relative to the Liabilities of the State of Ohio, Dec. 12, 1842. Original issuance; We use the same classifications as Scheiber (2012), Tables 6.1 & 6.2 based on location of buyer. 1836 & 1841 contain unknown residence sales we classify as out of state.
[c]: Documents accompanying the Kentucky Governor's Message, Reports of Legislature of Kentucky, Dec. 1849. Original issuance; 2,383,500 were directly issued to contractors and workers between 1840-1842. We split this sum between in and out of state shares as they likely went to domestic holders.
[d]: Pennsylvania Report of the Auditor General, containing a statement relative to the holders of State Stock, July 2, 1842. Reprinted in *Niles Register*, Dec. 10, 1842.
[e]: U.S. Congress (1843). For Ohio: pg. 82-85, out-of-state is payable in New York. For Maryland: pg. 56-57, out-of-state all in London sterling and in state payable in the Loan Office of Baltimore (Kettell (1849b), pg. 492).
[f]: Wilkins (1989), pg. 77: estimates from Winslow, Lanier & Co., New York.
[g]: Wilkins (1989), pg. 77: estimates from the U.S. Treasury.

Table 2: Shares of "foreign" and "domestic" bondholders and currency denominations for select states.

2.1 State Fiscal Policy In this section, we provide brief synopses of the fiscal situations of various states before and during the crisis. For all states, policy decisions were integral for the level of debt and perception of default.

New York When New York began issuing debt in 1817 for the Erie and Champlain canals, the state dedicated revenues from auction duties and a salt tax for debt service. By 1824, revenues from these sources were $290,000, which was comparable to the canal bond interest payments of $350,000. In addition, the law of 1817 created a board of commissioners of the canal fund and authorized the commissioners to borrow only if the canal fund was "deemed ample and sufficient" to pay interest payments [see *Hunt's Merchants Magazine* (1839)]. In 1836, New York embarked on additional internal improvement projects: enlarging the Erie canal, extending the canal system, and investing in railroads. Between 1836 and 1841, the state borrowed more than $15 million [see Wallis, Sylla, and Grinath III (2004)]. Although the financing policy on state debt was changed in 1825 and no specific funds were set apart for the interest payment, the toll revenue from the canals was able to cover the interest payment on the whole amount of outstanding debt from 1833 to 1838. The inaugural issue of *Hunt's Merchants Magazine* declared the toll surplus alone could "sustain a debt of 12 millions of dollars" [see *Hunt's Merchants Magazine* (1839), pg. 176]. Nevertheless, New York was experiencing difficulties in financing interest payments and expenditures by the early 1840s. In March 1842, the state adopted the "Stop and Tax Law," which suspended further expenditures on improvement projects and re-instituted the state property tax.[10] The law sent a clear message to investors and bond prices quickly rose following the austerity measure, as shown in figure 1. New York was able to continue borrowing after the 1840s crisis, with voters approving a bond issue to expand the canal network in the 1850s.

Ohio and Kentucky Auxiliary funds were set aside for interest payments on state debt in these two states. In Ohio, the Auditor was given discretionary power to levy property taxes at an annual level sufficient to cover interest on the canal debt, providing direct taxation for debt relief.[11] In Kentucky the Governor was authorized to "borrow any sum, not exceeding the capacity of the sinking fund to pay the interest, and ultimately the principal, of the state bonds, at an interest not exceeding 6 per centum per annum" [see *Hunt's Merchants Magazine* (1839) pg. 177].

Pennsylvania As McGrane (1935) documents, Pennsylvania constructed an extensive system of internal improvement projects in the 1830s despite strong public aversion to taxation. To balance local interests and sectional rivalries, the state spread the resources across different lines of public works instead of concentrating on the Pennsylvania canal. As early as 1830, the funds that were placed at the disposal of the canal commissioners weren't sufficient to meet the interest payment

[10] Although the state property tax had been suspended in 1826, New York did have other tax revenue sources throughout the 1830s.

[11] Although the Auditor did not raise taxes to cover debt payments until the 1840s, Kettell (1849c) argues this provision added to initial investor confidence in the state.

on state debt. The state chartered the United States Bank and repealed property taxes in 1836, and the failure of the Bank in 1839 left Pennsylvania without many tax resources. In 1838, the state treasurer expected a deficit of over 3 million dollars by the end of 1839, but the legislature decided to borrow more money rather than raise taxes. Although the public works were completed by 1834 and open to traffic, their net revenue in 1840 was less than $140,000, far below annual interest payments on state debt which were over $1.2 million. In April 1844 – two years after the state defaulted – the state finally enacted a comprehensive property tax for debt service.

Maryland Hanna (1906) dates 1826 as the beginning of the Internal Improvement Era in Maryland. Maryland amassed debt to invest in the stocks and bonds of private canal and railroad companies, instead of directly operating its improvement projects. Rivalries between parties interested in canals and railroads in the 1830s led construction in both to follow almost parallel routes with identical purposes [see McGrane (1935)]. Between premiums on new debt issuance and revenues from the private improvement operations, the state was initially able to service its debt. Minor loans consistently established individual sinking funds for payment, for instance tobacco warehouse loans were secured by tobacco inspection revenue and the monument loan by lottery receipts [see Hanna (1906) pg. 147]. However, with the larger loans earmarked for canals and railroads, sinking fund policy was neglected. Although the total sinking funds were about $1 million in 1841, the funds were insufficient to absorb the state debt, which was more than $15 million with annual interest of nearly $600,000.[12] Given no system of direct taxation existed, the state passed a property tax in March 1841. However, the tax offered little revenue in its first few years, as several counties contested payment in court and fallacious estimates of property value often were given.

Illinois Illinois was eager to follow the early example of New York and the Erie canal, but was slow in implementation. In 1837 it passed an act for canal and railroad construction, as well as capitalizing the State Bank of Illinois. Projected costs of these projects totaled $23,524,781, estimated at about $300 per family in Illinois at the time [see Kettell (1852) pg. 662]. In 1839, the state experienced bank default on credit sales of state bonds and increased its borrowing [see Wallis, Sylla, and Grinath III (2004)]. Despite increasing property tax rates in the early 1840s, the state found itself unable to finance its interest payments and defaulted in January of 1842.

Indiana Indiana's finances over this period were crucial for her outcome: Over-optimistic revenue forecasts and underestimates of canal costs eventually led the state to default in 1841.

Wallis (2003) provides a detailed discussion of Indiana state tax policy and internal improvement projects in the 1830s. The U.S. Congress granted Indiana land in 1827 for the construction of the Wabash and Erie canal that began in 1832. In 1836 Indiana passed an ad valorem property tax and the Mammoth Internal Improvement bill to extend improvement projects throughout the state. The ad-valorem tax replaced a per-acre tax that fell heavily on farmers and allowed the state to tax the

[12] See McGrane (1935) and *Hunt's Merchants Magazine* (1839).

Year	Surplus Fund Return	Taxable Property (million)	Tax Rate	Total Revenue	Expenditure
1836		78			
1837	67,500	89.7	0.0005	112,350	50,000
1838	140,611	103.2	0.0005	192,189	108,000
1839	148,188	118.6	0.0005	207,502	177,000
1840	150,933	136.4	0.0005	219,145	237,000
1841	149,326	156.9	0.0005	227,770	253,000
1842	147,056	180.4	0.0005	237,265	300,000
1843	141,410	207.5	0.001	348,892	363,000
1844	140,140	238.6	0.001	378,744	424,500
1845	136,022	274.4	0.00125	479,015	482,625
1846	135,697	315.6	0.00125	530,139	535,032
1847	135,256	362.9	0.00125	588,865	578,790
1848	136,163	417.3	0.00125	657,813	610,238

Table 3: Baseline Forecasts of Indiana Revenue for 1838 to 1848 (reported in 1836): the total revenue included the revenue from taxable property that was taxed at specified rates and returns on the surplus fund. The expenditure included the interest payments on state bonds less the toll revenue that was assumed to arise each year.

value of town lands and other personal property that were likely to benefit from the improvement projects. The Mammoth bill created a Board of Internal Improvement and authorized it to borrow up to $10 million for a "system" of canals.

As part of the discussion on the $10 million bond authorization, the State Board of Internal Improvement reported to the State House in 1836 possible plans to finance the internal improvement projects, including detailed forecasts for revenues and expenditures between 1838 and 1848. Table 3 displays their baseline forecast for revenue with the following key assumptions: 1) The taxable property value would increase at an annual rate of 15%; 2) A surplus fund would be established with a $67,500 startup fund and would receive an annual return of 9%. Only the interest income from the surplus fund would be spent on the internal improvement project, while the principal would remain in the fund. Unfortunately, neither assumption materialized.

Land revenue played an increasingly important role in the state budget in the late 1830s for Indiana. The ratio of land to total tax revenue climbed from 41% in 1835 to 84% in 1838, as this period witnessed a rapid increase in the land price. The land price for Indiana rose from $5.4 per acre in 1835 to $9.87 in 1837, as shown in figure 3. Land tax revenue rose from $44,537.13 in 1835 to $163,621.7 in 1839. Such exuberance in land tax revenue was echoed in contemporary government reports.

> "*... **the wealth of a country like this is not stationary.** The progress of our system of improvement, will give impulse to business of every kind, and will cause an influx of wealth from abroad, which by being employed in manufactures and other operations, will increase the commerce of the country, and add greatly to our taxable means ... if the present rule of assessment be continued, **there will be an average annual increase of 15 per cent. in the valuation of taxable property**.* "

– Report of the State Board of Internal Improvement (1836), p. 8 (boldface added)

The revenue forecasts in table 3 relied on the over-optimistic expectation of continual increases in land value. Figure 4 compares the expected versus the actual tax revenue on land.[13] The actual land revenue fell far short of the forecasts. The expected revenue from land was over $334,000 in 1848, three times as high as the actual revenue, which was less than $112,000. Even though the taxable land in acres steadily increased at an annual rate of 8%, the land price plummeted from $9.87 per acre in 1837 to $5.37 in 1842, and remained close to $5 for the next eight years, as shown in figure 3.[14]

In addition, Indiana was unable to establish the surplus fund as planned before the state defaulted. As shown in table 3, the interest income from the surplus fund was supposed to be the primary revenue source for the project in the early years. In reality, this was never possible.

Indiana not only overestimated its future revenue, but also underestimated expenditures for the internal improvement project. According to Kettell (1849a), the initial estimate was $10 million for the entire internal improvement project. Indiana had borrowed over $12 million when it defaulted in 1841, while none of the canals or railroads of the project had been completed. After default, Indiana negotiated with its bondholders and finished the Wabash and Erie Canal, which alone cost $20 million in total.

The forecasts on the annual expenditure shown in table 3 reflect the anticipated annual interest payments owed each year less the expected toll revenue arising from the project. Implicitly, the government assumed tax revenue only would be used to roll over the debt, while the principal of the debt would be paid off in the long run when the completion of the project greatly stimulated the state economy.

2.2 Bond Prices and State Fiscal Policy

These individual state stories share some common themes. Many states began authorizing and issuing unprecedented debt after 1836 for various projects. Information on these state fiscal policies was publicly available, as the states published Auditor's and Treasurer's reports annually.[15] Although states provided distinct financing schemes for mounting debts, bond prices remained initially stable and the differences across states were quite narrow, as shown in figure 1.

Were investors paying attention to fiscal conditions as they developed before and during the crisis? Or were investors' strong reactions during the crisis in part due to a correction from past inattentiveness? The next section empirically examines the importance of fiscal attention as contemporary events unfolded.

[13] The State Board of Internal Improvement Report (1836) used taxable property, which is more than just taxable land. For this comparison, we use the taxable land value as we only have prices on land as opposed to general property.

[14] Kettell (1849a) and Wallis (2003) also record this land price drop in Indiana.

[15] Information also was printed in newspapers. For instance, Pennsylvania's Bank Improvement Act of 1836 was printed in the *National Intelligencer* (Feb. 20, 1836) and the *United States Telegraph* (Feb. 23, 1836).

States						Territories	
AL	5	AR	2	CT	5	IA	1
DC	4	DE	1	GA	3	FL	2
IL	1	IN	6	KY	1	WI	4
LA	1	MA	4	MD	1		
MO	2	MS	8	NC	3		
NH	2	NY	6	OH	8		
PA	3	RI	2	SC	5		
TN	3	VA	5	VT	3		

Table 4: U.S. Newspapers by states (January 1830 - December 1845)

3 Fiscal Information Index and Bond Price

In this section we examine the importance of fiscal attention for bond prices. In particular, we construct a "fiscal information index" by relying on three of the Gale digitized databases: the nineteenth century U.S. newspapers, the nineteenth century British newspapers, and the Times digital archive 1785-2010.

3.1 Newspapers and Fiscal Information Index

The newspaper database includes 138 newspapers for the period between January 1830 and December 1845. 91 of these were U.S. newspapers, with 84 from the contemporary states and 7 from the territories, shown in table 3.1. The remaining 47 were from the U.K., with 39 from England and 8 from Scotland Ireland, and Wales. The database covers major newspapers of the time. For instance, there were six newspapers from New York, including the widely circulated *New York Herald* and *New York Spectator*.[16]

In order to track the article coverage to fiscal information, we construct a "fiscal information index" by searching for the key words 'debt' & 'tax' & the state name (Indiana, Illinois, Maryland, Pennsylvania, New York, Ohio, or Kentucky) in the three newspaper databases and accumulate the number of articles that included all three key words.[17] The top panel of figure 5 plots the raw article counts at monthly frequency. Mott (1950) notes that the 1830s were associated with the advent of the penny paper, a daily newspaper costing a penny, and a sharp increase in newspapers, from a total of 1,200 in 1833 to about 3,000 by 1860 in the U.S. In order to account for the trend of newspapers available in general during the period, we construct an article index by dividing the fiscal article counts by the total number of articles written at the time. We then normalize the index by setting it to 100 in January 1834. The bottom panel of figure 5 plots the normalized article indices for the seven states.

The article indices rose for all states in the 1840s relative to the 1830s and were quite volatile, often rising after December when the state government published the annual Auditor's and Treasurer's report, and remaining high for the next couple of months. Such cyclicality seemed less

[16]The *New York Herald* included a section called "Money Article" by 1835, which Mott (1950) credits as precursor to modern financial page.

[17]We exclude the advertisement section of newspapers.

	μ(low)	μ(high)	σ(low)	σ(high)	p_{ll}	p_{hh}	SBIC
(1)	59.21***	179.93***	34.52		0.94	0.78	10.56
	(3.41)	(7.96)	(2.19)		(0.02)	(0.08)	
(2)	54.30***	152.49***	28.37	56.65	0.96	0.90	10.44
	(3.17)	(10.27)	(2.28)	(6.42)	(0.02)	(0.05)	

Table 5: Markov-switching fiscal index model: case (1) specifies constant volatility, while case (2) allows regime-switching volatility. Standard errors denoted in parenthesis.

pronounced in the 1830s than the 1840s, which might reflect that investors paid less attention to relevant fiscal reports before the crisis. To formalize the idea, we estimate a Markov-switching model to statistically test for breaks in the composite fiscal index that covers all seven states.[18] Following Hamilton (1989), the model takes the form:

$$I_t = \mu(s_t) + \sigma(s_t)\epsilon_t \tag{1}$$

where I_t denotes the composite fiscal index, $\mu(s_t)$ denotes the average level of the index, which varies according to the regime s_t. In addition, we also allow the volatility of fiscal index, captured by $\sigma(s_t)$, to vary according to regime s_t. ϵ_t is independently and identically distributed from a mean zero normal distribution. We assume two latent states. Table 3.1 displays the estimation results. Case (1) specifies constant volatility, while case (2) allows regime-switching volatility. Both cases show distinct values for the average index levels in two regimes: the estimates of the mean counts, μ(low) and μ(high), are statistically significant at the 1% level, and μ(low) is statistically distinct from μ(high) at the 1% level. The low regime is more persistent than the high regime. The last row displays the Schwarz-Bayesian Information Criteria (SBIC), which measures the fit of a model specification. A lower SBIC value implies a more favorable model specification. The specification with regime-switching volatility is preferred, as evidenced by comparing the SBIC values.

Figure 6 plots the filtered probability of being in the low article regime for the composite fiscal index. It stays high throughout the 1830s, with only one sharp drop in early 1835 when there was a lot of discussion in the news about the distribution of the federal government's surplus to state governments. The path of the filtered probability, however, is quite different in the 1840s. High and low article regimes alternate, with high regimes almost always starting at the beginning of a year, right after the state governments published their annual Auditor's and Treasurer's reports. This suggests that not only were more fiscal articles published in the 1840s, but also more relevant articles were written and therefore investors were probably better informed.

3.2 Bond Price and Fiscal Information Index To test how bond prices depend on the fiscal information indices, we estimate the following equation over the period January 1834 to

[18] In order to construct the composite fiscal index, we total the number of fiscal articles for all seven states, divide it by the total number of articles available over the same period, and normalize the index by setting it to 100 in January 1834. The results are robust to performing the regime-switching tests for individual states.

December 1845:

$$\begin{aligned} \ln p_{it}^b &= \beta_0 + \beta_1 I_t + \beta_1^r I_t dR_t + \beta_2 \ln p_{it-1}^b + \beta_2^r \ln p_{it-1}^b dR_t \\ &\quad + \beta_3 z_{it} + \beta_3^r z_{it} dR_t + \epsilon_{it} \end{aligned} \tag{2}$$

The dependent variable p_{it}^b is the monthly average bond price for four states (Maryland, Pennsylvania, New York, and Ohio).[19] I_t is the composite fiscal index,[20] and dR_t is a dummy variable for the crisis period that is equal to zero before January 1839 and one thereafter. We allow the fiscal index to interact with the crisis dummy, which measures how the impact of the fiscal index on bond prices shifted during the crisis. z_{it} denotes control variables, including state specific dummies as well as the all-commodity index of wholesale prices for the New York market from Cole (1938), $\ln p_t^{com}$, and the S&P 500 composite price index from the Global Financial Database, p_t^{sp}.[21] We use lagged values of the commodity and S&P price indices to avoid simultaneity and endogeneity issues. We allow a response to the lagged bond price, and also consider specifications where lagged bond prices, commodity prices, and S&P price indices interacting with the dummy variable for the crisis period.

The regression results are summarized in Table 3.2. The estimates for the composite fiscal index and the interacted term between the fiscal index and crisis dummy are robust. In particular, the coefficient on the fiscal index is insignificant in most cases, while the one on the interacted fiscal index with the crisis dummy is always negative and significant at 1% level. Specification (1) is the only case where the fiscal index coefficient is significant; in this case, the coefficient is positive and much smaller in magnitude than the coefficient on the fiscal index interacted with the crisis dummy. These results suggest the fiscal news reports had no significant impact on bond prices until after January 1839. In the baseline case (1), an increase in the rolling-window fiscal index by 100% reduces bond price by 30%. The estimate for the lagged bond price is always significant and positive, and that for the commodity price is negative and significant. The estimate for the S&P price index is insignificant, which may reflect that the crisis of 1837 had a significant impact on the S&P index yet little effect on state bond prices. Table 3.2 shows the robustness of the results to the inclusion of contemporaneous commodity and S&P price indices.

Changes in fiscal policy occur at a lower frequency than bond price movements. For instance, Auditor and Treasurer reports on state financing tend to made annually, while bonds were traded daily. Thus, it may be useful also to look at rolling-window indices that measure the accumulated fiscal articles for the past 12 months and encapsulate the past year of fiscal information. Figure 7 plots the rolling-window fiscal index (the blue line with the left axis) against the bond price (the red line with the right axis) for each state from January 1834 to December 1845. A couple of

[19] In the baseline case, we exclude Indiana, Illinois and Kentucky because their bond price data are not available until 1836 or 1838. For a robustness check, we use individual bond prices (instead of the average bond price for each state) in a panel of all seven states. In this case, we include dummy variables for each security, allowing to control for security specific effects.

[20] We rescale the index for estimation so that the index takes a value of one in the benchmark month.

[21] Given our limited panel of four states, we do not include dummy variables for time.

Coefficient	Specification				
	(1)	(2)	(3)	(4)	(5)
RW fiscal index, β_1	0.14***	0.00014	0.00023	-0.0015	-0.0016
	(0.027)	(0.0010)	(0.0012)	(0.0020)	(0.0019)
RW fiscal index X crisis dummy, β_1^r	-0.30***	-0.012***	-0.012***	-0.010***	-0.0098***
	(0.069)	(0.0032)	(0.0028)	(0.0032)	(0.0032)
Lagged bond price		0.99***	0.99***	0.95***	0.95***
		(0.005)	(0.008)	(0.011)	(0.015)
Lagged bond price X crisis dummy				0.051***	0.051***
				(0.014)	(0.011)
Lagged Commodity price		-0.048***	-0.049***	-0.023***	-0.023***
		(0.0079)	(0.0092)	(0.0045)	(0.0058)
Lagged Commodity price X crisis dummy				-0.052***	-0.052***
				(0.014)	(0.012)
Lagged S&P 500 Index			-0.0016		0.0027
			(0.011)		(0.0074)
Lagged S&P 500 Index X crisis dummy					0.0030
					(0.0057)
RW fiscal index in crisis: $\beta_1 + \beta_1^r$	-0.16***	-0.012***	-0.012***	-0.012***	-0.011***
N	576	572	572	572	572
Adjusted R^2	0.54	0.99	0.99	0.99	0.99
State-fixed effect	Yes	Yes	Yes	Yes	Yes

Table 6: Regression Results: dependent variable is the bond price p_{it}^b; explanatory variables include the composite fiscal index I_t, the lagged bond price p_{it-1}^b, the commodity price p_{t-1}^{com}, the S&P price index p_{t-1}^{sp}, and their interacting terms with the crisis dummy. Bond and commodity prices are converted to the natural logarithm. Standard errors denoted in parenthesis and obtained via a bootstrap procedure. *** p < 0.01, ** p < 0.05., * p < 0.01

Coefficient	Specification			
	(2)	(3)	(4)	(5)
RW fiscal index, β_1	0.00017	-0.00054	-0.0017	-0.0016
	(0.00094)	(0.0013)	(0.0020)	(0.0020)
RW fiscal index X crisis dummy, β_1^r	-0.012***	-0.0099***	-0.0099***	-0.0086***
	(0.0033)	(0.0026)	(0.0032)	(0.0030)
Lagged bond price	0.99***	0.98***	0.95***	0.94***
	(0.005)	(0.011)	(0.011)	(0.013)
Lagged bond price X crisis dummy			0.051***	0.047***
			(0.013)	(0.012)
Commodity price	-0.047**	-0.044***	-0.023***	-0.020***
	(0.0073)	(0.0084)	(0.0041)	(0.0061)
Commodity price X crisis dummy			-0.051***	-0.051***
			(0.013)	(0.011)
S&P 500 Index		0.012		0.0062
		(0.011)		(0.0058)
S&P 500 Index X crisis dummy				0.013
				(0.0093)
RW fiscal index in crisis: $\beta_1 + \beta_1^r$	-0.012***	-0.010***	-0.012***	-0.010***
N	572	572	572	572
Adjusted R^2	0.99	0.99	0.99	0.99
State-fixed effect	Yes	Yes	Yes	Yes

Table 7: Additional Regression Results: dependent variable is the bond price p_{it}^b; explanatory variables include the composite fiscal index I_t, the lagged bond price p_{it-1}^b, the commodity price p_t^{com}, the S&P price index p_t^{sp}, and their interacting terms with the crisis dummy. Bond and commodity prices are converted to the natural logarithm. Standard errors denoted in parenthesis and obtained via a bootstrap procedure. *** p < 0.01, ** p < 0.05., * p < 0.01

	Indiana	Illinois	Maryland	Pennsylvania	New York	Ohio	Kentucky
Fiscal Index Peak	1842/6	1842/6	1842/6	1842/2 and /6	1842/6	1842/6	1842/6
Bond Price Trough	1842/6	1842/11	1843/2	1842/8	1842/3	1842/4	1842/4

Table 8: Dates for the fiscal indices at peak and those for the bond prices at trough for each state

observations emerge. There are negative co-movements between the bond price and the fiscal index for all seven states. In the 1830s, the bond price was high and the fiscal index was low; as the crisis hit, the bond price plummeted while the fiscal index surged.

In addition, the timing of the co-movements differs for the defaulting and non-defaulting states. Table 8 compares the dates when the bond prices were at their trough to those when the rolling-window fiscal indices were at their peak. The fiscal indices peaked in June 1842 for all states.[22] Bond prices bottomed out at distinct times for each state. Interestingly, the troughs of bond prices occurred after the peaks of the fiscal indices for the defaulting states, yet ahead of the peaks for non-defaulting states. Given the limited fiscal information available, investors initially punished all states after the crisis erupted. As the demand for fiscal information surged, more news articles were written on the fiscal situation in U.S. states, and investors started to differentiate states that were likely to honor their debt from others. Thus the fiscal index preceded the drop in bond prices for the defaulting states, as investors were absorbing information and responding accordingly in the bond market. For the states with either more solid fiscal backing (New York and Ohio) or much less debt (Kentucky), investors were able to differentiate their fiscal situation and support their bond prices before the peak of fiscal indices, as confirmed in figure 7.

3.3 Discussion One potential explanation for our results is an expectation of bailout: investors who bought the state bonds might have expected the federal government to step in and bailout those states in case they ran into solvency problems. In this case, scant attention to state fiscal policies would be necessary as debts were implicitly guaranteed.

This conjecture is not entirely unfounded, as on August 4, 1790 the federal government did nationalize states' debt for the American Revolutionary War.[23] McGrane (1935) documents the heated debate over a federal government bailout in the early 1840s. Foreign investors started to discuss the possibility of a national pledge in late 1839, and debate in the U.S. about federal assumption of the state debts quickly followed. Although President Tyler in his message of 1841 declared that the states alone were responsible for their debts, European investors in 1842 refused to lend to the federal government unless it assumed the state debts. On December 29, 1842, a select committee of the House was appointed to report on the advisability of federal assumption, but ultimately the matter failed in the Congress.

Despite the bailout debate *after* the onset of the crisis, there was limited, if any, evidence that

[22] The fiscal index peaked in both February and June 1842 for Pennsylvania.

[23] English (1996) documents the broad changes in the legal prospects for creditors suing the U.S. state governments. In 1793, the first Supreme Court found against the state of Georgia, when a citizen of South Carolina sued Georgia for nonpayment of debt in the case of *Chisholm v. Georgia* (1793). As a response, Congress passed the Eleventh Amendment to the Constitution, making it very difficult for creditors to force states to repay debts in the future.

investors expected a bailout *ex-ante* when purchasing bonds. According to McGrane (1935), the U.S. state bonds were subject to fewer fluctuations in prices and appealed to British investors who held the bonds as "a safe and more or less permanent investment and not for speculative purpose." McGrane also documents correspondence between Barings Bank—a key player in facilitating state bond issuance in England—and Hope Bank, Barings' counterpart in Holland (see McGrane (1935), p. 33).

> "*... the buyers of American state stocks never contemplated until lately that the general government was in any way accountable or that it would or could interfere with them.*"
>
> – *Barings to Hope, June 10, 1842*

> "*(the twenty-six states were) all sovereign and independent, and although circumstances might in time enable the general government to aid the states, that government has no power or right to interfere.*"
>
> – *Barings to Hope, May 27, 1842*

Although some investors may have viewed a bailout as practicable, there is no evidence that such view was universal before (or during) the crisis. In the next section, we offer an alternative explanation as to why the fiscal news index was more informative about bond prices during the crisis based on the theory of costly information processing.

4 Theoretical Model

There is a growing literature on costly information processing. Sims (2003, 2006, 2010) proposes a rational inattention framework, in which agents make optimal decisions but have limited ability to translate external data into actions. Peng and Xiong (2006) use the rational inattention model to study the learning process of investors who face unobservable fundamental factors in their portfolio. More recently, Maggio and Pagano (2015) model explicit information costs and study how disclosure of financial information affects trading. Dellavigna and Pollet (2009) provide empirical support by showing that earning announcements on Fridays have a 15% lower immediate response and a 70% higher delayed response than weekday announcements, suggesting investors are distracted on Fridays as the weekend approaches. Christelis, Jappelli, and Padula (2010) use a survey of health, aging and retirement in Europe and find that the propensity to invest in stocks is driven by information constraints and cognitive abilities, instead of preferences or psychological traits.

In a similar spirit, we develop a simple two-period model to illustrate how attentiveness to fiscal conditions can influence bond prices. We assume that the 'real' fiscal stance of the state government is a latent variable that investors cannot observe. Instead, investors can extract related fiscal information at a cost. The more information they extract, the more likely they can identify the 'real' fiscal stance of a state and avoid poor investment decisions. As information is costly, the optimal amount of resources devoted to fiscal information processing depends on the current

economic environment. As we show below, in good times it is optimal to spend less resources on processing fiscal information. As bad times materialize, however, investors are motivated to process more information and differentiate 'good' state bonds from 'bad' ones.

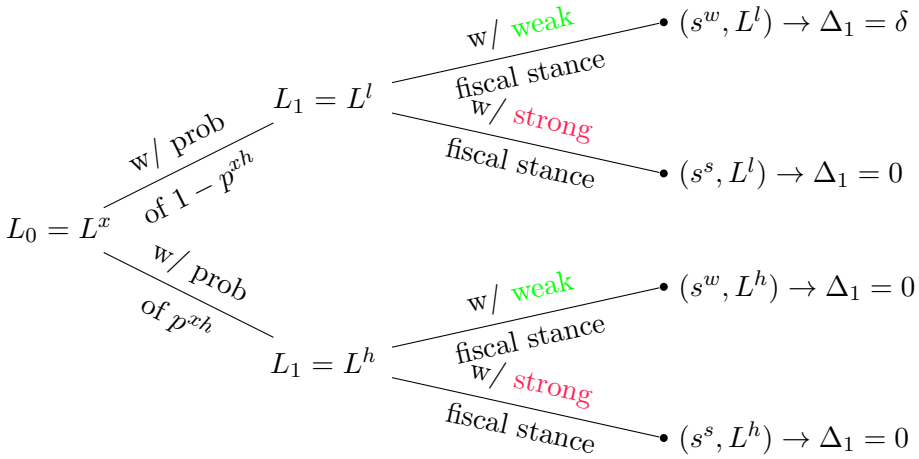
4.1 Two-period Model At period $t = 0$, investors (foreigners) receive an endowment of y_0, and decide how much to consume c_0 and to save b_0 in that period; at next period, they consume the return from their savings c_1. They can save in a range of state bonds b indexed by j. Bonds differ in default probability, reflecting distinct underlying fiscal fundamentals. The representative investor's consumption-savings problem is given by

$$\max \quad E_0 \{u(c_0) + \beta u(c_1)\} \tag{3}$$

$$s.t. \quad y_0 = c_0 + i_0 + \int q_0(j) b_0(j) dj \tag{4}$$

$$c_1 = \int (1 - \Delta_1(j))\, b_0(j) dj \tag{5}$$

At $t = 0$, investors can spend part of their resources to collect and analyze information, i_0, about government bonds. The more information they process, the more likely they can differentiate which state would default next period. The state's capacity to honor its debt jointly depends on its fiscal stance s^i, which is time-invariant and can be either strong s^s or weak s^w, and the land value L_t, which is time-varying and can be either high L^h or low L^l. In particular, the following chart shows the interactions: the state defaults with a haircut of δ only when the land value is low and the fiscal stance is weak; otherwise it always honors its debt obligation.



In order to capture the events in the 1840s, we assume that investors can observe the land value at each period L_t and knows the transition probability from one state to another p^{xh}; but they cannot observe the fiscal stance s^i. Instead investors have to spend some resources i_0 to analyze information and infer the state. The more information they process, the more likely they know about the state's capacity to pay off its debt and therefore invest accordingly. For simplicity, we assume that the probability of identifying a non-defaulting state bond is $\frac{i_0}{y_0}$. Therefore, the

expected consumption for period $t = 1$ is,

$$E_0 c_1 = b_0 \left\{ p^{xh} + (1 - p^{xh}) \left(\frac{i_0}{y_0} + (1 - \delta) \left(1 - \frac{i_0}{y_0} \right) \right) \right\} \tag{6}$$

Given the current land value L^x, the land value will be high next period with a probability of p^{xh}, in which case no states will default regardless of their fiscal stance. With a probability of $1 - p^{xh}$, the land value will drop next period; and if investors spend i_0 units of resources in processing information, they will have a probability of $\frac{i_0}{y_0}$ for receiving the bond payment in full next period and a probability of $1 - \frac{i_0}{y_0}$ for getting a haircut of δ.

The investor's optimization problem can be written as

$$\max_{i_0, b_0} u(y_0 - i_0 - q_0 b_0) + \beta u \left(b_0 \left\{ p^{xh} + (1 - p^{xh}) \left(\frac{i_0}{y_0} + (1 - \delta) \left(1 - \frac{i_0}{y_0} \right) \right) \right\} \right) \tag{7}$$

and the first-order conditions are,

$$\frac{1}{y_0 - i_0 - q_0 b_0} = \beta \frac{1}{b_0 \left(1 - \delta(1 - p^{xh}) + \delta \frac{i_0}{y_0} (1 - p^{xh}) \right)} \frac{\delta b_0}{y_0} (1 - p^{xh}) \tag{8}$$

$$\frac{q_0}{y_0 - i_0 - q_0 b_0} = \beta \frac{1}{b_0 \left(1 - \delta(1 - p^{xh}) + \delta \frac{i_0}{y_0} (1 - p^{xh}) \right)} \left(1 - \delta(1 - p^{xh}) + \delta \frac{i_0}{y_0} (1 - p^{xh}) \right) \tag{9}$$

Given $i_0 \geq 0$, we can derive

$$\frac{i_0}{y_0} = \max \left\{ 0, 1 - \frac{1}{\delta} \frac{\beta + 1}{2\beta + 1} \frac{1}{1 - p^{xh}} \right\} \tag{10}$$

The higher the haircut δ, the more resources investors will spend on information. If we further assume the land value is very persistent, then $p^{hh} >> 1 - p^{hh}$, and $p^{lh} << 1 - p^{lh}$. In this case, investors will spend less resources on information if the current land value is high, which is consistent with what we observe in the 1830s and 1840s.

5 Conclusion

To be included

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A Data Appendix

To be included

B Causes of the Crises of 1837 and 1839

There is still an on-going debate as to the causes of the panic of 1837 and 1839. We briefly note some of the various views. The crisis of 1837 started in May when banks suspended convertibility into specie. The crisis of 1839 is usually dated from the suspension of specie payments by the Bank of the United States of Pennsylvania on October 10, 1839, followed by suspensions in the south and west shortly thereafter (Wallis (2001), page 19).

Temin (1969) argues that international factors were at the heart of the crisis. "Two increases in the Bank of England's discount rate in the summer of 1836 and their instructions for the Liverpool branch to reject bills of exchange drawn on houses associated with American commerce in late August were the start of a deliberate and sustained effort to 'recover' specie that had been presumed lost to the U.S." (see page 7, Rousseau (2002)). Wallis (2001) provided more details in summarizing Temin's point. Raw cotton was the largest export of the U.S., and was often exported to Britain through middlemen. Cotton owners would consign their product to an intermediary and in return be able to draw on credits that is a share of the estimated cotton value. The owner could realize cash for those credits by drawing a bill of exchange payable at sight plus sixty days in sterling in London, or a bill on New York or Boston. If cotton prices fell, the sale price may not cover the cost of shipping and the payment advance, and therefore the 60-day bill deviations between London and Boston/New York would rise. The American economy was booming in 1836, the credit markets were tight, and discount rates on domestic commercial paper in New York and Boston were high. The Bank of England started to feel the pressure on its reserves in late 1836, raising its bank rate from 4 to 5 percent and becoming more selective in the American bills it would accept. As a result, cotton prices fell and disrupted the banking system.

Timberlake (1978) argued the distribution of the federal surplus revenues to the individual states in the Spring of 1837 drained the specie in the eastern states, particularly in New York, and caused the panic. The distribution transferred $5 million to states according to their relative populations in four equal quarterly installments starting on January 1, 1837 (see page 7, Rousseau (2002)). Rousseau (2002) instead believed that 'supplemental' transfers of public balances (ordered by the U.S. Treasury under the Deposit Act of June 23, 1836) and the Specie Circular of July 11, 1836 were the key causes. Other than the 'official' distribution of federal surplus to the states, the Deposit Act of June 23, 1836 also required to establish one bank as a government depository in each state. The amendment of the Deposit Act on July 4 required $38 million in 'supplemental' interbank transfers over the next 6 months to achieve an equitable balance among the states. In addition, the Specie Circular required all federal lands be purchased with specie after August 15, 1836, as the federal government intended to erect a barrier for land speculators. As Wallis (2001) surveyed (page 5): "Democrats and some historians argued that the expansion of the banking system in the

early 1830s produced an increase in the money supply, a rapid inflation and the conditions for a financial crash in 1837. Whigs and other historians maintained that Jackson's failure to recharter the Bank of the United States, his arbitrary removal of federal deposits from the BUS to the state banks, the Specie Circular of 1836, and the mismanagement of the federal surplus distribution in 1837 disrupted the financial system." Wallis (2001) found both Temin's and Rousseau's evidence to be compelling.

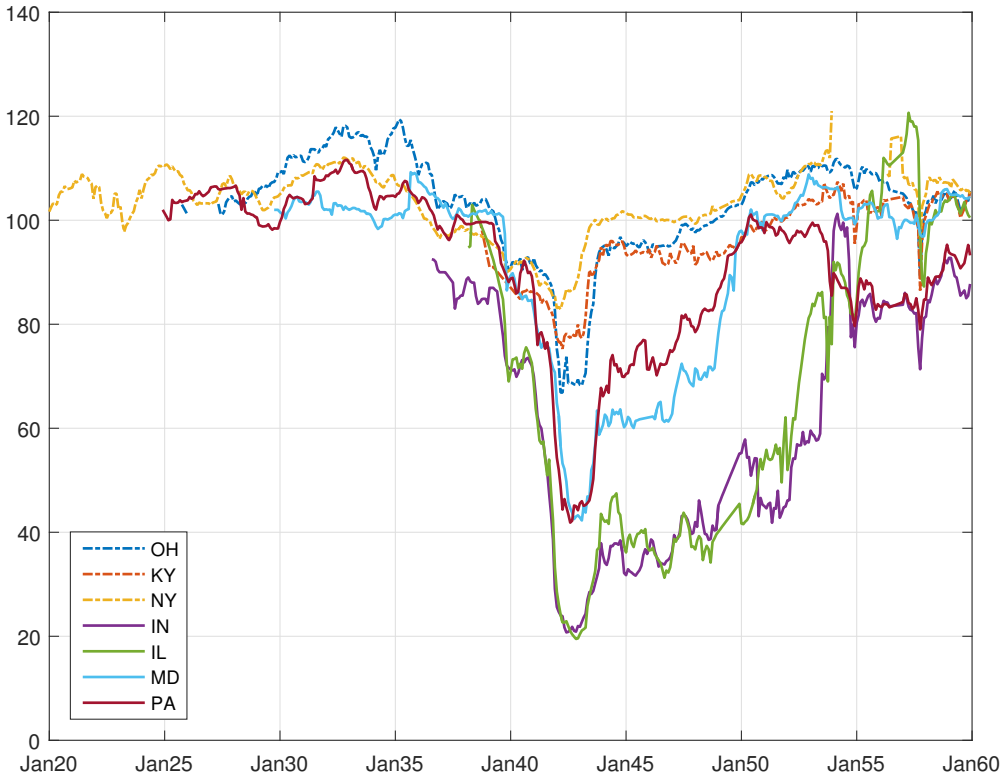

Figure 1: State government bond prices at monthly frequency (1820/01-1859/12): from the dataset "the price quotations in early U.S. securities markets, 1790-1860" compiled by Sylla, Wilson and Wright. Ohio, Kentucky, New York didn't default. Maryland defaulted in January 1842, Pennsylvania in August 1842, Indiana in January 1841, and Illinois in January 1842.

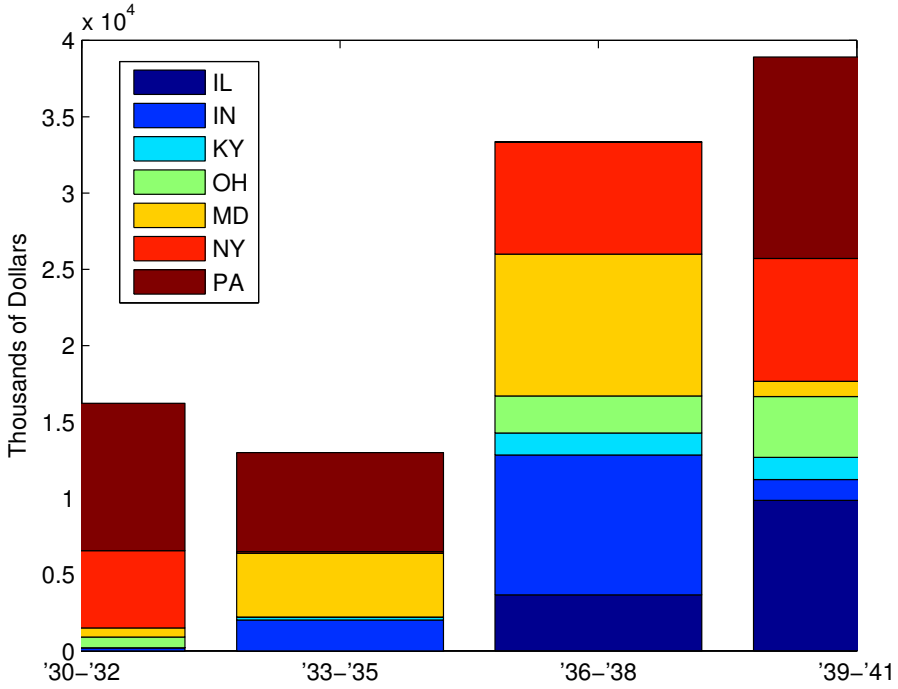

Figure 2: Debt outstanding on September 1, 1841 by year of authorization at each state (in thousands of dollars): from U.S. Congress (1843).

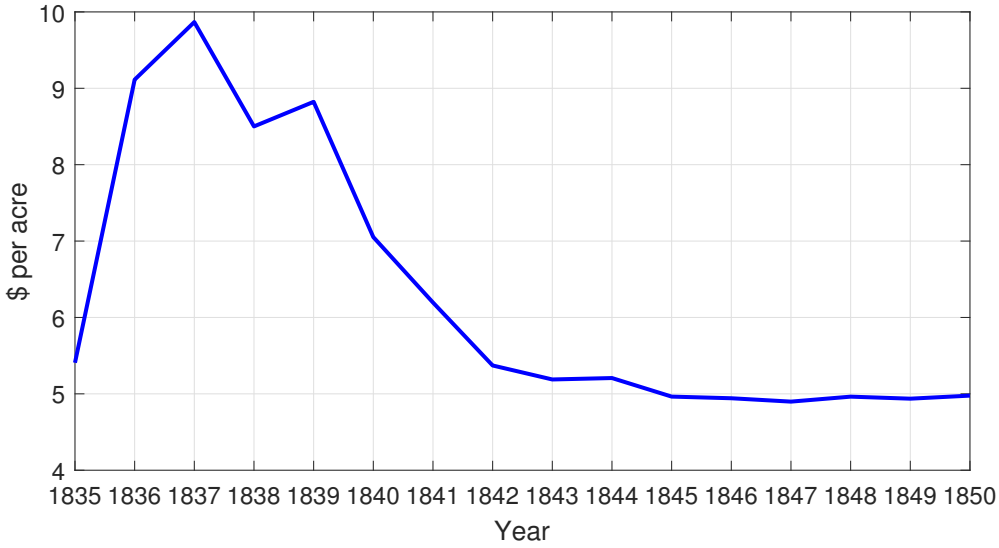

Figure 3: Annual land price for Indiana (1835-50): computed using the land value and the total land acres reported in the Auditor's Reports.

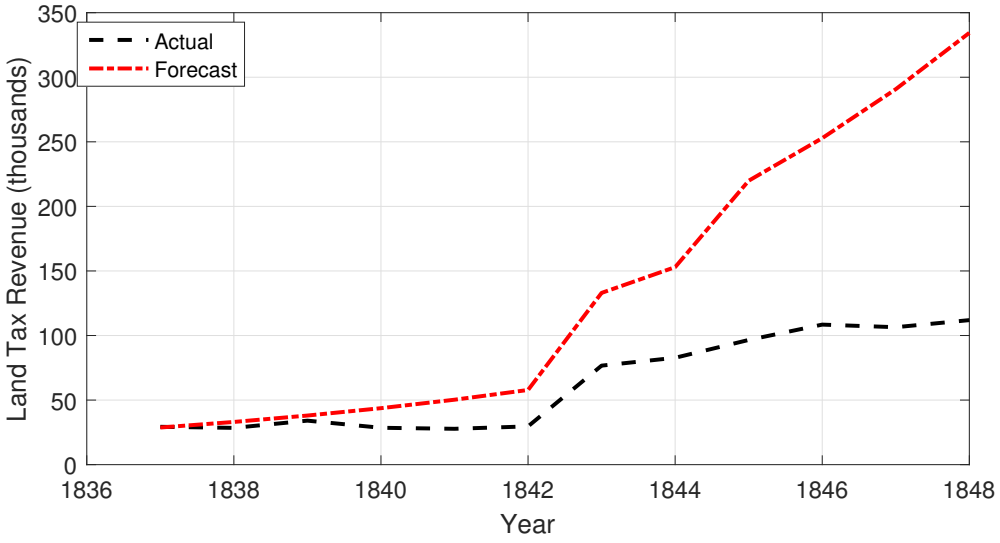

Figure 4: Land tax revenue for Indiana (1837-48): "actual" revenue is computed using the actual land acres & prices and the forecast on tax rates; "forecast" revenue is computed using the forecasts on land value and tax rate.

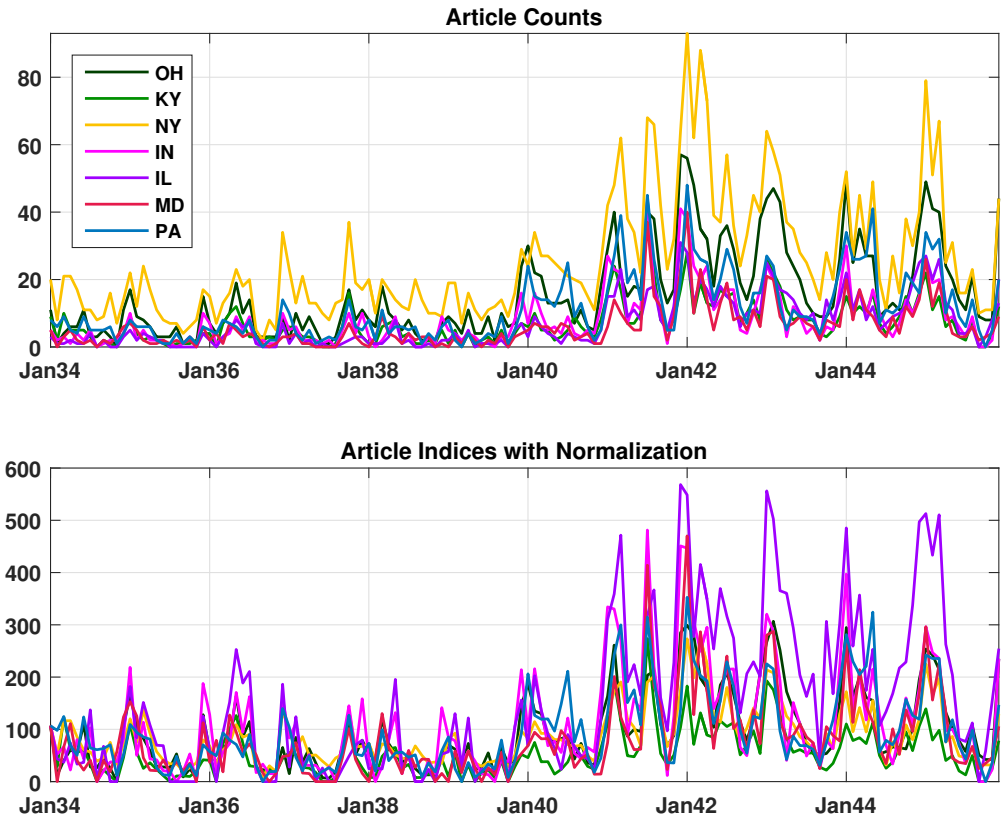

Figure 5: Fiscal article counts and indices at monthly frequency (1834/01 - 1845/12): the top panel shows the number of articles published at each month that included the key search words; the bottom panel plots the normalized fiscal indices by dividing the fiscal article counts by the number of all articles available at the same time, and then normalizing and setting it to 100 in January 1834.

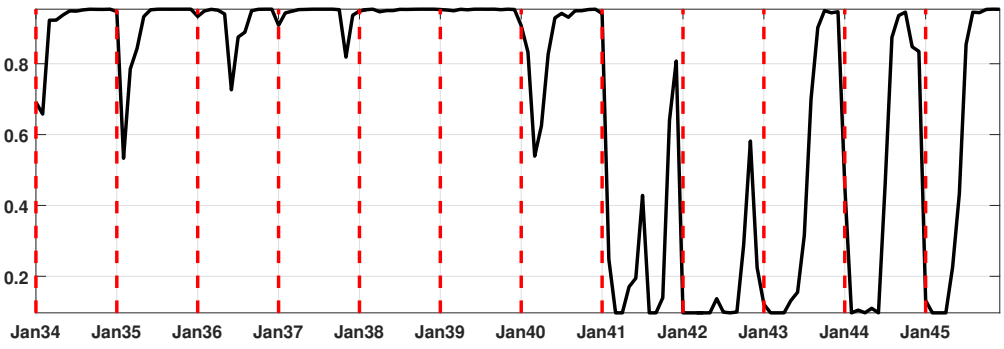

Figure 6: Probability of low article count regime for the composite fiscal index.

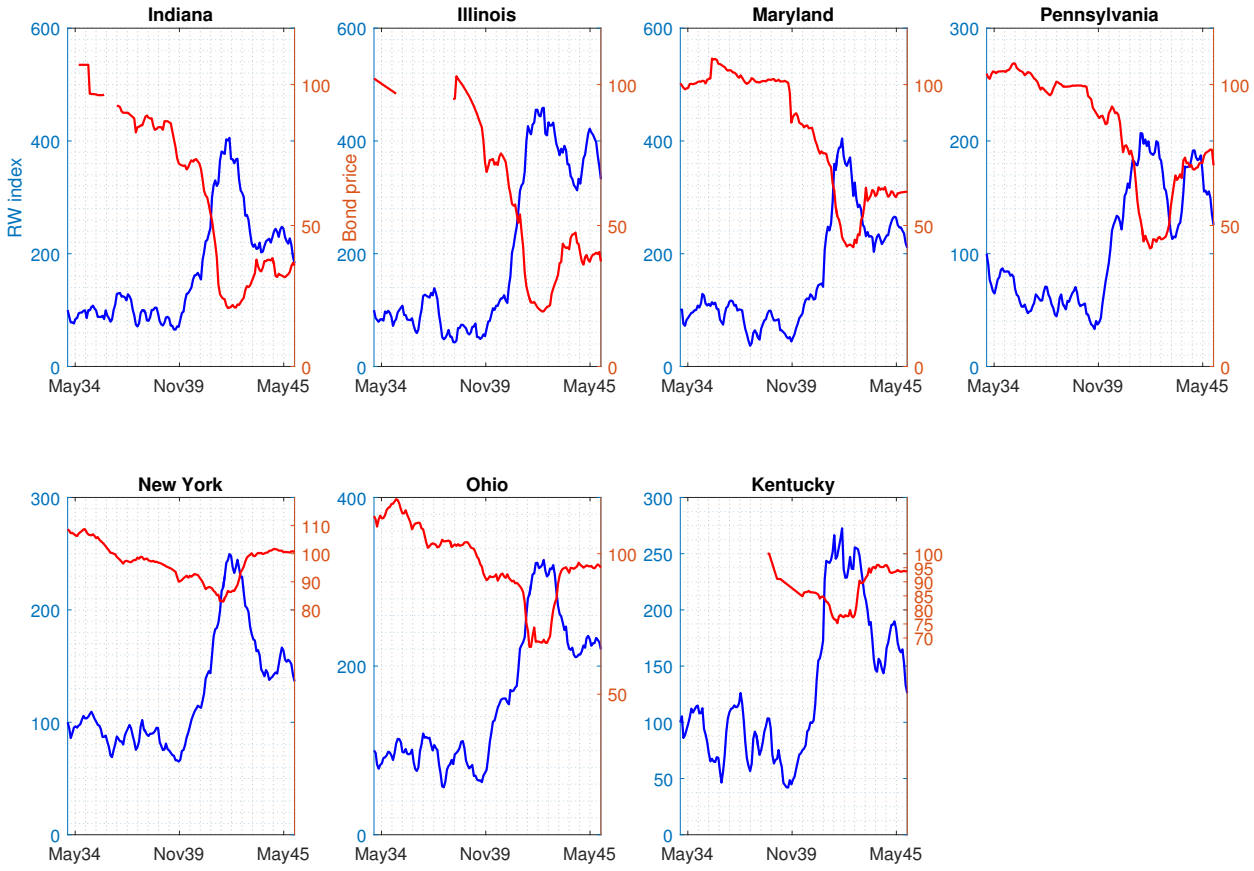

Figure 7: State-specific fiscal information indices and bond prices at monthly frequency (1835/12 - 1845/12): red lines (with right axis) are bond prices; blue lines (with left axis) are fiscal information indices.