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# Sovereign Risk and Fiscal Information: A Look at the U.S. State Default of the 1840s*

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## Abstract

This paper examines how newspaper reporting affects government bond prices during the U.S. state default of the 1840s. Using unsupervised machine learning algorithms, the paper constructs novel "fiscal information indices" for state governments based on U.S. newspapers at the time. The impact of the indices on government bond prices varies over time. Before the crisis, the entry of new states into the bond market spurred competition: more state-specific fiscal news imposed downward pressure on bond prices for established states. During the crisis, more state-specific fiscal information lowered bond prices for states with less responsible fiscal policy.

*Keywords*: sovereign default; information; fiscal policy
*JEL Codes*: E62, H30, N41

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# 1 Introduction

In good times, the interest rate spreads on long-term sovereign bonds are often low. Spreads can remain low despite persistent fiscal deficits and rising government debt levels, but once a stress point arrives, spreads can rise quickly and markedly. The recent debt crisis in Europe illustrates this point and stimulated debate over the degree to which sovereign bond prices reflected economic fundamentals. The U.S. state debt crisis in the 1840s offers another historical example of this pattern for sovereign interest rate spreads.[1] In this paper, we revisit the 1840s episode to study how information about fiscal policy affects sovereign bond pricing.

Our focus on the U.S. experience in the 1840s offers a unique opportunity to understand sovereign defaults. Between 1841 and 1843, eight out of the twenty-six states at the time, as well as one territory, defaulted, while several other states appeared on the brink of default. In the years preceding the crisis, many states began amassing unprecedented amounts of debt and legislated several changes to taxes and expenditures. Some states provided direct taxation to support debt financing, while others relied more heavily on the anticipation of future economic growth. Although economic theory suggests that bond prices should reflect distinct economic and fiscal conditions, U.S. state bond prices were markedly similar prior to the crisis, as shown in Figure 1. Between late 1839 and 1841, however, state bonds experienced market premiums to different degrees.

In this paper, we analyze newspaper coverage of state-specific fiscal policy in the 1830s and 1840s to uncover how fiscal information affected investors' behavior before and during the crisis. To do so, we construct a novel measure of fiscal information based on textual analysis with contemporary U.S. newspapers. We categorize news articles discussing each state over this period into topics using unsupervised machine learning algorithms and find one of the identified topics relates to state legislative activities and fiscal actions. We adopt the frequency with which this identified topic appears in articles as our measure of fiscal information. To our knowledge, our paper is the first to study economic conditions by incorporating textual topic analysis on newspapers in the nineteenth century.[2] While modern studies confront a plethora of information sources, an

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

[2] Koudijs (2015) uses arrival dates of transatlantic boats to examine the role of private information on financial

advantage of exploiting historical newspapers is that as the dominant source of public information, they were widely read at the time [see Mott (1950)].

We find that our measures of state fiscal information exhibit patterns that follow state government legislative activities: the measures often peak at the end or in the beginning of a year, corresponding to the publication of annual state Auditor and Treasurer reports. These patterns suggest that newspapers reported on state legislative developments in the 1830s and 1840s. More importantly, our measures of fiscal information affect state bond prices, but the effect differs across states and over time. Before the crisis, the entry in the late 1830s of "new" western states—namely Indiana and Illinois—into the state government bond market induced a competition effect: more state-specific fiscal news imposed downward pressure on bond prices for states that had started accruing debts earlier, including states that had responsible policies for financing their debts, e.g., New York and Ohio. During the crisis, however, fiscal news helped investors differentiate states with sound fiscal policy from those without, as more state-specific fiscal information lowered bond prices for states that were ill-prepared for fiscal downturns. We show our results are robust to alternative means of constructing our measures of fiscal information, either by considering alternative machine learning algorithms or by constructing simple counts of news articles that include keywords related to state fiscal policy.

A key contribution of our paper is to demonstrate how newspaper textual analysis can result in meaningful time-series proxies of economic and policy conditions even before the twentieth century. We are aware of no applications in economics and finance in the nineteenth century, despite a growing literature that examines how news affects economic and financial variables in the twentieth century [see Tetlock *et al.* (2008), Garcia (2013), Hanna *et al.* (2017), Manela and Moreira (2017), Calomiris and Mamaysky (2018), Fedyk (2018) among others].[3] Words in newspaper articles are rarely independent; instead they are linked together by underlying topics. We use unsupervised machine learning methods to discover the hidden structure in unlabeled text data and to group data into topics without providing prior knowledge on how each topic links to a particular set of words. Our approach highlights a new data source for future historical studies based on textual

prices in the 18th century.

[3]Garcia (2013) studies the effect of sentiment on asset prices using the *New York Times* between 1905 and 2005. Hanna *et al.* (2017) analyze the *Financial Times* between 1899 and 2010. And Manela and Moreira (2017) construct uncertainty measures using front-page articles of the *Wall Street Journal* starting in 1890.

analysis, where macroeconomic and financial indicators at business-cycle and higher frequencies (for instance, monthly) are particularly lacking.

Our paper also is related to the literature studying the sources and effects of the state defaults in this era.[4] Temin (1969) argues that 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 *et al.* (2004) argue that unforeseen declines in land prices after 1839 were the ultimate cause for default. Dewey (1968) suggests 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 by analyzing the degree and importance of fiscal information for pricing state bonds at the time.

In addition, this paper complements the theoretical literature on information processing and sovereign default, highlighting the empirical relevance of information flows. Cole *et al.* (2016) show that a model with endogenous information acquisition about economic fundamentals can generate contagion in sovereign bond spreads. Gu and Strangebye (2017) study costly information acquisition for a single government bond and show that the sovereign bond spread exhibits significant time-variation in its volatility. Angeletos and Werning (2006) and Carlson and Hale (2006) examine how information flows affect multiplicity of equilibria, while Bassetto and Galli (2017) study how information affects inflation and default within a country.

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 details the construction of our fiscal information measures. Section 4 presents our main empirical analysis, while the robustness of the results is discussed in section 5. Section 6 concludes.

## 2 Historical Background

As the principal level of government at the time, U.S. states amassed a large amount of debt between the 1830s and 1840s, which was funneled into transportation and financial infrastructure projects. According to Wallis (2000), state governments had accumulated $193 million in debt by

[4]Temin (1969), Wallis (2001), Rousseau (2002), and Knodell (2006) provide thorough discussions of events surrounding the U.S. state defaults in the 1840s.

1841, which accounted for 86% of total local, state, and federal debt at the time.[5] These debts were issued for different purposes, as documented in Wallis *et al.* (2004). While southern states issued bonds to finance state banking institutions, northern and western states accumulated large debts on internal improvement projects, such as building canals and railways.

Given the limited data on secondary market bond prices for southern states, we focus exclusively on seven northern and western states – Illinois, Indiana, Kentucky, Maryland, New York, Ohio, and Pennsylvania – which issued debt mostly for infrastructure projects.[6] Following Wallis *et al.* (2004), Figure 2 shows the outstanding debt in 1841 by years of authorization for these seven states. As shown in the figure, the period of 1836-38 witnessed a substantial increase in debt authorization from $15 million to about $35 million. Debt accumulated rapidly, as almost two-thirds of the total debt in 1841 was authorized after 1836.

In addition, the seven states also shared other similarities in debt issuance. All states placed restrictions on new bonds to be sold at or above par, although some states circumvented this requirement in the crisis.[7] Bonds were long-term, usually with maturities past 20-years, and almost all bonds had coupon payments of 5 or 6 percent [see Ratchford (1941)]. 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 1 shows that over 50% of debt was denominated in "foreign" (out of state) units in the early 1840s.

State bonds were held by a wide range of investors. Based on the state Auditor records on buyers of original issuances, states that amassed larger debt levels relied more heavily on foreign nation creditors, predominantly in England, in the early 1840s.[8] As shown in the top panel of Table 1, 69% of Pennsylvania bonds were purchased by foreign creditors in the primary market in 1842,

[5]The federal government largely spent its revenues, which were collected primarily from tariffs, on war financing, as political divisiveness kept the federal government from playing a substantial role in the development of United States infrastructure. 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. See Rousseau (2002) for more discussion.

[6]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 for bank financing, see Wallis *et al.* (2004).

[7]For instance, McGrane (1935) discusses a debate in the Illinois legislature over bonds to the United States Bank of Pennsylvania which ultimately resulted in terms that incurred a loss to the state.

[8]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].

while 28% were held by in-state investors [see the Pennsylvania Report of the Auditor General, July 2, 1842]. Similarly, 42% of New York bonds were purchased by foreigners in the primary market in 1843. It is extremely difficult to trace out the split of bond holders in the secondary markets during this period. To shed some light, the bottom panel of Table 1 displays the percentage of debt held by U.S. investors and by foreign investors in the 1850s, both from primary and second markets. Although government bonds were a common asset used for securing U.S. bank notes in the free banking era (1837-1863) [see, for example, Rolnick and Weber (1984) and Chabot and Moul (2014)], state banks do not appear to be the central source of credit for state governments at the time. In 1841, total bank assets held under the category "state and local government bonds" by all banks was less than 7% of total outstanding state debt.[9]

With the enormous amount of state debt accumulated in the second half of the 1830s, the economic crisis in 1839 set the stage for the state defaults in the 1840s. Figure 1 plots the average secondary market bond prices for the seven states (with par value of $100) between January 1820 and December 1859. There was limited variation in bond prices across states prior to 1840, as prices fluctuated between $90 and $120. As credit quickly dissipated from the market in the fall of 1839, banking failures pressured state finances; at the same time, declines in land values lowered state tax bases [see Wallis *et al.* (2004)]. All state bond prices plummeted in 1840.

Despite all states bonds experienced risk premium at the onset of the crisis, 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, despite that Illinois resumed its debt payment in 1846 and Indiana in 1847.

How did these states anticipate honoring their debts prior to the crisis? In the rest of this

[9]To compute this figure, we rely on the bank database of Weber (2008), which contains individual bank balance sheets for the antebellum period collected from state banking authority reports. We summed across states all bank assets in the state and local government category, which amounts to $10,293,790 in 1841. We then compare this value to the total outstanding state debt as reported in U.S. Congress (1843), as 1841 is one of the few years in which such data is available. More broadly, over the period 1834-1845, the largest bank holdings of state and local assets was in 1839, amounting to $21,022,114, which is less than 12% of total outstanding debt in 1841.

section, we highlight some similarities and differences across states' fiscal policies, paying particular attention to their debt financing plans.

**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. In addition, a law in 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)]. The state's early financing was quite efficient: by 1839, of the 6.87 million debt authorized and issued between 1820 and 1825, 4.5 million already had been redeemed [see *Hunt's Merchants Magazine* (1839)]. In 1836, New York embarked on additional internal improvement projects to enlarge the Erie canal, extend the canal system, and invest in railroads. Between 1836 and 1841, the state borrowed more than $15 million [see Wallis *et al.* (2004)]. Although the financing policy of state debt was changed in 1825 so that no specific funds were set aside for interest payments, toll revenues from the canals was able to cover interest payments 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)]. Nevertheless, New York was experiencing difficulties in financing interest payments and expenditures by the early 1840s. In March 1842, the state suspended improvement projects and re-instituted the state property tax.[10] The state avoided default in this episode.

**Ohio and Kentucky** Neither Ohio nor Kentucky defaulted in the crisis. Auxiliary funds had been set aside for interest payments on state debt in both these 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 percentum per annum" [see *Hunt's Merchants Magazine* (1839) pg. 177].

[10] The state property tax was suspended in 1826, but New York had 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.

**Pennsylvania** As McGrane (1935) documents, Pennsylvania constructed an extensive system of internal improvement projects in the 1830s despite strong public aversion to taxation. As early as 1830, funds that were placed at the disposal of the canal commissioners were insufficient to cover interest payments on state debt. Nevertheless, the state repealed its property tax when it chartered the Second Bank of United States in 1836. As a result, the failure of the Bank in 1839 left Pennsylvania without many tax resources. By 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 some public works were completed by 1834 and open to traffic, their average annual net revenue for the 5 years prior to 1840 was less than $140,000, far below annual interest payments on state debt, which were over $1.2 million [see McGrane (1935)]. The state defaulted in 1842.

**Maryland** Hanna (1906) dates 1826 as the beginning of the Internal Improvement Era in Maryland. Rather than directly operating its improvement projects, Maryland amassed debt to invest in stocks and bonds of private canal and railroad companies. In the 1830s, rivalries between parties interested in canals and railroads 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, sinking policy was neglected for the larger loans earmarked for canals and railroads. Although total sinking funds were about $1 million in 1841, the funds were insufficient to absorb the state debt, which was over $15 million with annual interest of nearly $600,000 [See McGrane (1935) and *Hunt's Merchants Magazine* (1839)]. Given that 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 reported.

**Illinois** Illinois was eager to follow the early example of 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 undertakings totaled more than $23,000,000, estimated at about $300 per family in Illinois at the time [see Kettell (1852)]. In 1839, the state experienced bank default on credit sales of state bonds, and hence increased its borrowing [see Wallis *et al.* (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** Wallis (2003) provides a comprehensive 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 order to extend improvement projects throughout the state, in 1836 Indiana passed the Mammoth Internal Improvement bill, which created a Board of Internal Improvement and authorized it to borrow up to $10 million for a "system" of canals. The state reported possible plans to finance the internal improvement projects, including property taxes and a surplus fund. Their forecasts of state revenues, however, relied on over-optimistic expectations of continually increasing land values. When land prices plummeted in 1840, the actual tax revenues fell far short of their forecasts [see Wallis *et al.* (2004)]. In addition, Indiana underestimated expenditures for internal improvements. According to Kettell (1849a), the initial estimate was $10 million for all public work projects. After default, Indiana negotiated with its bondholders and only finished the Wabash and Erie Canal, which alone cost $20 million.

## 3 Measuring Fiscal News

As highlighted in section 2, many states began authorizing and issuing unprecedented debt in the second half of the 1830s for various infrastructure projects, but the states differed in their financing schemes for mounting debts. Information on these state-specific fiscal policies was published annually in state Auditor and Treasurer reports. Were newspapers reporting on the state fiscal developments? To address this question, we construct "fiscal information indices" by using the nineteenth century U.S. newspapers in the Gale digitized database.

### 3.1 Newspapers and Textual Analysis

As an educational publishing company, Gale – a part of Cengage Learning – has digitized 400 U.S. newspapers with over 1.7 million pages in the entire 19th century, providing an unparalleled window into the past. For the period between January 1830

and December 1850, the database includes 137 newspapers (Table 2), covering major newspapers of the time. For instance, there were nine newspapers from New York, including the widely circulated *New York Herald* and *New York Spectator*.

The database classifies all articles into six categories: business and finance, editorial and commentary, news, advertising, people, and art & sports & leisure. We focus on the first three categories that are pertinent for economics and, in particular, fiscal policy. The category of business and finance includes business and finance news, financial and commercial tables, and shipping news. For instance, the *New York Herald* included a section called the "Money Market Article," which Mott (1950) credits as the precursor to the modern financial page. Editorial and commentary articles tend to focus on important political and economic issues at the time, while the category of news contains articles summarizing general macroeconomic and political news.

In order to track the media coverage of fiscal policy, we construct "fiscal information measures." We use unsupervised machine learning methods, K-means and LDA, to uncover hidden patterns in the news articles and determine meaningful clusters of words called topics.[12] Those methods differ from the dictionary approach, in which researchers first define a list of keywords to capture content of interest and then identify text documents that include those keywords. An example of the latter approach is Baker *et al.* (2016), who construct an economic policy uncertainty measure using the dictionary approach. Relative to this method, the advantage of the K-means and LDA algorithms is that the algorithms self-identify texts belonging to certain categories and do not rely on user-imposed structure on the data. Hansen *et al.* (2018) provide a recent application in economics, using this approach to study how transparency affects the deliberation of monetary policymakers on the Federal Open Market Committee.

### 3.2 Vocabulary and Preprocessing

Compared to most papers in the literature that study more recent document files, a key challenge in utilizing older documents is how to properly convert those files into high-quality text files. Since the archival files exist only in paper form, they need to be scanned and then converted into text files using Optical Character Recognition (OCR) methods. The previous literature cautions that the quality of text files for nineteenth century newspapers

[12] Supervised machine learning, in contrast, starts with researchers manually classifying training data with predefined classes. The trained algorithm is then applied to the rest of the text documents of interest. Examples in economics include Shapiro *et al.* (2018).

can be poor when using off-the-shelf OCR software for conversion, see Garcia (2013) and Hanna *et al.* (2017).[13] In contrast, we use the commercial text files provided by Gale, who used the best of OCR technology.

We first parse the text files from Gale and extract articles. As an example, Figure 3 provides a digital image of the headline of the *Indiana Journal* on October 22, 1836. When converting the image into a text file, Gale properly considered the format of the newspaper and extracted the content of news articles. Figure 4 provides an example of this input-output from Gale. The top panel shows the image of a short article which reported that the Canal and Morris Banking Company had bought two million dollars of Indiana bonds. The article is assigned a unique ID and a specific article category by Gale, as shown in the bottom left panel of Figure 4. The article ID is in the format of [newspaper ID-date-page number-article number], for instance [5AHV-1836-Oct22-002-014] reflects that this article was the 14th article published on the second page of the *Indiana Journal* on October 22, 1836. The bottom right panel displays the OCR text file for this article. We parse all the text files and extract articles that were classified within the three categories of interest – business and finance, editorial and commentary, or news – and published between January 1830 and December 1850. This process extracts a little over two million articles.

We then spell check all article files to examine the text quality. To pre-process the text files, each sentence is decomposed into single words and punctuation characters, a process called tokenization. We correct hyphenated words that were used to accommodate newspaper formatting rules, similar to Hanna *et al.* (2017).[14] We also remove all non-alphabetic characters, including numerical numbers and punctuations. Finally, we compare each word with words from standard English dictionaries. The word is kept if it appears in the dictionaries. Otherwise, it is either replaced by another valid word that is closest to the existing one and appears in the dictionary, or kept if no valid word can be found in the dictionary to replace it. Within our data sample, the median share of valid words in an article is 90%, implying that only 10% of words in the article text files are misspelled or gibberish or non-existent words.

After spell checking newspaper articles, we followed the literature [for instance Loughran and

[13] In both Garcia (2013) and Hanna *et al.* (2017), the authors use ABBYY software to convert newspaper files themselves.

[14] For instance, "Pennsylvania", if shown at the end of a line, was split as "Penn- sylvania". In response, we combine any word followed by a hyphen and a space with the following word into a new word.

McDonald (2016), and Calomiris and Mamaysky (2018)] to preprocess the text corpus. Common *stopwords* like 'the' and 'of' that appear frequently in all texts are removed. In addition to the standard list of stopwords in the Python library, we include the widely used list of stopwords from Loughran and McDonald (2016), which include dates and time, names, and geographic terms.[15] We then convert the remaining terms into their linguistic roots through stemming. For instance, 'banking' and 'banks' contains the same stem 'bank'. The outcome of stemming is not necessarily a word recognized by standard dictionaries.

In the nineteenth century, local newspaper articles covered a broad range of topics, ranging from reporting on current events to printing fiction and local gossip. Since our focus is only on articles related broadly to economic and government conditions, we limit our corpus for topical analysis to the subset of articles that contain at least one of the following keywords: stock(s), debt(s), bond(s), or securities. Examining the subset of articles with these keywords shows that they tend to include articles related to the government, articles related to finance and banking, and miscellaneous other articles.[16] We focus on this subset of articles as they are likely to draw topics related to economic and fiscal conditions, while not imposing many constraints on the initial article set.[17] Limiting articles to include one of these terms still gives a corpus of over 200,000 articles between the period of January 1830 and December 1850.

Finally, we follow Loughran and McDonald (2011) and conduct a term weighting scheme for each article by using term frequency-inverse document frequency (tf-idf). The weighting scheme addresses three components: the importance of a word/term within a document, measured by word frequency (tf); a normalization by document length; and the importance of a word/term within all documents, measured by inverse document frequency (idf). At an abstract level, we construct a [N x T] matrix, where N is the number of documents and T is the number of unique words.

[15] Loughran and McDonald's list can be found at https://sraf.nd.edu/textual-analysis/resources/#StopWords.

[16] An example of the first category is from an article in the *New York Herald's Money Market* report on March 10, 1842. It states "the debt of the State (of Ohio), clearly showing the large pressing claims....canal stock debt to be provided for... ". An example of the second categories appears in an article from the *Morning Herald* on January 4, 1838 in a re-print of Governor William L. Marcy's address, where he speaks of "specie were suspended by the banks of this State, there was due to them a debt...". An example of other miscellaneous articles in this category comes from the January 5, 1838 article of the *Morning Herald* that reads "the present operations of the trade may therefore be as a precautionary measure to stock themselves previously to our supply of American cotton."

[17] A similar approach is used by Calomiris and Mamaysky (2018), where they limit topic and sentiment analysis to Thomson Reuters News articles that contain words on their pre-specified econ list. We experimented with alternatively selecting the text corpus to include all articles containing at least one keyword related to revenues: tax(es), or toll(s). The implied topics and fiscal indices constructed from this set are very similar. See section 5.2 for details.

### 3.3 Clustering Method

Words in news articles are rarely independent, but instead are linked together by underlying topics. The goal of clustering analysis is to discover the hidden structure or intrinsic characteristics of data, and to extract insights from vast amounts of unstructured data.

The K-means algorithm is one of the simplest, most popular, and empirically successful clustering algorithms [see Jain (2010)]. It determines a partition of text files such that it minimizes the squared error between the empirical mean of a cluster $\mu_k$ and the points in the cluster $c_k$, which correspond to the tf-idf vectors of our articles. A user must pre-specify the number of clusters $K$ to partition. K-means then minimizes the sum of the squared error over all $K$ clusters:

$$\min \sum_{k=1}^{K} \sum_{x_i \in c_k} ||x_i - \mu_k||^2$$

We initiate the algorithm with random values for the centroid points $\mu_k \in K$ from our articles.[18] The algorithm then iterates between two steps until it stabilizes:

1. Assign each data point to its nearest centroid point, based on the squared Euclidean distance.

2. Update centroid points by taking the mean of all data points assigned to a centroid's cluster.

Each article is uniquely assigned to a cluster, while individual terms are assigned to all clusters with various weights. There is no agreed upon metric for choosing an optimal $K$ in the literature; we choose $K = 5$ based on experimentation and the value producing the best interpretability of the implied topics.[19]

To understand how sensitive our results are to different methods, we also consider an alternative clustering algorithm, LDA, following Hansen *et al.* (2018). LDA is a mixed-membership model in which articles can be related to multiple topics. This contrasts with K-means, in which each article is uniquely assigned to one cluster. As a Bayesian factor model for discrete data, LDA is a probabilistic model determining the probability a topic is associated with a particular article [see Blei *et al.* (2003) for details].

[18] Since the algorithm often converges to a local minimum, we randomize our starting point over several implementations to verify the resulting clusters are consistently chosen.

[19] Results under alternative $K$ specifications are available upon request.

3.4 Clustering Results As shown in Figure 5, K-means generates tag clouds for five topics. Each tag cloud contains the most relevant words for defining a topic, with more important words displayed in larger font. The top 16 stemmed words associated with each topic are also shown in the top panel of Table 3. We label each topic to reflect the most relevant words: "legislative/fiscal", "banking", "market", "governance", and "other." The "legislative/fiscal" cluster contains the keywords bill, senate, committee, resolution and etc, reflecting legislative activities. The "banking" cluster involves keywords relevant for banking activities, like bank, money, bill, paper and etc. Top words in the "market" cluster capture market activities at the time, in particular related to shipment and international trade, like market, sold, arrive, ship, trade and etc. The "governance" cluster reflects political activities through the keywords of govern, people, great, public, constitution and etc. The last cluster is labelled as "other", as the top words are less meaningful.

Having identified articles to each topic, we plot the share of articles corresponding to each topic at a monthly frequency in Figure 6. The time series display interesting patterns. The "legislative/fiscal" topic presents seasonal patterns that follow state government legislative activities: the series often peaks at the end or in the beginning of a year, right after state governments publish their annual Auditor's and Treasurer's reports, and then drops in the middle of a year. This pattern is less pronounced in the early 1840s. As the crisis unfolded, more governmental actions regarding the financial situation of states were discussed, providing investors more information about the fiscal development across states. The "banking" topic includes spikes around the Bank War of 1834 on rechartering the Second Bank of the United States, the Panic of 1837, the Economic Crisis in 1839, and state default episodes, akin to modern-day economic uncertainty measures, e.g. Baker *et al.* (2016). Although the banking cluster is not directly related to our paper, constructing such proxies could be particularly valuable for future historical studies, as macroeconomic indicators in these earlier eras are often lacking.

The bottom panel of Table 3 shows that LDA identifies similar topics as K-means. For all five topics, the top 16 words are almost identical to those from K-means, albeit with slightly different word rankings. To construct frequency measures for each topic, we assign each article to the topic in which it has the highest estimated probability. Figure 7 shows that the legislative/fiscal topic measure from LDA is highly correlated with the measure from K-means, even though the level of

the two measures are slightly different, which may reflect the Bayesian nature of the LDA method.

In order to measure state-specific fiscal information, we repeat the clustering analysis for each state, in which the textual corpus includes articles with the state name and one of the previously listed keywords: stock(s), debt(s), bond(s), or securities. Figure 8 plots the time series of the state-specific "legislative/fiscal" topic for each state using K-means. These indices display the same seasonal patterns as the aggregate "legislative/fiscal" topic. We adopt these state-specific "legislative/fiscal" topics as our benchmark empirical measures of state-specific fiscal information.

## 4 Fiscal Information Index and Bond Price

How did investors respond to the media coverage of fiscal policy? In this section we examine the impact of state-specific fiscal information on bond prices by estimating the following equation on individual bond prices:

$$\ln p_{ist} = \alpha_t + \beta_i + \gamma_s I_{s,t-1} + \gamma_s^c I_{s,t-1} dC_t + \epsilon_{ist} \quad (1)$$

The dependent variable $p_{ist}$ is the bond price for bond $i$ at time $t$ that was issued by state $s$. $\alpha_t$ controls for time specific effects, which capture the influence of aggregate trends over time, for instance the direct impact of the 1837 economic crisis on bond prices. $\beta_i$ controls for bond specific effects, including different coupons, maturities, and payable currency across bonds. $I_{s,t-1}$ is the lagged fiscal information index for state $s$ at time $t-1$, and $\gamma_s$ measures how the state-specific fiscal information index affects its own bond price over the whole sample. Importantly, we allow fiscal indices to interact with a crisis dummy $dC_t$ that is equal to zero before June 1839 and one thereafter.[20] Thus, $\gamma_s^c$ measures the additional impact of the state-specific fiscal index upon its own bond price during the crisis.

Bond prices come from the price quotation database for the early U.S. securities markets between 1790 and 1860 [see Sylla *et al.* (2002)].[21] This database compiled security prices from contemporary newspapers in seven markets: London, New York, Philadelphia, Boston, Baltimore, Richmond, and

[20] Our estimation results are robust to different dating of the crisis dummy.

[21] Some state bonds were reported with their coupon and maturity. However, for the period of interest to us, between 1835 and 1845 in particular, the coupon and maturity information was missing for most bonds. Therefore we work directly with the bond price, as we are unable to compute the yield for many bonds. Beach (2017) also follows this approach.

Charleston.[22] 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.

As shown in Figure 9, the database includes 188 bonds across the seven states over the period of January 1830 to December 1850. In general, the northeastern states like New York and Pennsylvania issued a larger number of bonds than other states. There were 72 bonds for New York, 30 for Pennsylvania, 22 for Indiana, 20 for Illinois, 18 for Ohio, 14 for Kentucky, and 12 for Maryland. Some bonds were traded in multiple stock markets within the same month, in which case we use price series in all markets in order to use all the information available. Kim and Wallis (2005) note that there existed price differences for the same bond trading in different markets, in particular a premium for bonds trading on the London market relative to the New York market. To account for these potential price differences, we treat a bond trading in a particular market as a distinct bond by giving a unique $i$, leading to 216 distinct bond series, as some bonds were traded in multiple markets.

**Results** As summarized in Table 4, the regression results show that state-specific fiscal information measures affect bond prices differently before versus during the crisis. Moreover, the impact of fiscal indices upon bond prices also differs across states. The column of specification (1) shows that based on the K-means clustering, the estimated coefficients on fiscal measures $\gamma_s$ are negative and significant for "old" states that started internal improvement projects earlier, namely New York, Ohio, Pennsylvania, and Maryland. In contrast, the estimated coefficients are positive but statistically insignificant for "new" states that did not start issuing bonds until the second half of 1830s, namely Illinois and Indiana. The estimates suggest that when new states entered the bond market to fund internal improvement projects, they brought more competition to the state bond market and imposed downward pressure on other state bond prices.

When allowing fiscal measures to interact with the crisis dummy, the estimated $\gamma_s^c$ coefficients suggest that state-specific fiscal information lowered bond prices for states with weak fiscal policy during the crisis. $\gamma_s^c$ is positive and statistically significant for New York, and positive but statistically insignificant for Ohio and Kentucky. All three states had more responsible debt financing

[22]The database also includes price quotations for 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/.

schemes. These estimates suggest that for these states, state-specific fiscal information did not put downward pressure on bond prices – and even boosted bond prices in the case of New York – during the crisis. In contrast, $\gamma_s^c$ is negative and statistically significant for Maryland, Indiana and Illinois, all of which were ill prepared for fiscal downturns prior to the crisis. The coefficient is negative but statistically insignificant for Pennsylvania.[23]

The key takeaway that state-specific fiscal indices affect bond prices differently across states and over time is robust to alternative specifications. In regression (2), we drop the state of Kentucky, as its associated coefficients are largely insignificant due to limited data on Kentucky bond prices. In specification (3), we replace the legislative/fiscal clusters from the LDA method with those from K-means. The LDA measures further strengthen our finding, as the estimated $\gamma_s^c$ coefficients become statistically significant for both Ohio and Maryland. One concern is that the legislative/fiscal clusters, as shown in Figure 8, have clear seasonal patterns. In specifications (4) and (5), we address the concern and seasonally adjust the cluster time series by using the X-13-ARIMA program of the U.S. Census Bureau. The key results still hold. Lastly, we consider a case in which state-specific fiscal measures do not interact with the crisis dummy, as shown in specification (6). The estimated coefficients $\gamma_s$ are negative for most states, which conceals the drastically different impact of fiscal information on different states and at different times.

## 5 Robustness

We investigate the robustness of our regression results under several alternative specifications. We first consider an alternative approach to developing fiscal information measures that do not rely on machine learning techniques. We then consider the sensitivity of our topic analysis to the manner by which we select articles for analysis. In both cases, our empirical results remain: fiscal information affects bond prices differently before versus during the crisis, and across states. Lastly, we address the concern that the lack of bond price movements prior to the crisis reflected an expectation of bailout.

[23] This may reflect that the Second Bank of United States played a key role in shaping the fiscal situation in Pennsylvania, which may not be fully captured by our legislative/fiscal cluster.

5.1 Dictionary Methods Although there is growing interest in textual analysis in economics, dictionary methods remains the most widely used application, where users pre-specify keywords of interest and count their frequency of occurrence. Several studies employ this approach to construct economic indices, e.g. Baker *et al.* (2016), Shoag and Veuger (2016), Manela and Moreira (2017), and Azzimonti (2018). The advantage of this approach is that it gives a quick understanding of how frequently certain issues were discussed in the media, while the drawback is that it is potentially heavily influenced by the pre-selected keywords of researchers. In this section, we investigate how sensitive our results are to this alternative approach.

We follow the dictionary approach of Baker *et al.* (2016) to construct a fiscal news index by searching for keywords related to government revenues, expenditure, and debt. As discussed in section 2, the seven states issued state bonds largely to finance internal improvement projects. Therefore, articles containing the terms of internal improvement projects or public works were closely associated with news reports on the government fiscal situation for those states. In addition, tolls and property taxes were the major sources of revenue for those state governments, and articles with such words often reported on fiscal conditions. Finally, stock(s) or debt(s) or bond(s) or securities were terms frequently used in describing government liabilities at the time. Thus, we consider an article as including state-specific fiscal information if, other than the state name, it also includes:[24]

1. at least one keyword related to expenditure: internal improvement(s), or public work(s); and
2. at least one keyword related to revenues: tax(es), or toll(s); and
3. at least one of the following keywords: stock(s), debt(s), bond(s), or securities.

Figure 11 shows that the dictionary measures exhibit similar seasonal patterns as the benchmark measures constructed with topical analysis. This reflects that the dictionary measures with fiscal keywords correlate well with the "legislative/fiscal" topic.

Specifications (1) and (2) in Table 5 present regression results with the new measures, without and with seasonal adjustment. The key results still hold. The estimated $\gamma_s$ are negative and

[24]To settle on these keywords, we performed a human audit study of selectively reading articles based on various keywords and refining our approach to limit results to encompassing relevant material. In addition, we performed a human audit on articles from our final set of articles in the fiscal information indices to determine its accuracy.

significant for New York and Ohio, but positive and statistically significant for Illinois and Indiana. $\gamma_s^c$ have the opposite sign for these states: they are negative and significant for Illinois and Indiana, but positive for New York and Ohio. The estimates for Maryland and Pennsylvania are less significant.

5.2 Alternative Selection of Textual Corpus For the topic analysis, we initially constrained the newspaper articles to the set of articles containing at least one of the following keywords: stock(s), debt(s), bond(s), or securities. In this section, we consider an alternative criteria for initially selecting our set of articles for analysis. Specifically, we consider all articles containing at least one keyword related to revenues: tax or taxes. This alternative criteria still allows for a broad coverage of articles related to government actions and other miscellaneous articles.[25] As before, to limit attention to state-specific information, we repeat the analysis where our initial textual corpus also includes articles with a particular state name, in addition to the revenue keywords.

In general, the topics generated from this set of articles are highly correlated with our baseline set. For instance, the time series for the overall legislative topic (without a specific state name) for our baseline set of words and this alterative set are plotted in Figure 12. The correlation of the two series is 0.85. Similarly, the financial topic's time series have a correlation of 0.84. Nevertheless, the article coverage from the tax(es) keywords is less than half of the article coverage with the stock(s), debt(s), bond(s), or securities keywords. As such, we adopted the debt-type keywords for our baseline analysis, so as to limit the amount of constraints imposed on the textual corpus. Specifications (3) and (4) in Table 5 present regression results with the new measures, without and with seasonal adjustment. Again, the central results remain.

5.3 Bailout One potential explanation for the bond price dynamics across states 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.

[25] For instance, this set of keywords includes the same Governor's Message mentioned in footnote 16, with the passage "One is to make the assessment of the tax compulsory." Likewise it picks up an article from the *Morning Herald*'s *Money Market* on January 25, 1838 that reads: "the receipts for toll on the Pennsylvania canals and railroads were as follows." (Note that this article also is included with the stock(s), debt(s), bond(s), or securities keywords.) However, this set of keywords also picks up other types of articles, such as the January 20, 1838 *Morning Herald* article reporting on bank failures and ending: "when the bell on Brattle street should toll; but nothing was then done."

This conjecture is not entirely unfounded, as on August 4, 1790 the federal government did nationalize states' debt for the American Revolutionary War.[26] 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 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*

To further investigate the view of a bailout, we construct a bailout information index from our newspaper database by searching for the keywords of 'debt assumption' or 'assume debt' or

[26] 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.

'assume bond' in the newspaper articles. The total number of articles over the period 1834-1839 including these words is only 40, whereas over the period 1840-1845 it increases to 204. Overall, these numbers are very low and indicate little discussion prior to the onset of the debt crisis. Although some investors may have viewed a bailout as practicable, there is no evidence that such view was universal before (or during) the crisis.

## 6 Conclusion

Between 1841 and 1843, nine U.S. states and territories defaulted on state debt held by creditors both within the U.S. and abroad. Before the default crisis, many states embarked in massive public improvement projects, amassing large increases in state debt. This paper documents that these fiscal actions were chronicled and discussed in the newspapers at the time. We construct a novel measure of fiscal information based on textual analysis of U.S. newspaper articles from the 1830s and 1840s using unsupervised machine learning algorithms. We partition the texts into topics and show such topical analysis results in meaningful measures of economic conditions at the time. Importantly, one topic that emerges relates to legislative and fiscal actions, which we adopt as an index of fiscal information.

We then show our fiscal information index affects state secondary-market bond prices, but the effect differs across states and over time. Prior to the default event, the entry of western states (e.g., Indiana and Illinois) into the bond market in the late 1830s induced a competition effect: more fiscal news imposed downward pressure on bond prices for states that started accumulating debt earlier (e.g., New York and Ohio). During the default crisis, fiscal news helped investors differentiate states with sound fiscal policy from insolvent ones, as a higher fiscal information measure lowered bond prices for states that were ill-prepared for fiscal downturns. We show these results are robust to various manners in which the fiscal information index can be constructed. Our results suggest information can play an important role in the evolution and contagion of a sovereign default episode. Other interesting future avenues to pursue in this regard include more carefully documenting how information spreads from one region to another and how the sentiment/tone of such information matters.

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| 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; 1836 & 1841 contain unknown residence sales that 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 1: Shares of "foreign" and "domestic" bondholders and currency denominations for select states.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| AL | 6 | AR | 3 | CT | 9 | CA | 5 |
| DC | 4 | DE | 1 | GA | 5 | FL | 2 |
| IL | 2 | IN | 11 | KY | 1 | WI | 4 |
| LA | 1 | MA | 6 | MD | 1 | ME | 1 |
| MO | 3 | MS | 10 | NC | 5 | IA | 1 |
| NH | 2 | NY | 9 | OH | 9 | HI | 3 |
| PA | 3 | RI | 5 | SC | 8 | KS | 2 |
| TN | 3 | VA | 7 | VT | 3 | WV | 1 |
| UT | 1 | | | | | | |

Table 2: U.S. Newspapers by states (January 1830 - December 1850)

| K-Means | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Fiscal cluster | bill | committe | senat | resolut | report | state | order | vote |
| | refer | question | act | present | subject | relat | time | adopt |
| Banking cluster | bank | state | note | cent | compani | paper | institut | pay |
| | public | time | issu | govern | market | busi | receiv | follow |
| Market cluster | market | cent | sold | demand | rate | arriv | advanc | firm |
| | yesterday | ship | continu | trade | old | limit | state | busi |
| Governance cluster | state | govern | peopl | great | public | parti | right | constitut |
| | presid | time | congress | general | present | men | subject | war |
| Other cluster | state | time | great | compani | ship | court | lie | offic |
| | old | receiv | work | tile | arriv | paper | follow | near |

| LDA | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Fiscal cluster | bill | committe | senat | resolut | state | report | act | vote |
| | court | order | elect | offic | appoint | presid | refer | present |
| Banking cluster | bank | note | cent | state | compani | issu | pay | paid |
| | institut | paper | declar | union | busi | receiv | follow | old |
| Market cluster | market | cent | sold | demand | ship | arriv | rate | advanc |
| | firm | yesterday | port | continu | trade | old | clear | foreign |
| Governance cluster | state | govern | peopl | public | parti | great | right | constitut |
| | congress | presid | principl | present | men | time | subject | war |
| Other cluster | time | great | state | lie | work | tile | near | men |
| | appear | paper | old | receiv | letter | like | morn | offic |

Table 3: Top 16 words associated with each cluster in K-means and LDA methods

| Coefficient | Specification | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | K-means | K-means | LDA | K-means, SA | LDA, SA | K-means |
| $\gamma_{ny}$ | -1.54*** | -1.57*** | -1.06*** | -2.90*** | -1.48*** | -1.08*** |
| | (0.17) | (0.16) | (0.10) | (0.27) | (0.12) | (0.21) |
| $\gamma^c_{ny}$ | 1.64*** | 1.65** | 0.82*** | 2.69*** | 0.77*** | |
| | (0.49) | (0.50) | (0.18) | (0.60) | (0.17) | |
| $\gamma_{oh}$ | -1.16*** | -1.18*** | -0.84*** | -1.59*** | -0.92*** | -1.09*** |
| | (0.15) | (0.16) | (0.11) | (0.22) | (0.15) | (0.21) |
| $\gamma^c_{oh}$ | 0.84 | 0.87 | 0.82** | 1.91** | 1.19** | |
| | (0.49) | (0.51) | (0.30) | (0.69) | (0.45) | |
| $\gamma_{pa}$ | -0.94*** | -0.97*** | -0.25* | -1.09*** | -0.06 | -1.33*** |
| | (0.21) | (0.21) | (0.10) | (0.26) | (0.09) | (0.30) |
| $\gamma^c_{pa}$ | -1.13 | -1.14 | -0.45*** | -0.92 | -0.49*** | |
| | (0.64) | (0.66) | (0.13) | (0.76) | (0.15) | |
| $\gamma_{md}$ | -1.16*** | -1.17*** | -0.34 | -1.48*** | -0.10 | -1.95*** |
| | (0.29) | (0.31) | (0.23) | (0.39) | (0.30) | (0.47) |
| $\gamma^c_{md}$ | -2.94* | -2.99* | -2.91*** | -2.94* | -4.04*** | |
| | (1.21) | (1.24) | (0.87) | (1.42) | (1.06) | |
| $\gamma_{in}$ | 1.64 | 1.60 | 2.74* | 4.34 | 5.22** | -2.12** |
| | (1.03) | (1.07) | (1.15) | (2.36) | (1.74) | (0.81) |
| $\gamma^c_{in}$ | -5.24** | -5.17*** | -5.79*** | -8.61*** | -9.41*** | |
| | (1.61) | (1.54) | (1.43) | (2.60) | (1.99) | |
| $\gamma_{il}$ | 8.32 | 8.28 | 10.23** | 11.05 | 12.64** | -2.90 |
| | (4.71) | (4.64) | (3.77) | (6.45) | (3.91) | (1.66) |
| $\gamma^c_{il}$ | -13.09** | -13.05** | -13.77*** | -16.04* | -17.65*** | |
| | (4.71) | (4.59) | (3.57) | (6.40) | (3.84) | |
| $\gamma_{ky}$ | -2.69 | | | | | |
| | (3.58) | | | | | |
| $\gamma^c_{ky}$ | 0.70 | | | | | |
| | (3.76) | | | | | |
| Obs | 5822.00 | 5536.00 | 5536.00 | 5536.00 | 5536.00 | 5536.00 |
| Adj. $R^2$ | 0.90 | 0.90 | 0.90 | 0.90 | 0.91 | 0.90 |
| Bond FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Time FE | Yes | Yes | Yes | Yes | Yes | Yes |

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4: Dependent variable is the bond price $p_{ist}$; explanatory variables include the lagged state-specific fiscal indices $I_{s,t-1}$ and their interacting terms with the crisis dummy. Bond prices are converted to the natural logarithm. Specification (1) is the baseline case with legislative/fiscal clusters from K-means method for the period of January 1830 and December 1850; (2) drops the state of Kentucky from the baseline case; (3) uses the measures from LDA method; (4) adopts seasonally adjusted measures from K-means method; (5) uses seasonally adjusted measures from LDA method; and (6) excludes the information indices interacting with the crisis dummy, $\ln p_{ist} = \alpha_t + \gamma_i + \beta_s I_{s,t-1} + \epsilon_{ist}$.

| Coefficient | Specification | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| | Dictionary | Dictionary, SA | Alternative key | Alternative key, SA |
| $\gamma_{ny}$ | -3.79*** | -6.17*** | -0.92*** | -1.41*** |
| | (0.45) | (0.67) | (0.10) | (0.15) |
| $\gamma^c_{ny}$ | 5.92*** | 6.86*** | 1.88*** | 2.65*** |
| | (1.35) | (1.54) | (0.27) | (0.35) |
| $\gamma_{oh}$ | -1.84*** | -2.31*** | -0.57*** | -0.62*** |
| | (0.33) | (0.45) | (0.10) | (0.15) |
| $\gamma^c_{oh}$ | 1.61 | 2.19 | 1.11*** | 1.94*** |
| | (0.95) | (1.23) | (0.23) | (0.34) |
| $\gamma_{pa}$ | -0.25 | 0.24 | -0.07 | 0.15 |
| | (0.34) | (0.42) | (0.13) | (0.15) |
| $\gamma^c_{pa}$ | -3.57** | -3.81* | -0.13 | 0.05 |
| | (1.35) | (1.57) | (0.30) | (0.36) |
| $\gamma_{md}$ | -0.33 | -0.06 | -0.00 | 0.13 |
| | (0.56) | (0.79) | (0.18) | (0.24) |
| $\gamma^c_{md}$ | -11.12*** | -11.80*** | -0.72 | -0.46 |
| | (2.79) | (3.09) | (0.53) | (0.65) |
| $\gamma_{in}$ | 9.94*** | 22.49*** | 1.63* | 3.74* |
| | (2.97) | (3.87) | (0.71) | (1.53) |
| $\gamma^c_{in}$ | -14.73*** | -24.19*** | -3.47*** | -5.60*** |
| | (3.85) | (4.55) | (0.98) | (1.63) |
| $\gamma_{il}$ | 30.58*** | 37.21*** | 6.91* | 10.89** |
| | (7.82) | (9.15) | (2.88) | (3.96) |
| $\gamma^c_{il}$ | -37.37*** | -43.40*** | -8.29** | -12.19** |
| | (7.72) | (9.22) | (2.83) | (3.86) |
| Obs | 5536.00 | 5536.00 | 5536.00 | 5536.00 |
| Adj. $R^2$ | 0.90 | 0.90 | 0.90 | 0.90 |
| Bond FE | Yes | Yes | Yes | Yes |
| Time FE | Yes | Yes | Yes | Yes |

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5: Robustness Analysis. Specification (1) uses the dictionary approach; (2) adopts the seasonal adjustment on (1); (3) uses alternative keywords to select the text corpus; and (4) adopts the seasonal adjustment on information measures in (3). Bond prices are converted to the natural logarithm.

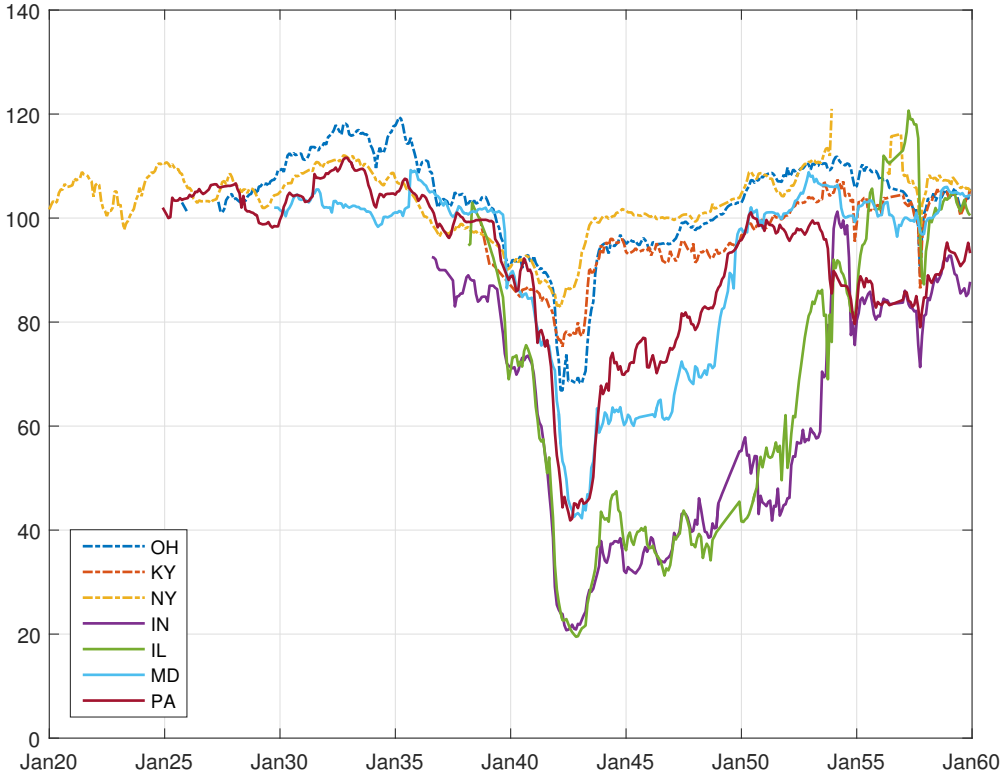



Figure 1: State government bond prices at monthly frequency (1820/01-1859/12): from the dataset "the price quotations in early U.S. securities markets, 1790-1860" compiled by Sylla *et al.* (2002). Ohio, Kentucky, New York didn't default. Indiana defaulted in January 1841, Illinois and Maryland in January 1842, and Pennsylvania in August 1842.

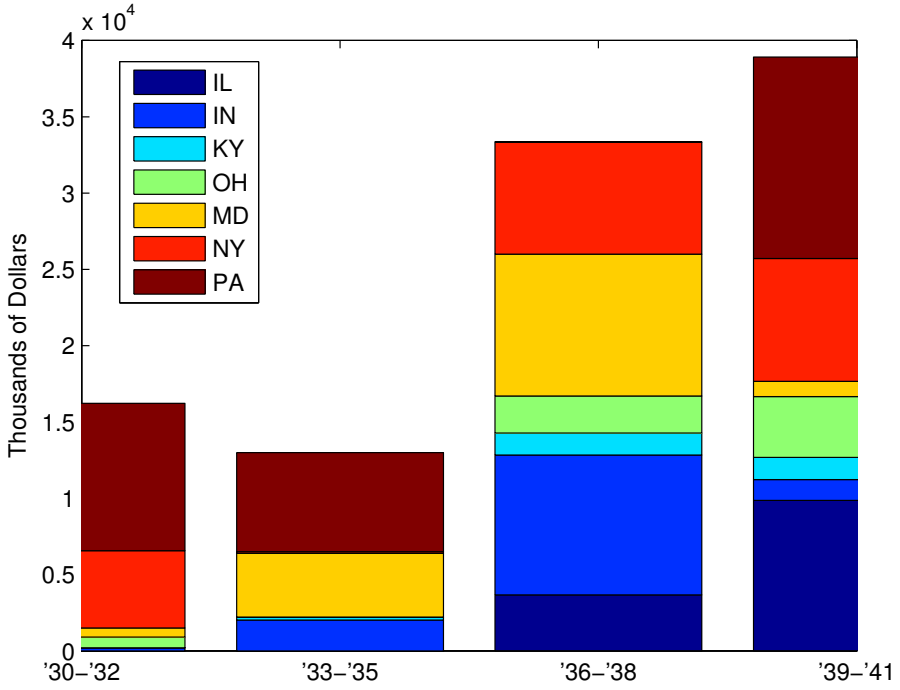
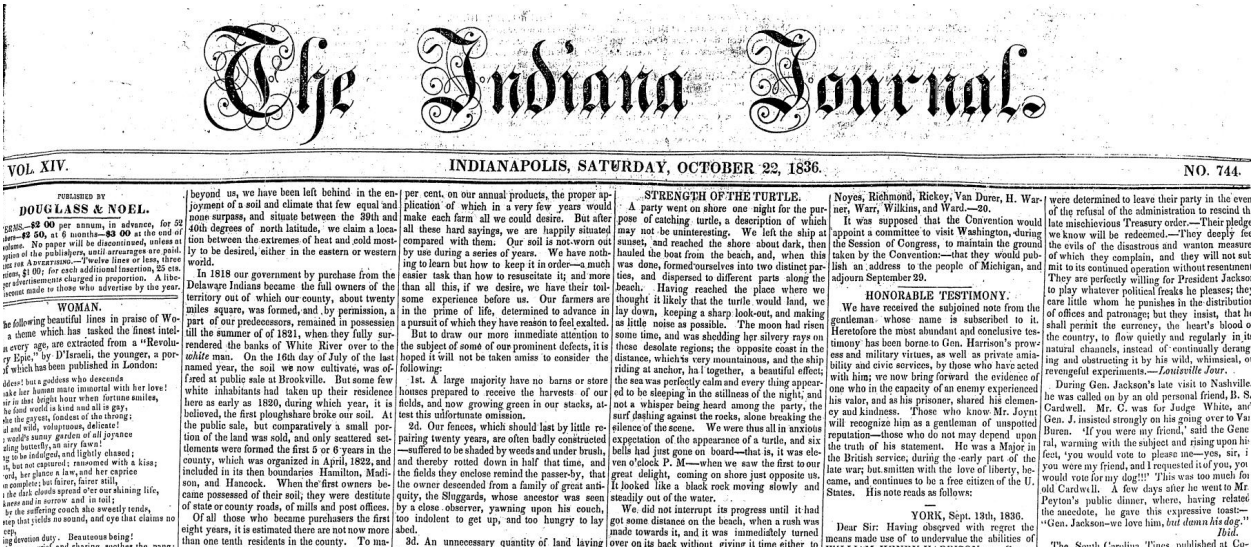



Figure 2: Debt outstanding on September 1, 1841 by years of authorization for each state (in thousands of dollars): from U.S. Congress (1843) and Wallis *et al.* (2004).



The Indiana Journal.

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

PUBLISHED BY
DOUGLASS & NOEL.

WOMAN.

beyond us, we have been left behind in the enjoyment of a soil and climate that few equal and none surpass, and situate between the 39th and 40th degrees of north latitude, we claim a location between the extremes of heat and cold mostly to be desired, either in the eastern or western world.

In 1818 our government by purchase from the Delaware Indians became the full owners of the territory out of which our county, about twenty miles square, was formed, and by permission, a part of our predecessors, remained in possession till the summer of of 1821, when they fully surrendered the banks of White River over to the *white* man. On the 16th day of July of the last named year, the soil we now cultivate, was offered at public sale at Brookville. But some few white inhabitants had taken up their residence here as early as 1820, during which year, it is believed, the first ploughshare broke our soil. At the public sale, but comparatively a small portion of the land was sold, and only scattered settlements were formed the first 5 or 6 years in the county, which was organized in April, 1822, and included in its then boundaries Hamilton, Madison, and Hancock. When the first owners became possessed of their soil; they were destitute of state or county roads, of mills and post offices.

Of all those who became purchasers the first eight years, it is estimated there are not now more than one tenth residents in the county. To nu-

per cent. on our annual products, the proper application of which in a very few years would make each farm all we could desire. But after all these hard sayings, we are happily situated compared with them. Our soil is not worn out by use during a series of years. We have nothing to learn but how to keep it in order—a much easier task than how to resuscitate it; and more than all this, if we desire, we have their toilsome experience before us. Our farmers are in the prime of life, determined to advance in a pursuit of which they have reason to feel exalted.

But to draw our more immediate attention to the subject of some of our prominent defects, it is hoped it will not be taken amiss to consider the following:

1st. A large majority have no barns or store houses prepared to receive the harvests of our fields, and now growing green in our stacks, attest this unfortunate omission.

2d. Our fences, which should last by little repairing twenty years, are often badly constructed —suffered to be shaded by weeds and under brush, and thereby rotted down in half that time, and the fields they enclose remind the passer-by, that the owner descended from a family of great antiquity, the Sluggards, whose ancestor was seen by a close observer, yawning upon his couch, too indolent to get up, and too hungry to lay abed.

3d. An unnecessary quantity of land laying

STRENGTH OF THE TURTLE.

A party went on shore one night for the purpose of catching turtle, a description of which may not be uninteresting. We left the ship at sunset, and reached the shore about dark, then hauled the boat from the beach, and, when this was done, formed ourselves into two distinct parties, and dispersed to different parts along the beach. Having reached the place where we thought it likely that the turtle would land, we lay down, keeping a sharp look-out, and making as little noise as possible. The moon had risen some time, and was shedding her silvery rays on these desolate regions; the opposite coast in the distance, which is very mountainous, and the ship riding at anchor, ha l together, a beautiful effect; the sea was perfectly calm and every thing appeared to be sleeping in the stillness of the night, and not a whisper being heard among the party, the surf dashing against the rocks, alone breaking the silence of the scene. We were thus all in anxious expectation of the appearance of a turtle, and six bells had just gone on board—that is, it was eleven o'clock P. M—when we saw the first to our great delight, coming on shore just opposite us. It looked like a black rock moving slowly and steadily out of the water.

We did not interrupt its progress until it had got some distance on the beach, when a rush was made towards it, and it was immediately turned over on its back without giving it time either to

Noyes, Richmond, Rickey, Van Durer, H. Warner, Warr, Wilkins, and Ward.—20.

It was supposed that the Convention would appoint a committee to visit Washington, during the Session of Congress, to maintain the ground taken by the Convention:—that they would publish an address to the people of Michigan, and adjourn September 29.

HONORABLE TESTIMONY.

We have received the subjoined note from the gentleman whose name is subscribed to it. Heretofore the most abundant and conclusive testimony has been borne to Gen. Harrison's prowess and military virtues, as well as private amiability and civic services, by those who have acted with him; we now bring forward the evidence of one who in the capacity of an enemy experienced his valor, and as his prisoner, shared his clemency and kindness. Those who know Mr. Joynt will recognize him as a gentleman of unspotted reputation—those who do not may depend upon the truth of his statement. He was a Major in the British service, during the early part of the late war; but smitten with the love of liberty, became, and continues to be a free citizen of the U. States. His note reads as follows:

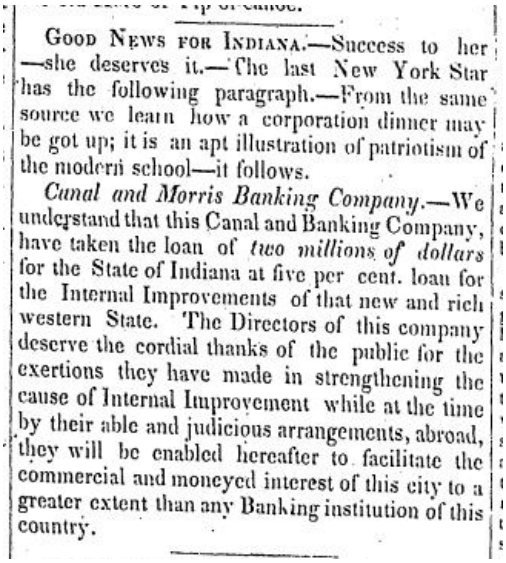
YORK, Sept. 13th, 1836.

Dear Sir: Having observed with regret the means made use of to undervalue the abilities of

were determined to leave their party in the even of the refusal of the administration to rescind th late mischievious Treasury order.—Their pledge we know will be redeemed.—They deeply fee the evils of the disastrous and wanton measure of which they complain, and they will not sub mit to its continued operation without resentment They are perfectly willing for President Jackso to play whatever political freaks he pleases; they care little whom he punishes in the distributio of offices and patronage; but they insist, that h shall permit the currency, the heart's blood o the country, to flow quietly and regularly in it natural channels, instead of continually derang ing and obstructing it by his wild, whimsical, o revengeful experiments.—*Louisville Jour.*

During Gen. Jackson's late visit to Nashville he was called on by an old personal friend, B. S. Cardwell. Mr. C. was for Judge White, an Gen. J. insisted strongly on his going over to Va Buren. 'If you were my friend,' said the Gene ral, warming with the subject and rising upon hi feet, 'you would vote to please me—yes, sir, i you were my friend, and I requested it of you, yo would vote for my dog!!!' This was too much fo old Cardwell. A few days after he went to Mr Peyton's public dinner, where, having related the anecdote, he gave this expressive toast:— "Gen. Jackson—we love him, *but damn his dog.*"

*Ibid.*



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.

(a) Digital image for the sample article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(b) ID and category for the sample article provided by Gale


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      it.-'Cihe last New York Star has the following paragraph.-From
      the same source we learn how a corporation dinnller may be got
      up; it is an apt illustration of patriotism of the modcrri school-it
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      this Canal and Bankini 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 richl 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. </ocrText>
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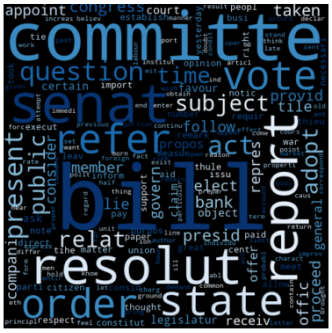
(c) Text file for the sample article provided by Gale

Figure 4: Sample article on the second page of *Indiana Journal* on October 22, 1836




(a) Legislative/fiscal topic


(b) Banking topic


(c) Market topic


(d) Governance topic


(e) Other topic

Figure 5: Tag clouds from K-means on articles within the three categories (business and finance, editorial and commentary, news) between 1830/01 and 1850/12 including at least one of the following keywords: stock(s), debt(s), bond(s), or securities.

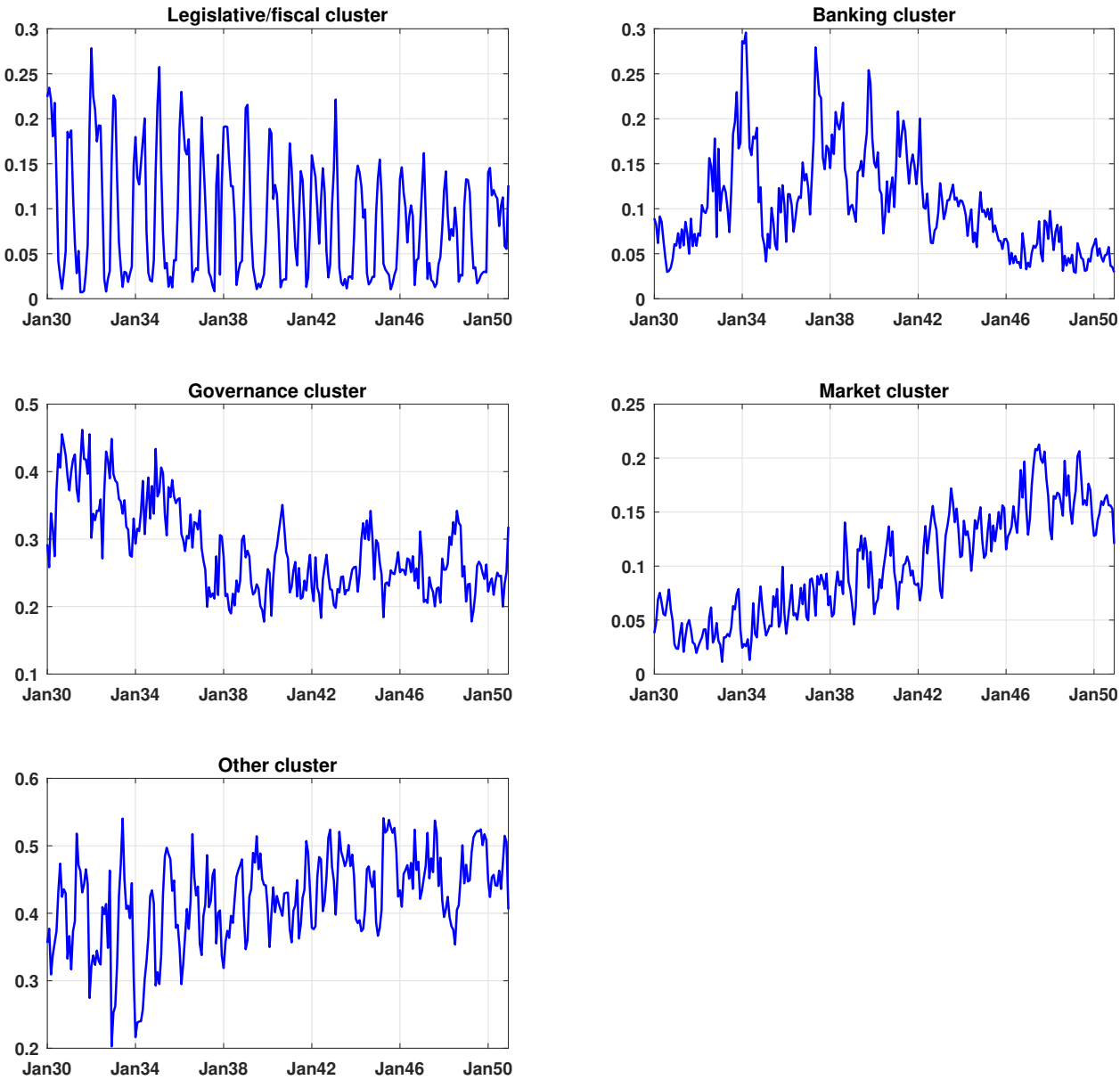



Figure 6: K-means: Share of articles for each topic at monthly frequency between 1830/01 and 1850/12.

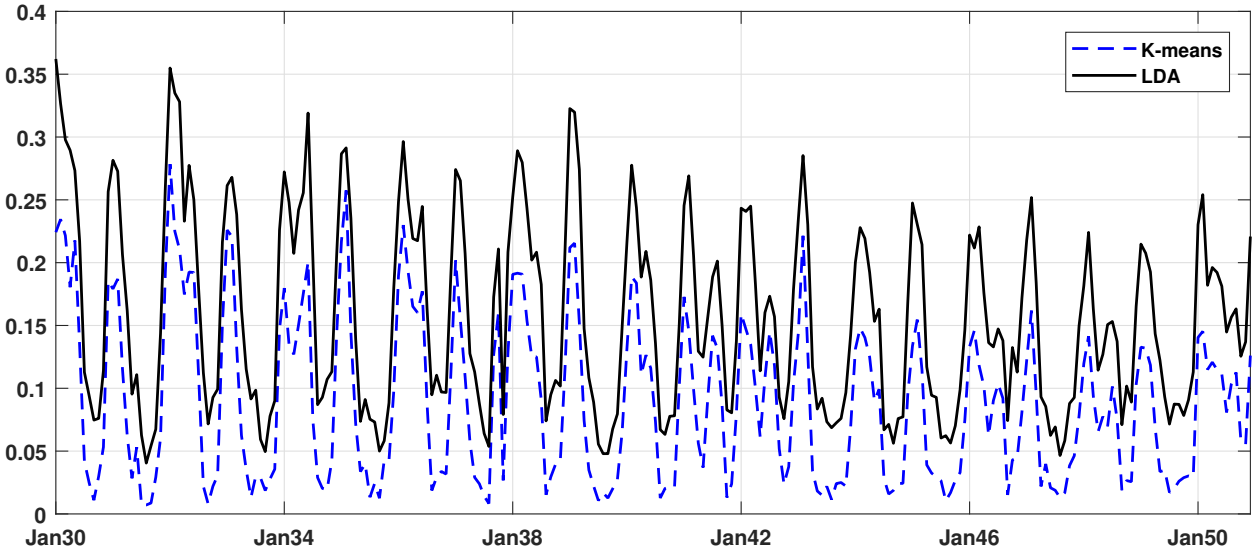



Figure 7: Compare aggregate fiscal information measures from K-means and LDA methods: measured by share of articles in the aggregate legislative/fiscal topics from both methods. Monthly frequency between 1830/01 and 1850/12.

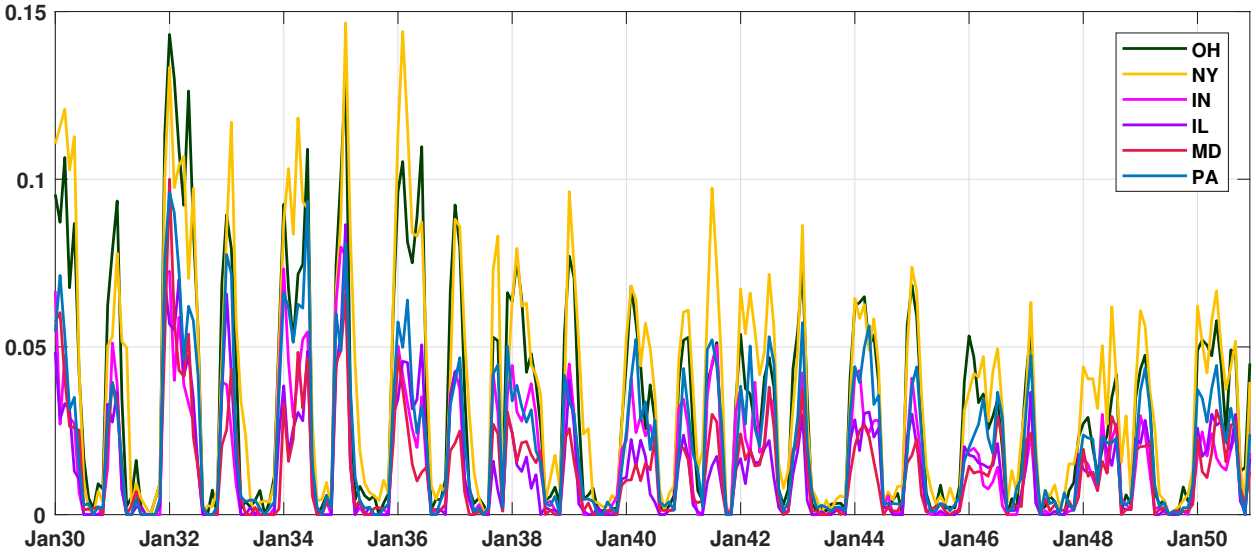



Figure 8: State-specific fiscal information index at monthly frequency between 1830/01 and 1850/12: measured by share of articles in the state-specific legislative/fiscal topics.

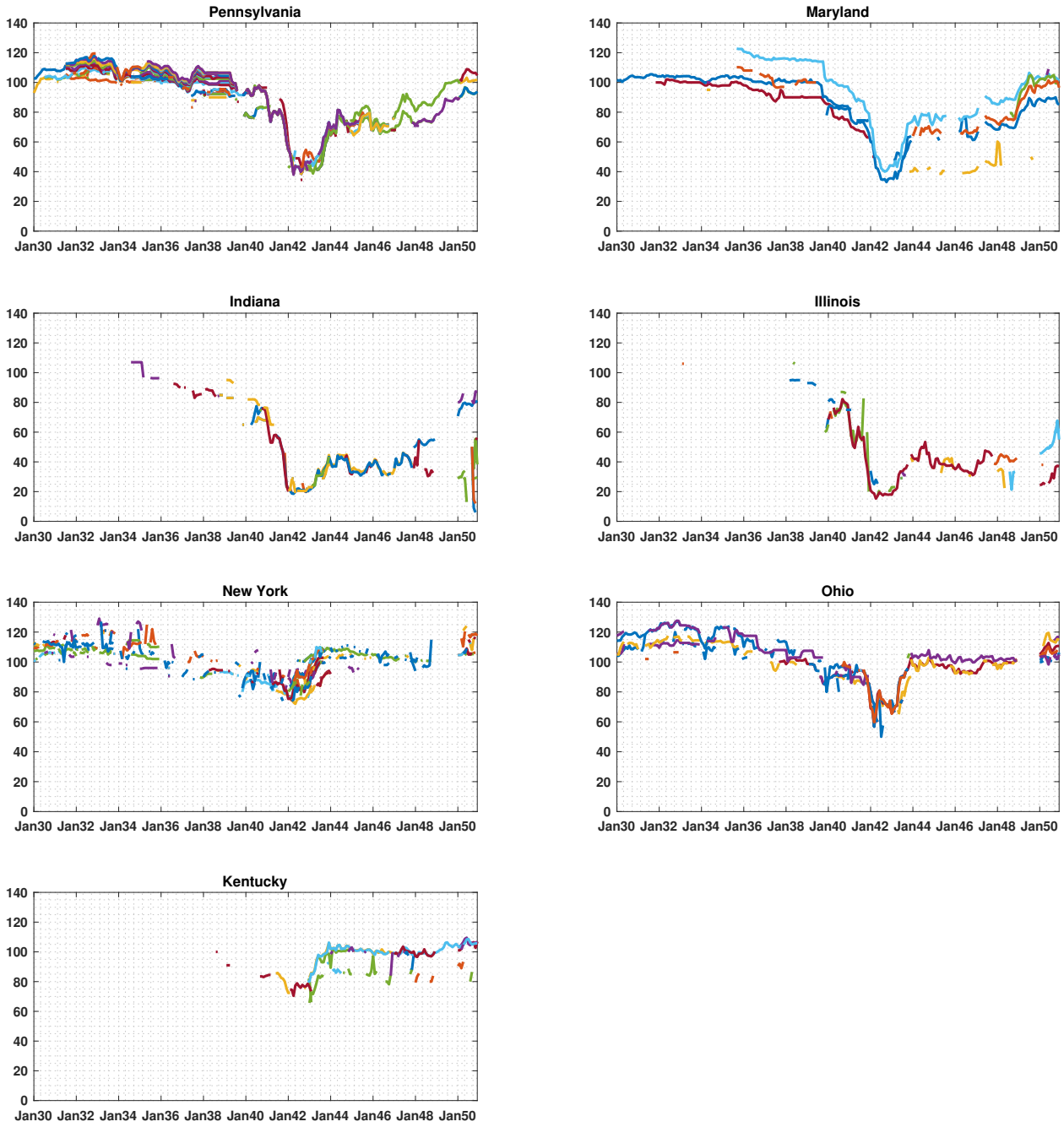



Figure 9: Bond prices for each individual bond across states at monthly frequency (1830/01 - 1848/12)

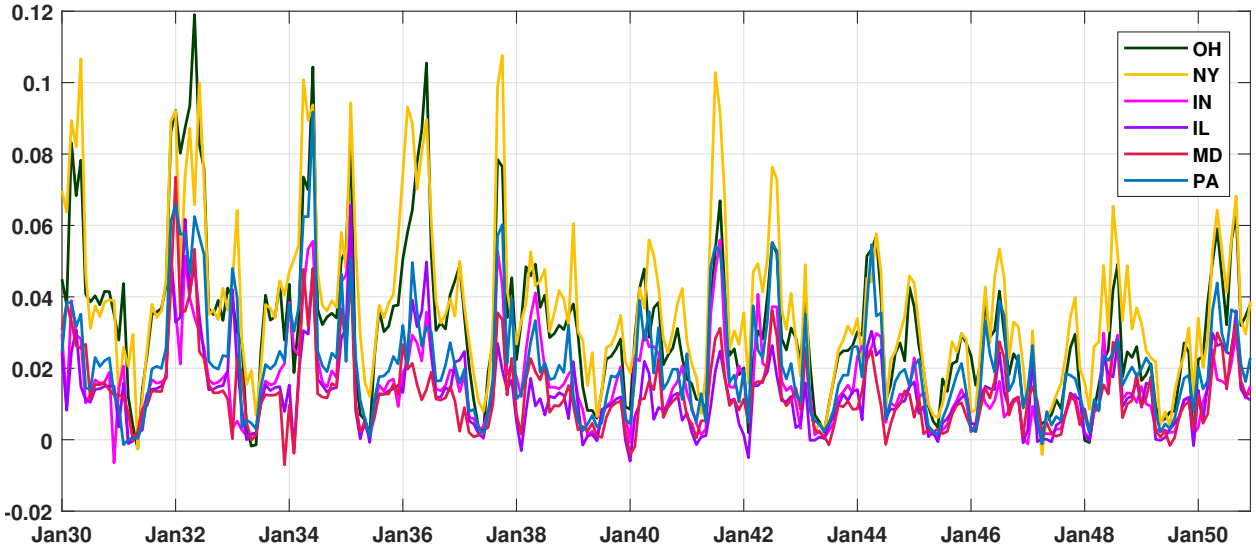



Figure 10: Seasonally adjusted State-specific fiscal information measures at monthly frequency between 1830/01 and 1850/12.

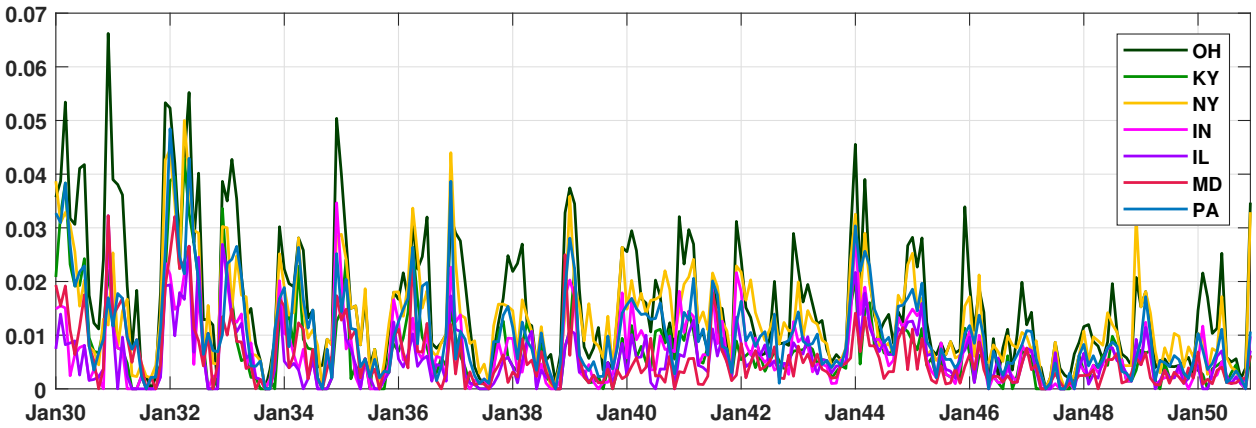



Figure 11: State-specific fiscal information measures from the dictionary approach. Monthly frequency between 1830/01 and 1850/12.

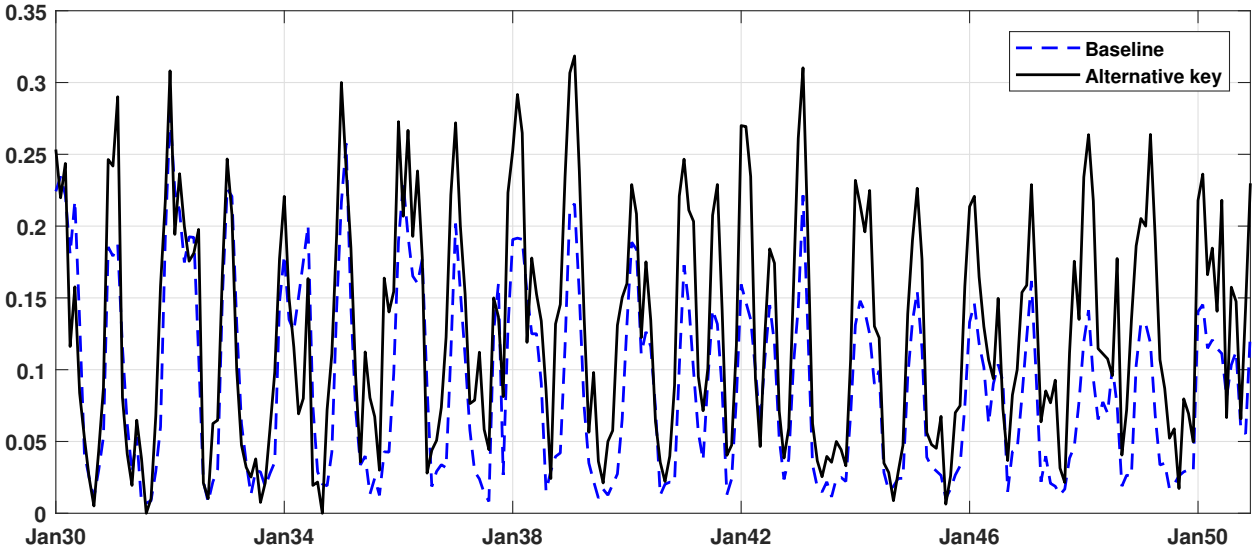



Figure 12: Compare aggregate fiscal information measures from the baseline case and the case with alternative approach in selecting articles. Monthly frequency between 1830/01 and 1850/12.