Public Pensions, Political Economy and State Government Borrowing Costs

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ABSTRACT

I find that public pension funding status has a robust and statistically significant relationship with state borrowing costs, as measured by credit default swap spreads. A one standard deviation increase in the net pension liability to GDP ratio is related to an 18 basis point increase in CDS spreads. This effect is most pronounced among states with constitutional protection for pension liabilities, suggesting the markets perceive these legal protections as material. I also find suggestive evidence that states with more powerful unions pay higher borrowing costs. Results are robust to using spreads from the underlying bonds themselves. These findings highlight the fact that states are already paying for potential future pension problems through higher borrowing costs.

JEL classifiation: G12, G18, H63, H74, H75

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The poor fiscal health of state and local governments has been a frequent headline topic following the recent financial crisis. Many municipal and state governments, such as Detroit and Illinois, have found themselves in fiscal trouble, increasing the likelihood of defaults on their obligations (or an actual default in the case of Detroit). Meanwhile, events in Puerto Rico display that "Municipal debt, state debt, federal debt, sovereign debt is not without risk."[1]. Researchers have highlighted that these fiscal troubles are often worse than reported due to large underfunded public pension liabilities. However, less attention has been paid toward quantifying how public pension liabilities are already affecting default risk, and consequently state borrowing costs.

In this paper I explore the relationship between fiscal conditions, public pensions, and state government credit default swap spreads as a measure state borrowing costs (henceforth referred to as spreads). I ask how much of the cross-state variation in spreads is due to differences in unfunded pension liabilities as opposed to other fiscal condition measures? Moreover, I investigate how the political economy of public pensions, in particular legal protections for pension liabilities and pensioner bargaining power, affects spreads.

Using reduced form cross-sectional regressions, I find a robust and statistically significant relationship between the level of pension liabilities and state CDS spreads. A one standard deviation difference in the net pension liabilities to GDP ratio for a state is associated with a 18 basis point higher CDS spread (or 28 basis point increase in bonded debt spreads), about 20% of the total average spread in my sample. The point estimate is similar to that for other long term debt liability coverage ratios. A instrumental variables exercise suggests this correlation is causal. Moreover, this relationship is much stronger in states with constitutional protections for pension liabilities. These results imply that markets are pricing off balance sheet pension risks, and that markets believe legal protections will matter for their implied seniority in the event of a default.

Additionally, I find suggestive evidence that states with higher union presence also have higher debt spreads. The direction of coefficients suggests that increased bargaining power may increase the "seniority" of pension liabilities in the event of a fiscal crisis. This suggests that pension liability priority in the event of a default is not a certain matter. Instead the relative recovery by both pensioners and debtholders will be the result of a state specific negotiation process. Finally, I show that debt spreads have a statistically significant relationship with local sub-state government

[1] "Puerto Rico Collapse Shows Debts Seen as Ironclad May Not Be," *Bloomberg*, May 4, 2017.

pension funding. State default risk is not only a function of state fiscal policies but also of the policies and conditions of municipalities over which they have some authority.

As part of my study I construct a panel dataset of state government fiscal conditions. I hand code revenue, expense, asset, and liability data from Comprehensive Annual Financial Reports (CAFRs) which are issued every year by each state, and are similar to corporate 10-K filings. I focus in particular on state balance sheet information, which is most salient for understanding debt pricing, and the overall fiscal health of a state. This dataset allows me to control for general fiscal conditions when exploring the relationship between pension liabilities and debt spreads, a concern highlighted by Novy-Marx and Rauh (2012).

My study presents a unique investigation of the relationships between various facets of fiscal conditions and state debt spreads. I separate long-term and short-term solvency concerns and their relationship with spreads. Moreover, I look at bonded debt and pension liabilities separately and explore the marginal contributions of each to current debt spreads. These findings are qualitatively and quantitatively meaningful for policy makers, as they describe the effect of fiscal policies on *current* borrowing costs, as well as future default likelihoods. The results also demonstrate the importance of municipal debt and pension legal structures as markets try to quantify default risk.

State Government Default and Public Pensions

Two background questions are crucial for interpreting my results. First, in the event of a fiscal crisis what would a state default look like, both legally and economically? Second, how could public pension liabilities affect default risk?

Current observed spreads suggest that current default probabilities may be higher than historical figures[2]. This is despite the fact that state government default is extremely rare in the United States. No state has defaulted since Arkansas during the Great Depression. Other than a handful of defaults during the Civil War, state government default is almost nonexistent. Even in the case of Arkansas, debtholders were eventually made whole. Given that state government debt to GDP ratios are much lower than most sovereigns, along with the wide taxing authority of states, the probability of actual default may appear unlikely. However, growing fiscal issues, particularly with regards to pension funding, may be changing this perception and contributing to higher borrowing

[2]See Schwert (2017) for a discussion of physical and risk-neutral default probabilities implied by state bond yields.

costs.

Even in the case of an insolvency there is currently no legal framework for state default. States are sovereign under the U.S. constitution and therefore cannot be sued, which rules out the possibility of bankruptcy hearings. Although, some legal scholars have argued for the need for such a structure (see e.g. Skeel (2013b)). Nevertheless, sovereigns (e.g. Argentina) have defaulted in the past and not been shut out of markets indefinitely. Recent events in Puerto Rico suggest that given a dire enough fiscal crisis, the US government may be willing to create legal structures to facilitate a default. Therefore, factors such as legal protections and relative bargaining power, which may affect recovery in a default, may also affect current spreads through market expectations.

While state government defaults are very rare, municipal defaults do occur. Whereas there is no legal structure for state bankruptcy, Chapter 9 of the bankruptcy code deals explicitly with municipal bankruptcy. Gao, Lee, and Murphy (2017) discuss the role of Chapter 9 protections at the state level on local municipal spreads, and I expand upon their analysis. The majority of recent default crises[3] have been triggered by idiosyncratic issues, which makes it difficult to generalize their structure to a potential state default. Although, in numerous cases there have been conflicts between public pension members and creditors. While it is true that in most cases pension liabilities have been protected relative to bondholder claims this has not been universal. Negotiations such as those in the Detroit bankruptcy may set a blueprint for how different claims may be handled in a state default.

Ultimately, both sovereigns and municipalities have defaulted on debt obligations, so there is no reason we should not expect the possibility of a state default at some point in the future. Given this possibility, it is vital for researchers to understand what markets perceive as the factors driving state default risk. Investigating these factors should provide information into market expectations of the likely structure of a state bankruptcy. This is also important for policy makers who must deal with higher borrowing costs now as a consequence of these issues.

In this paper when I discuss default, I refer to default on bonded debt. Bond yields and CDS spreads (which I use as a proxy for default risk and associated borrowing costs), are tied to default events on the underlying bond, not potential missed pension payments. Nevertheless, pension

[3] In recent years we've seen municipal bankruptcies in the municipalities of Bridgeport, CT, Central Falls, RI, Detroit, MI and Jefferson County, AL. For more discussion of municipal bankruptcy, see Spiotto (2008).

liabilities are a payment obligation for a state government. What is unclear in practice is the seniority of bonded debt vs. pension liabilities. As discussed by Skeel (2013a), the legal priority of bonded vs. pension debt is uncertain in municipal bankruptcies, and would be in the case of state issues.

Outcomes for bondholders and pension holders are generally municipal specific, and depend on court preferences and relative bargaining power of the two parties. I investigate market views of the implied seniority of each obligation in state debt markets. Even if bonded debt is more senior, pension payments divert resources that could otherwise be used to service debt, thus leading to higher default probabilities, or losses given default. This should result in higher borrowing costs for states with larger uncovered pension liabilities.

Brown and Wilcox (2009) highlight the fact that certain state constitutions have explicit protections for public pension liabilities. The relationship between pension liabilities, debt liabilities, and spreads indicates the importance of each to investors in assessing default risk. I use public union membership, and political donations as proxies for the bargaining power of those pension "debtholders" in the event of a fiscal crisis. Detroit, for example, eventually filed for bankruptcy after failing to renegotiate their pension obligations. Thus, states with stronger union presence may implicitly have more "senior" pension liability claims.

States also oversee numerous municipal governments which carry their own pension liabilities. These liabilities may have a "crowding-out" effect on state governments if the state were willing to step in to help municipalities in a crisis. Gao et al. (2017) discuss that certain states are more "proactive" in dealing with local fiscal crises and Chapter 9 bankruptcies. They show that municipalities in proactive states have lower spreads, given the lower likelihood of default (or higher recovery rates) that results from the institutional oversight. I investigate the interaction of these policies with local pension funding, while focusing on the effects of these policies on a state's own debt, not that of its municipalities. If states will need to divert resources to help municipalities meet pension obligations, this may have an adverse effect on their own default risk.

Literature Review

My paper's main contribution is to the literature on explaining the determinants of municipal bond spreads, and more specifically state CDS spreads. Despite the large literature on corporate and sovereign CDS, there is a lack of research looking specifically U.S. state level CDS, despite the important policy implications. To my knowledge the only paper that looks at these contracts in depth is Ang and Longstaff (2013). The authors focus on the "systemic" component in spreads both among U.S. states and also within Euro countries. Their results suggest that systemic risk explains a very small (12% on average) proportion of overall credit risk. I focus on the drivers of differences in spreads across states, which is not touched upon by Ang and Longstaff (2013).

There does exist a literature on determinants of municipal bond yields. However, the majority of this research revolves around either liquidity or the incorporation of tax benefits in prices. However, recent work by Schwert (2017) shows that default risk, not liquidity, is the main driver of municipal (including state) bond yields. An obvious question arising from this finding is what drives cross-sectional and time-series variation in municipal default risk? My results suggest that longer-term solvency concerns are a large component of the variation, and that pension liabilities are seen as economically similar to debt obligations in relation to debt spreads.

Much of the previous literature on municipal debt focuses on isolated reduced form relationships with spreads. Butler, Fauver, and Mortal (2009), Gao and Qi (2013), Gao et al. (2017), and Poterba and Rueben (2001) explore the importance of political economy on municipal (both state and local government) bond yields. I expand on these studies by investigating the interplay between various facets political economy and pension funding and how they relate to state spreads. In particular I investiage how legal protections and union bargaining power may alter the relationship between pension funding and borrowing costs.

The other main area I contribute to is the literature on public pension liabilities. Recent research by Novy-Marx and Rauh (2009) and Novy-Marx and Rauh (2011) exposes the poor accounting practices for public pensions. They argue that outstanding liabilities are much larger than commonly reported, due to the use of poor discount rate assumptions. In another work, Novy-Marx and Rauh (2012) focus on the relationship between pension funding ratios and debt spreads during the financial crisis. They discuss the need to control for general fiscal and economic trends if one was to expand their study. In this paper, I do just that. In collecting fiscal variables, I am able to control for state level trends that could confound with pension funding. I provide a more expansive look into the relationship between pension funding and debt spreads than in Novy-Marx and Rauh (2012).

The remainder of the paper is laid out as follows. First, in section II I describe the data for both spreads and more importantly state level finances. I spend some time documenting facts both in CDS prices, and state level finances, given the uniqueness of the data. Next, in section III I perform my main reduced regression analyses, exploring the relationship between fiscal conditions, pension funding, and spreads. In section IV I explore how constitutional protections for pension liabilities affect the relationship between spreads and pension funding. Next, in section V I explore the relationships between union membership, local pensions, political economy. and spreads. Finally, section VI concludes.

II. Data

In this section I present details on state government fiscal information, along with the CDS data I use to proxy for state borrowing costs. The data on state level finances allows me to investigate cross-sectional and time-series patterns in state finances. Additionally the state CDS market has been relatively understudied in the academic literature. Therefore, in addition to describing data construction I also present a number of facts related to spreads and fiscal conditions. All my results hold when using underlying bonds themselves, and more information on that data is presented in appendix A. Despite potential liquidity issues, I use CDS spreads in my main results given the standard nature of the contracts which helps eliminate confounding factors in my regression analyses.

A. Government Data

As mentioned in the introduction, there is a lack of compiled panel data on U.S. state level finances. To my knowledge, currently the only publically available semi-comprehensive source is the US Census State Finances data. Each year the Census asks state governments by survey to fill in a number of accounting variables, which are then compiled by the Census Bureau. However, the Census focuses primarily on revenue and expense variables. While these values capture government flows, they do not collect balance sheet information in a comprehensive manner. Balance sheet information is more instructive for assessing longer-term state fiscal health which may be more closely related to debt pricing. Because of this, I construct a dataset of state government finances in which I focus on balance sheet variables. This data allows me to separate the general effects of fiscal conditions from pension funding in assessing their relationship with debt spreads.

Each year state governments release a Comprehensive Annual Financial Report (CAFR). These reports reflect state government fiscal years that end June 30[4], and are similar to corporate 10-K filings. A CAFR contains a Statement of Net Position and Statement of Activities which are balance sheet, and income statement equivalents. I primarily use these two statements to construct the fiscal data. I focus on 2002-2016; beginning in 2002 GASB required a more standardized CAFR format. A more detailed explanation of my data construction can be found in appendix C. The summary statistics I present in the rest of the section are for the full sample of 27 states which have at least one valid CDS observation in the sample. Summary statistics for the full sample of all 50 states can be found in appendix D.

With this data I construct a number of relevant financial ratios. My data collection is similar to that done by the Mercatus Center in their 2015 and 2016 'Ranking the States by Fiscal Condition.' However, I expand on their analysis both by collecting many more years of data and also more detailed line items. I focus on three variables which capture different facets of state fiscal positions. All variables are scaled by GDP to adjust for the size of the overall state economy. Annual GDP data is taken from the BEA. Ultimately, states have unlimited taxing power, and GDP proxies for the size of the tax base which a state could feasibly rely on, both in normal times and in a fiscal crisis. I also present results with liabilities only scaled by revenue, and my results remain qualitatively similar[5].

The three fiscal control variables I focus on in my analyses are: Revenues - Expenes (Rev-Exp), Current Assets - Current Liabilities (CA-CL), and Long-term assets- Long-term Liabilities (A-LTL). Each variable is a "deficit" capturing current funding status of a different part of the government. Rev-Exp is the only non-stock variable I control for, and is meant to capture the relative inflow/outflow of money into the state coffers. CA-CL and A-LTL capture balance sheet obligations which the government will need to meet. Including both allows me to separate short-term vs. long-term solvency concerns as they are incorporated in debt pricing. Pension liabilities are discussed in more detail below as they are not collected from the CAFR.

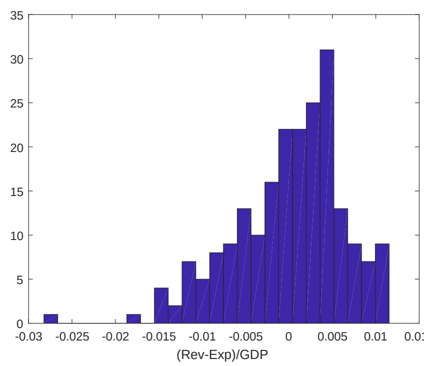
[4]The only exceptions are the following: Alabama, Michigan (Sep. 30), New York (March 31), and Texas (Aug. 31).

[5]The entire analysis could instead be performed with state income, and all the qualitative results would follow.

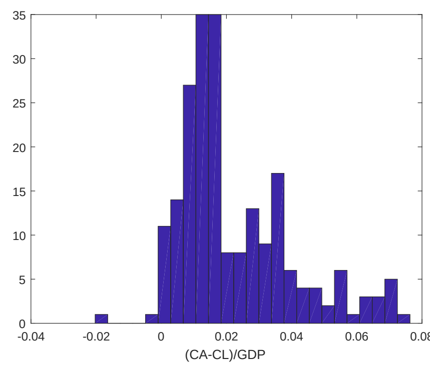
I supplement this data with pension funding ratios from the Public Plans Database (PPD) constructed by the Center for Retirement Research at Boston College. The data contains plan level asset and liabilities data by fiscal year. I aggregate by state and year to obtain a matching panel dataset. For each state I calculate the net pension liability as pension assets minus pension liabilities. [6]. Using this data allows me to separate pension funding effects from general government fiscal conditions in the pricing of state debt.

Figure 1: Financial Ratio Distributions: 2005-2016

Table 1 presents distributions of annual observations for the main explanatory variables used in the paper. The distributions represent fiscal data for all 27 states which have a valid CDS price over the period. A state need have a valid CDS spread for the given year to be represented here. The fiscal data for all observations can be found in appendix D. Rev represents total revenue, Exp is total expenses. CA and CL are current assets and liabilities respectively. A is long-term assets, and LTL is long-term liabilities. PA is pension assets and PA is pension liabilities. All variables are scaled by annual state GDP. Ratios are multiplied by 1000 for presentation.



(a)



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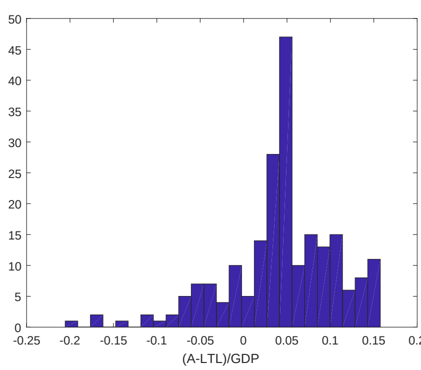

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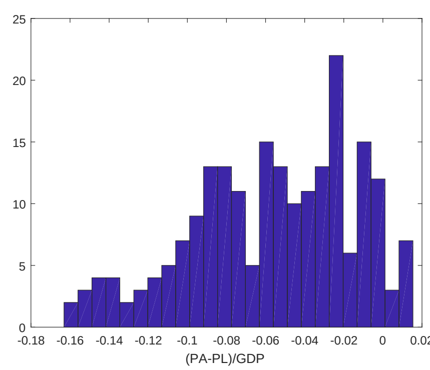

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[6]The PPD data uses GASB standards to calculate pension liabilities. That is, pension liabilities are generally discounted at the return of assets. As pointed out recently by Novy-Marx and Rauh (2009) this may drastically underestimate the value of pension liabilities given that they are in effect riskless. Many state constitutions include provisions preventing them from defaulting on public pension debt. Nevertheless, I maintain the pension liabilities as reported for this analysis. This assumption may change the magnitude of effects in my regressions but should not contribute to differences in statistical significance or overall exploratory power.

In the rest of the section I present summary statistics from this fiscal data and discuss certain cross-sectional and time-series patterns. As mentioned above, these statistics focus on 2005-2016 to match the time periods over which I have CDS data. In figure 1 I present the distributions of these statistics over the entire pooled sample. There is a large dispersion in these financial ratios, particularly the (PA-PL)/GDP ratio. The variation suggests a wide array of fiscal conditions across states.

Table I: Explanatory Variable Time Series Summary Statistics

Table I presents time-series summary statistics of annual observations for the main explanatory variables used in the paper. The distributions represent fiscal data for all 27 states which have a valid CDS price over the period. A state need have a valid CDS spread for the given year to be represented here. The fiscal data for all observations can be found in appendix D. Rev represents total revenue, Exp is total expenses. CA and CL are current assets and liabilities respectively. A is long-term assets, and LTL is long-term liabilities. PA is pension assets and PL is pension liabilities. All variables are scaled by annual state GDP. Ratios are multiplied by 1000 for presentation.

	(Rev-Exp)/GDP (x 1000)						(A-LTL)/GDP (x 1000)				
Year	Mean	StDev.	Min.	Med.	Max	Year	Mean	StDev.	Min.	Med.	Max
2005	2.33	0.00	2.33	2.33	2.33	2005	25.03	0.00	25.03	0.03	25.03
2006	1.64	0.00	1.64	1.64	1.64	2006	25.83	0.00	25.83	0.03	25.83
2007	3.32	7.06	-0.89	-0.63	11.47	2007	42.59	69.73	-15.83	0.02	119.78
2008	-1.61	4.55	-11.43	-1.03	6.29	2008	57.20	48.87	-30.94	0.05	144.01
2009	-8.42	5.71	-28.23	-8.48	-0.38	2009	51.53	50.94	-43.87	0.05	147.35
2010	-3.12	6.19	-15.39	-1.56	4.56	2010	49.90	58.75	-59.91	0.04	151.20
2011	1.59	5.29	-10.61	2.94	9.81	2011	46.84	59.20	-69.33	0.04	146.07
2012	1.71	5.51	-12.52	3.24	10.70	2012	46.85	60.67	-79.02	0.05	148.32
2013	3.12	5.46	-12.63	3.69	11.54	2013	43.96	59.58	-85.88	0.05	154.15
2014	2.73	5.28	-7.55	3.41	10.56	2014	44.39	61.57	-91.45	0.05	157.52
2015	3.05	4.74	-10.75	3.41	10.98	2015	22.33	92.06	-205.56	0.04	151.96
2016	2.02	4.68	-7.28	2.51	8.97	2016	13.87	83.29	-171.66	0.02	124.85

	(CA-CL)/GDP (x 1000)						(PA-PL)/GDP (x 1000)				
Year	Mean	StDev.	Min.	Med.	Max	Year	Mean	StDev.	Min.	Med.	Max
2005	10.03	0.00	10.03	10.03	10.03	2005	-26.56	0.00	-26.56	-26.56	-26.56
2006	12.09	0.00	12.09	12.09	12.09	2006	-25.93	0.00	-25.93	-25.93	-25.93
2007	16.31	5.39	11.21	15.79	21.95	2007	-33.39	21.63	-57.80	-25.78	-16.59
2008	25.08	20.34	-20.30	18.92	70.72	2008	-35.42	33.81	-89.29	-29.02	15.37
2009	20.44	17.60	1.01	14.73	68.83	2009	-48.01	39.68	-133.44	-46.87	14.52
2010	19.86	17.25	-1.39	12.74	67.58	2010	-52.76	39.86	-129.00	-48.48	12.09
2011	20.47	17.00	1.25	14.00	69.50	2011	-58.74	41.62	-134.93	-56.80	11.71
2012	22.12	17.50	2.78	15.01	71.09	2012	-63.16	43.41	-143.07	-60.05	12.07
2013	24.14	17.73	2.59	17.96	76.32	2013	-63.74	43.13	-145.40	-59.87	4.91
2014	24.24	17.26	2.40	17.54	70.11	2014	-62.35	42.97	-152.68	-56.46	-0.11
2015	24.70	18.29	2.12	17.58	63.41	2015	-62.52	43.33	-150.91	-57.45	-0.08
2016	25.85	20.98	0.63	16.23	61.53	2016	-79.91	52.06	-163.08	-58.93	-26.89

In table I I present annual summary statistics. For each of the four ratios, I display mean, standard devation, minimum, meadian, and max for each year in the sample. Unsurprisingly, we see worsening fiscal conditions in 2008 - 2010 during the Great Recession. Although, this is primarily true for long-term liabilities. (A-LTL)/GDP and (PA-PL)/GDP went down during the financial crisis. Moreover, they have remained at these elevated levels in the years since, and even gotten worseon average. Thus, the recession does not appear to be a blip in state government finances but rather has had lasting effects on fiscal positions. Shorter term liabilities in (CA-CL)/GDP and (Rev-Exp)/GDP did see a small decline during the financial crisis, but have returned to pre-recession levels. This is not surprising given the constitutional balanced budget requirements in 49 of the 50 states. State specific means and standard deviations for each ratio can be found in appendix D.

It is not shocking that fiscal positions worsened during the Great Recession. It is perhaps more surprising that long-term fiscal concerns have not improved since. This is particularly concerning for pension funding, given that so much attention has recently been directed towards the problems with underfunded pensions. Moreover, there is wide dispersion in fiscal conditions, which may be closely related to debt spreads and default risk. Observing fiscal conditions allows me to separate the relative impacts of different facets of government activity, pension funding in particular) on debt spreads, a task which I take up in the bulk of the paper.

B. CDS Data

A credit default swap (CDS) is a derivative contract in which the buyer purchases default protection on an underlying security from a seller. The buyer makes periodic (generally quarterly or semi-annual) payments to the seller until either the end of the contract term or the arrival of a pre-specified "credit event" related to the underlying debt contract. I prefer to look at CDS prices as opposed to state issued bonds for two principal reasons. First, daily CDS data are available while state bond price quotes are often stale and flat for long periods of time. Although, these are price quotes, and not actual traded prices. Additionally, bonds have numerous other features which affect spreads such as seniority, call options, and other guarantees. CDS on the other hand are standardized contracts with constant maturities which allows researchers to avoid adjusting for contractual specificities[7]. These factors make CDS a "purer" measure of default risk, which has been highlighted in the corporate CDS literature. Nevertheless, in appendix A I perform all my principal analyses using underlying bond spreads; my results are unchanged, and in many cases stronger. It is the case that the state CDS market has become less liquid throughout my sample. Moreover, the 27 states with traded CDS prices are certainly the states with more present fiscal issues which could potentially lead to a bias in the sample. However, given that my results are robust to using underlying bonds, I am not concerned about using CDS spreads for the main analyses.

I use daily spreads on five-year maturity CDS obtained from Markit. I focus on the five year maturity as these are the most liquid contracts. For the regression analyses in sections III and V I use annual spreads. To construct these I simply take the last daily observation in each given time period. The analysis is limited to 2005 - 2016 based on data availability. This sample size is almost double that used by Ang and Longstaff (2013). Moreover, I have a larger cross-section with 27 different states in the sample [8], while Ang and Longstaff (2013) were limited to only ten.

In table II I present summary statistics on monthly CDS spreads in the sample. Daily statistics can be found in table XXII in appendix D. The mean spread varies from 51.66 in Virginia to 176.89 in Illinois. California actually reached the highest monthly spread at 396.94 basis points. Illinois has the highest median spread indicating that they have had a longer period of high credit risk. The table shows significant variation in spreads as most states have standard deviations that are more than half of their means. Finally, there are large serial correlations month to month for all states. These data display a substantial amount of cross-sectional variation which warrants explanation. Moreover, the high serial correlation suggests the presence of a slow moving common factor driving spreads across states, a fact which I confirm in appendix B.

The time-series of spreads suggests a high level of correlation between states, and I quantify these correlations in figure 2. A full correlation table is found in table XXIII. This histogram plots the distribution of all unique pairs of correlations between the states. The figure shows

[7] The International Swaps and Derivatives Association (ISDA) sets forth standard contract terms which are used for CDS agreements. Markit uses a standardized methodology to collect quotes for prices, and interpolate to constant maturity values.

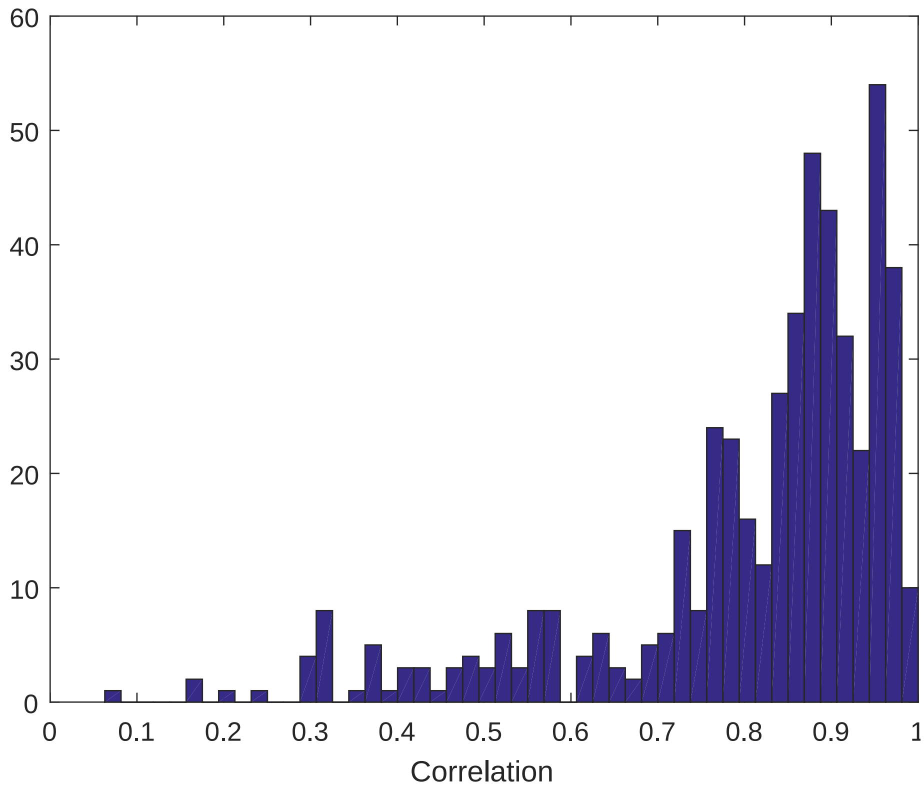
I use quotes from the restructuring clause definition, which is the most traded clause for sovereign CDS.

[8] States with valid data are: Alabama, California, Connecticut, Delaware, Florida, Georgi, Hawaii, Illinois, Massachusetts, Minnesota, Mississippi, Maryland, New Jersey, Nevada, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Utah, Washington, and Wisconsin.

Figure 2:

CDS Correlation Distribution

Figure 2 presents the distribution of correlation coefficients for daily spreads for all states in the sample. Pairwise correlation coefficients are calculated using all the days for which the two states both have valid data. The distribution is based on all unique pairwise combinations.



a high degree of correlation between states. However, it also displays a large number of pairwise correlations that are not close to one (although none are actually negative). The average correlation is 0.8 with a standard deviation of 0.18. This implies a high degree of commonality between states, an observation I quantify in appendix B. However, there is still sufficient deviation at the state level (as also discussed in Ang and Longstaff (2013))which warrants investigation.

Table II: Monthly State CDS Summary Statistics

Table II presents summary stats from monthly CDS data. Monthly CDS values for each state are taken from Markit as the last valid observation each month. CDS spreads are Markit quotes on the five-year maturity contract with restructuring clause. Time period covered is 2005 - 2016.

	Mean	StDev.	Min	Median	Max	Serial Correlation	N
CA	109.57	96.20	5.45	77.30	396.94	0.94	148.00
MA	78.01	44.87	7.50	68.26	214.50	0.90	113.00
VA	51.66	27.63	13.00	44.33	154.00	0.87	99.00
IL	176.89	91.41	7.00	179.65	359.07	0.95	119.00
MI	113.24	75.94	29.08	80.43	356.00	0.93	110.00
AL	101.93	21.97	65.26	99.52	168.00	0.62	33.00
CT	110.74	36.40	25.00	105.86	204.62	0.72	100.00
DE	54.22	27.38	14.71	50.50	147.00	0.85	85.00
FL	78.19	47.88	11.82	56.42	220.00	0.92	112.00
GA	55.97	26.71	26.22	53.50	132.00	0.84	93.00
HI	99.00	52.79	23.00	94.17	350.00	0.79	99.00
MN	51.37	26.32	5.00	44.94	128.50	0.88	106.00
MS	103.82	22.40	36.50	106.75	182.00	0.66	101.00
MD	52.31	27.62	6.00	42.99	137.75	0.88	107.00
NJ	123.72	63.86	6.23	127.30	287.59	0.91	111.00
NV	100.58	70.20	17.74	84.19	345.00	0.93	106.00
NY	83.47	70.16	4.33	51.59	317.50	0.94	124.00
NC	53.40	29.80	7.50	45.49	145.50	0.87	103.00
OH	81.07	42.37	25.00	62.09	212.23	0.91	110.00
PA	83.13	34.92	11.50	87.75	158.50	0.90	110.00
RI	96.70	37.81	43.21	103.28	173.23	0.91	54.00
SC	55.16	31.27	10.50	42.00	143.00	0.88	107.00
TN	90.17	36.33	44.00	82.50	150.00	0.77	21.00
TX	55.22	32.88	8.00	45.04	167.50	0.91	114.00
UT	48.57	26.81	11.50	41.17	147.00	0.87	98.00
WA	66.55	34.80	19.50	67.75	153.00	0.93	94.00
WI	69.00	42.54	16.63	63.87	172.00	0.87	102.00

III. Debt Spreads and Pension Liabilities

In the remainder of the paper, I study the relationship between state spreads and public pensions. Given that state government fiscal data corresponds to the end of the fiscal year, I match CDS spreads to the date of the end of each fiscal year. This results in a panel of 212 observations across 27 states from 2005-2016[9]. I perform a number of reduced form regressions with spread levels on the left hand side and the ratios described above on the right hand side. Using variables that differentiate short term and long term liabilities, and bonded vs. pension liabilities allows me to assess what time horizons investors are most concerned with when assessing default risk, and the special role of pension liabilities in debt pricing.

For robustness, I also use traded municipal bond data in place of CDS spreads. This sample runs from 2002-2016 and has 12578 annual bond observations across 42 states. When using individual bonds, I control for additional characteristics specific to each issue. The municipal bond robustness analyses, along with a fuller data description, can be found in appendix A. I focus solely on the CDS results in the main body of the paper. There are no qualitative differences when using the bond data.

The general specification I use is the following:

$$CS_{i,t} = \alpha_t + \beta \frac{PA - PL}{GDP} + \gamma^{'} X_{i,t} + \epsilon_{i,t} \tag{1}$$

where X includes the ratios discussed above: (Rev-Exp)/GDP, (CA-CL)/GDP, and (A-LTL)/GDP. The time fixed effects control for annual unobserved common variation across states. Alternatively, I could use the U.S. CDS spread since that is closely related to common time series variation as I show in appendix B; doing so would not change the results. Additionally, rather than scaling by GDP, I could use state level income or revenue and results would not change. For some specifications I cluster standard errors at the state level to account for unobserved state-level heterogeneity across time which is not captured by other explanatory variables.

My main specification includes only the four principal ratios above to understand the marginal contributions of each component. Next, I look at liability ratios along for each variable (e.g. PL/Rev). Finally, I control for economic conditions in states, to separate fiscal health/policy from

[9]Results are unchanged if using the average spread in the last month of each fiscal year.

economic trends. As mentioned above, all variables are scaled by state GDP as states with larger economies may be able to bear more substantial deficits over short periods of time given their ability to generate revenue from larger income bases. This helps standardize deficits across state of varying sizes. Additionally, I scale all non-dummy variables by their full sample standard deviation. Coefficients can be interpreted as the marginal change in debt spread (in basis points) for a one standard deviation change in the right hand side variable. Results for my main specification with simple ratios are in table III. Equivalent bond results are in table XIII in appendix A.

Table III: CDS Spreads and Fiscal Ratio Regressions

Table III presents results from reduced form regressions of annual state CDS spreads on fiscal condition variables. Each column indicates the numerator of the right hand side variable, which is then scaled by state-level GDP. The sample is based on annual data, where spreads are picked to match the end of fiscal years. Rev represents total revenue, Exp is total expenses, CL is current liabilities, NCL is noncurrent liabilities, PL is pension liabilities, CA is capital assets, and PL Local is local (i.e. non-state level) pension liabilities. Columns 3 and 4 include annual year fixed effects. All non-dummy variables are scaled by their sample standard deviations. Thus, a coefficient represents the marginal effect of a standard deviation in the right hand side variable on the debt spread in basis points. Columns 2 and 4 standard errors are clustered at the state level. Within R^2 is the R^2 once controlling for annual fixed effects (i.e. cross-sectional R^2). R^2 is adjusted R^2.

	(1)	(2)	(3)	(4)
Rev-Exp	-31.30***	-31.30***	-8.780	-8.780*
	(-6.28)	(-5.12)	(-1.87)	(-2.26)
CA-CL	-5.886	-5.886	-3.416	-3.416
	(-1.66)	(-1.25)	(-0.97)	(-0.74)
A-LTL	1.166	1.166	-13.20**	-13.20*
	(0.26)	(0.19)	(-3.15)	(-2.64)
PA-PL	-19.04***	-19.04**	-17.94***	-17.94**
	(-5.07)	(-3.32)	(-5.50)	(-3.26)
N	212	212	210	210
R^2	0.351	0.351	0.611	0.611
Within R^2			0.346	0.346
Year FE	No	No	Yes	Yes
Cluster	-	State	-	State

t statistics in parentheses

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

Unsurprisingly, the regressions without fixed effects explain a smaller fraction of the variation in spreads. Given that these exclude any common time-series component, the balance sheet variables have lower exploratory power. Still, with an R^2 value of 0.351, I am able to explain a significant fraction of the variation in spreads using only these fiscal ratios. The fixed effects regressions have much larger explanatory power with an R^2 value of 0.611. This explanatory power is consistent with that in studies of sovereign spreads which also have strong common components. And the within R^2 is 0.346, which indicates I can explain over 34% of the variation across states *after* controlling for common time trends. Overall I am able to use a relatively parsimonious model to explain a large amount of the variation in spreads. These R^2 results are similar to studies of both corporate and sovereign spreads.

More important than explanatory power, is the magnitude and direction of the estimated coefficients. Qualitatively, the directional effects of each variable are consistent with basic intuition. All ratios enter with a negative sign, as one would expect. Higher deficit ratios indicate a state that is in "better" fiscal position as their assets can better cover liabilities. Thus, higher ratios should be associated with lower default risk. This is confirmed in the data.

The coefficient on the pension funding ratio is the most consistently statistically significant across specifications. The coefficient on the non-current deficit is also statistically significant for the fixed effects regressions. These two coefficients are similar in magnitude as well. For PA-PL, the coefficient indicates that a state/year observation with a one standard deviation higher PA-PL ratio is associated with a 18 bp lower spread. Similarly a one standard deviation higher A-LTL ratio is associated with a 13 bp lower spread. This implies that investors see pension liabilities and bonded liabilities similarly when assessing state level default risk. The inflow ratio (Rev-Exp) is statistically significant in all but specification 3 indicating that this variable does have a modest effect on spreads.

There are two main take-aways from these results. First, I am able to explain a decent amount of variation (both time-series and cross-sectional) with a relatively parsimonious model. These within R^2 numbers are consistent with studies that lok at reduced form explanations of corporate CDS spreads. Second, longer term liabilities appear to be most relevant for investors in assessing default risk and pricing state CDS. Both noncurrent and pension liabilities show robust statistical significance across specifications. Moreover, they have roughly equal economic magnitude with one standard deviation changes in each being associated with 13 and 18 bp changes in spreads respectively.

Next, I verify that these results are consistent when only looking at the level of liabilities (i.e.

not the deficits). To do so, I run regressions using only the liability portion of the deficit divided by revenue on the right hand side. Here I include one additional variable, capital assets. This proxies for the ability of the government to raise revenue going forward as a function of its capital assets (e.g. roads and other infrastructure). Results are in table IV.

Table IV: CDS Spread and Liability/Revenue Ratio Regressions

Table IV presents results from regressions of annual state spreads on fiscal condition ratios. Each column indicates the numerator of the right hand side variable, which is then scaled by state-level revenue. The sample is based on annual data, where spreads are picked to match the end of fiscal years. Rev represents total revenue, Exp is total expenses, CL is current liabilities, NCL is noncurrent liabilities, PL is pension liabilities, CA is capital assets, and PL Local is local (i.e. non-state level) pension liabilities. Columns 3 and 4 include annual year fixed effects. All non-dummy variables are scaled by their sample standard deviations. Thus, a coefficient represents the marginal effect of a standard deviation in the right hand side variable on the debt spread in basis points. Columns 2 and 4 standard errors are clustered at the state level. Within R^2 is the R^2 once controlling for annual fixed effects (i.e. cross-sectional R^2). R^2 is adjusted R^2.

	(1)	(2)	(3)	(4)
Expenses	35.42***	35.42***	16.41***	16.41**
	(7.38)	(6.73)	(3.44)	(3.12)
Current Liabilities	7.332	7.332	11.26***	11.26
	(1.42)	(0.91)	(3.65)	(1.58)
Noncurrent Liabilities	5.649	5.649	12.63***	12.63
	(1.08)	(0.80)	(3.45)	(1.99)
Pension Liabilities	12.17**	12.17**	13.62***	13.62**
	(3.29)	(3.48)	(4.82)	(3.19)
Capital Assets	6.796	6.796	1.613	1.613
	(1.55)	(1.06)	(0.46)	(0.26)
N	212	212	210	210
R^2	0.366	0.366	0.641	0.641
Within R^2			0.395	0.395
Year FE	No	No	Yes	Yes
Cluster	-	State	-	State

t statistics in parentheses

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

Table IV confirms the deficit results. When using only the liabilities on the RHS, results are qualitatively unchanged. Again, the LTL and PL viarables have similiar coefficient sizes. The economic magnitude remains very similar; the LTL is almost unchanged, while the PL analogue has decreased slightly in absolute terms.[10]. Under this specification pension liabilities remain robustly statistically significant while the long-term liabilities are just barely below the 95% significance level in specification four. Finally, the expense/revenue ratio is now robustly significant across specification and of similar magnitude to the other two variables.

An additional concern with the above specifications concerns the relationship between fiscal health and economic conditions. A government's finances are necessarily driven by economic conditions within a state. My results may only be capturing the effects of good (or bad) economic times on debt spreads. Therefore, in the next table I control for economic conditions separately. Dividing each liability number by GDP does this in part, but only captures part of the economic environment. The Federal Reserve of Philadelphia constructs monthly economic indicators at the state level which combine various measures of the local economies including unemployment, output, and income. This is a more comprehensive measure of local economic conditions. I add these state specific indicators, along with the Case-Shiller housing price index, at an annual frequency to the main specifications below in table V. Bond data results can be found in table XII.

These results show that I am not merely picking up economic trends. The coefficients on non-current liabilities and pension liabilities are relatively unchanged and remain statistically significant at the 5% level. This alleviates concerns that I am confounding fiscal health which controlled by policy makers, with overarching economic conditions. One final concern, is that these results could be driven by small states, and thus the results may not be applicable across the diverse set of states. To check this, I perform a weighted least squares regression where I weight each observation by the amount of debt outstanding for each state. These results can be found in table VI. The results are again consistent, showing that this is not a concern.

[10]These are now positive coefficients as I now use the liabilities side as opposed to the asset-liability deficit.

Table V: CDS Spread and Fiscal Deficit Regressions with Economic Indices

Table V presents results from reduced form regressions of annual state spreads on fiscal condition deficit variables. Each column indicates the numerator of the right hand side variable, which is then scaled by state-level revenue. The sample is based on annual data, where spreads are picked to match the end of fiscal years. Rev represents total revenue, Exp is total expenses, CL is current liabilities, NCL is noncurrent liabilities, PL is pension liabilities, CA is capital assets, and PL Local is local (i.e. non-state level) pension liabilities. Columns 3-5 include annual year fixed effects. All non-dummy variables are scaled by their sample standard deviations. Thus, a coefficient represents the marginal effect of a standard deviation in the right hand side variable on the debt spread in basis points. Columns 2, 4, and 5 standard errors are clustered at the state level. Econ. Index is the state economic index calculated by the Philadelphia Fed. Housing Index is the Case-Shiller HPI Index. Within R^2 is the R^2 once controlling for annual fixed effects (i.e. cross-sectional R^2). R^2 is adjusted R^2.

	(1)	(2)	(3)	(4)	(5)
Rev-Exp	-27.68***	-27.68***	-8.480	-8.480	-13.33**
	(-5.05)	(-4.16)	(-1.78)	(-2.06)	(-2.89)
CA-CL	-5.101	-5.101	-3.343	-3.343	-2.783
	(-1.40)	(-0.95)	(-0.95)	(-0.70)	(-0.50)
A-LTL	-0.902	-0.902	-13.28**	-13.28*	-12.74*
	(-0.20)	(-0.16)	(-3.16)	(-2.69)	(-2.73)
PA-PL	-16.95***	-16.95**	-17.45***	-17.45**	-15.64**
	(-4.27)	(-2.84)	(-4.99)	(-3.08)	(-3.18)
Econ. Index	-7.725*	-7.725	-1.491	-1.491	-0.459
	(-2.19)	(-1.65)	(-0.40)	(-0.30)	(-0.09)
Housing Index					-9.100
					(-1.73)
N	212	212	210	210	210
R^2	0.358	0.358	0.610	0.610	0.621
Within R^2			0.343	0.343	0.361
Year FE	No	No	Yes	Yes	Yes
Cluster	-	State	-	State	State

t statistics in parentheses

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

Table VI: CDS Spread and Fiscal Deficit Regressions - Debt Weighted

Table VI presents results from weighted OLS regressions of annual state spreads on fiscal condition deficit variables. Each observation is weighted by the total amount of bonded debt in each state. Each column indicates the numerator of the right hand side variable, which is then scaled by state-level revenue. The sample is based on annual data, where spreads are picked to match the end of fiscal years. Rev represents total revenue, Exp is total expenses, CL is current liabilities, NCL is noncurrent liabilities, PL is pension liabilities, CA is capital assets, and PL Local is local (i.e. non-state level) pension liabilities. Columns 3 and 4 include annual year fixed effects. All non-dummy variables are scaled by their sample standard deviations. Thus, a coefficient represents the marginal effect of a standard deviation in the right hand side variable on the debt spread in basis points. Columns 2 and 4 standard errors are clustered at the state level. Within R^2 is the R^2 once controlling for annual fixed effects (i.e. cross-sectional R^2). R^2 is adjusted R^2.

	(1)	(2)	(3)	(4)
Rev-Exp	-50.47***	-50.47**	-10.36	-10.36
	(-4.43)	(-3.69)	(-1.55)	(-1.40)
CA-CL	-12.50*	-12.50	-11.31*	-11.31
	(-1.98)	(-1.27)	(-2.44)	(-1.40)
A-LTL	13.02	13.02	-12.33	-12.33
	(1.56)	(1.03)	(-1.96)	(-1.49)
PA-PL	-20.88**	-20.88*	-17.28***	-17.28*
	(-3.27)	(-2.74)	(-3.57)	(-2.42)
N	211	211	209	209
R^2	0.399	0.399	0.654	0.654
Within R^2			0.319	0.319
Year FE	No	No	Yes	Yes
Cluster	No	No	No	No
cluster	-	State	-	State

t statistics in parentheses

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

So far, these results do not imply anything about causality. To understand the causal relationship between pension funding and spreads, I implement an instrumental variables approach. In table VII I present the results from this IV specification. I instrument for the pension funding ratio using the return on pension assets. The identifying assumption in this regression is that the return on pension assets is not correlated cross-sectionally with any fiscal decisions that may affect debt spreads. That is, the return on assets is an exogenous shock to pension funding that does not itself affect spreads directly. A similar instrument was used in Shoag (2013). The negative and statisticaly significant coefficient on the pension funding ratio suggests that previous results are in

Table VII: CDS Spread and Fiscal Deficit Regressions - IV

Table VII resents results from a two-staged least squares regression of annual state spreads changes on changes in fiscal deficit variables, along with two non-IV regressions in changes. Changes in the pension funding ratio (PA-PL) are instrumented with the return on pension assets in the year. Each column indicates the numerator of the right hand side variable, which is then scaled by the change in state-level GDP. The sample is based on annual data, where spreads are picked to match the end of fiscal years. Rev represents total revenue, Exp is total expenses, CL is current liabilities, NCL is noncurrent liabilities, PL is pension liabilities, CA is capital assets, and PL Local is local (i.e. non-state level) pension liabilities. All non-dummy variables are scaled by their sample standard deviations. Thus, a coefficient represents the marginal effect of a standard deviation in the right hand side variable on the debt spread in basis points. Within R^2 is the R^2 once controlling for annual fixed effects (i.e. cross-sectional R^2). R^2 is adjusted R^2.

	(1)	(2)	(3)
Δ R-E	-7.665	-6.789	-16.05*
	(-1.44)	(-1.21)	(-2.23)
Δ CA-CL	-2.867	-2.933	4.671
	(-1.21)	(-1.34)	(0.50)
Δ A-LTL	-5.383**	-4.974*	-7.272
	(-2.99)	(-2.72)	(-1.42)
Δ PA-PL	-6.246	-5.418	-123.7***
	(-1.57)	(-1.17)	(-4.08)
Pension Return		-23.59*	
		(-2.18)	
N	184	183	185
Year FE	Yes	Yes	Yes
Cluster	State	State	State
IV			Pens. Ret.

t statistics in parentheses

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

fact causal. Note that this regression is performed in changes as opposed to levels given that the pension return instruments for *changes* in the pension funding ratio, not the level itself.

My results show that noncurrent and pension liabilities as a share of GDP have a robust statistically significant relationship with credit spreads. Moreover, these relationships are similar in terms of economic magnitude: 13 and 18 bp for a one standard deviation change respectively, accounting for about 20% of the average total spread. The results in table V show that these findings are not driven solely by underlying economic conditions. My simple specification is able to explain a significant amount of variation in credit spreads, which highlights the importance of fiscal health, which is often driven by political decisions, in assessing default risk. In the next two sections I perform a deeper exploration of public pensions and spreads by looking at various facets that relate to the political economy of pensions.

IV. Constitutional Pension Liability Protections

As I discussed in the introduction, the legal priority of pensions in a state default event is an open question. However, certain states do provide explicit protections in their constitutions for pension liabilities. For more details see Brown and Wilcox (2009). I use the classification of Munnell and Quinby (2012) to define legal protections for pensions. Explicit Protection is defined as states who explicitly have clauses in constitutions protecting pension liabilities. I also have a "Protected" flag for all states that also have contract protection clauses (but not explicitly for pensions) in their state constitutions. I interact these dummy variables with the pension funding ratios to understand if the effect of pension debt on spreads is higher in states with more legal protections for these liabilities. Results from these regression are presented in table VIII.

The Protected variable is only zero for three states in the CDS data, so in this case the municipal bond data may be more informative. These results can be found in table XIV in appendix A. Results on the interaction coefficients show that these pension liability effects on spreads are stronger in states with protections for these liabilities. In fact these states explain almost the entirety of the cross-sectional relationship between spreads and pension funding. The negative coefficients indicate a marginal effect of the pension funding ratio in these states. Moreoever, specification 3 sugests that the effect of pension funding ratios is limited to states with constitutional protections given that the coefficient on PA-PL is then close to zero and not statistically significant.

This suggests that markets believe these legal protections do matter for forming expectations regarding default probabilities and recovery rates. In a state with more "senior" pension liabilities, the government is likely to default on bonded debt before pensions. This increases their default risk for a given level of pension liabilities, as these obligations have priority. This highlights the importance for policy makers to consider the legal struture around state default and how that may affect borrowing conditions today along with events during a fiscal crisis.

Table VIII: CDS Spreads and Constitutional Pension Protections

Table VIII presents results from reduced form regressions of annual state debt CDS spreads on fiscal condition variables, along with two non-IV regressions in changes. The pension funding ratio (PA-PL) is instrumented with the return on pension assets in the year. Each column indicates the numerator of the right hand side variable, which is then scaled by state-level GDP. The Econ. Index is the state level economy index constructed by the Federal Reserve Bank of Philadelphia. The sample is based on annual data, where spreads are picked to match the end of fiscal years. Rev represents total revenue, Exp is total expenses, CL is current liabilities, NCL is noncurrent liabilities, PL is pension liabilities, CA is capital assets, and PL Local is local (i.e. non-state level) pension liabilities. Columns 3 and 4 include annual year fixed effects. All non-dummy variables are scaled by their sample standard deviations. Thus, a coefficient represents the marginal effect of a standard deviation in the right hand side variable on the debt spread in basis points. Exp. Prot. represents states with explicit protections for pension liabilities in their state constitutions, while Protected are states with any constitutional contract protection for pension liabilities. Columns 2 and 4 standard errors are clustered at the state level. Within R^2 is the R^2 once controlling for annual fixed effects (i.e. cross-sectional R^2). R^2 is adjusted R^2.

	(1)	(2)	(3)
Rev-Exp	-8.780*	-5.319	-8.605
	(-2.26)	(-1.29)	(-2.06)
CA-CL	-3.416	-2.730	-5.177
	(-0.74)	(-0.64)	(-1.08)
A-LTL	-13.20*	-13.77*	-15.26*
	(-2.64)	(-2.68)	(-2.63)
PA-PL	-17.94**	-12.88*	2.187
	(-3.26)	(-2.52)	(0.22)
Exp. Prot. x (PA-PL)/ GDP		-13.46	
		(-1.70)	
Prot. x (PA-PL)/ GDP			-21.27*
			(-2.15)
N	210	210	210
R^2	0.611	0.633	0.633
Within R^2	0.346	0.382	0.382
Year FE	Yes	Yes	Yes
State FE			
Cluster	State	State	State

t statistics in parentheses

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

V. Unions, Local Pensions, and Debt Spreads

In this section I perform additional analyses focusing on the political economy of public pensions and credit spreads. As discussed in the introduction, there is no clear legal framework for the seniority of public pensions vs. bonded debt in the event of a state fiscal crisis. Looking at variables which proxy for the seniority of pension obligations may be informative for assessing market expectations of what a state default would look like. I use public union membership and political donations by unions as proxies for the bargaining power of public pensions in a fiscal crisis. I test whether or not states with more "senior" pensions face higher spreads due to higher default probability or loss given default.

State governments do not work in isolation. They oversee numerous localities within their borders. These localities manage public pensions of their own. Much as the federal government might aid a state if it ever approached insolvency, states may, and have, aided municipalities with fiscal issues. Therefore, I also look at the effect of local (i.e. non-state) public pensions on state spreads. I test whether or not markets believe aid of municipalities may contribute to default risk, through potential diversion of state resources. The results from these two additional lines of research highlight the unique manners in which public pensions may have an effect on state spreads and borrowing costs

A. Union Membership and Protected Liabilities

The Detroit bankruptcy of 2013 resulted in part from an inability to renegotiate pension deals with public unions. Legally, there is no set priority for public pension liabilities vs. bonded debt. Unions with more power may be able to extract more resources from a government during a fiscal crisis. Ex-ante, this possibility should raise default probabilities and/or loss given default for bonded debt, resulting in higher spreads. I test that hypothesis in this subsection.

The BLS collects annual data on the percentage of employees in a state that are either members of or represented by a public union[11]. I use these data as a proxy for union "bargaining power" within a state. This is a rough proxy for union power. Membership does not necessarily have a one-to-one relationship with bargaining power, or a willingness to extract more value in a crisis.

[11] Data is also available for private unions, along with more specific MSA-level numbers.

Additionally, I use public union political donation spending amounts by state/year as collected by the National Instiute on Money in State Politics, as another proxy for union bargaining power. I look both at the level effect of relative union power and also the interaction with pension liabilities. Regression results are presented in table IX.

The results in columns 2 and 4 show a positive relationship between these proxies for union bargaining power and spreads. However, none of the coefficients are statistically signifcant. Thus, these results at best are weak evidence that states with higher union presence carry higher debt spreads due to the perceived seniority of pension liabilities. However, this finding, or lack thereof, may be due to lack of statistical power due to both the small sample and the poor proxies I have collected. Similarly, I do not see any statistical significance on the interaction terms. One might expect that in states with more union power, pension liabilities would matter for debt pricing as they would have more senior claims. This would manifest in a negative coefficent. I do not have enough statistical power to weigh in on this hypothesis. However, bond data results can be found in table XV, and show a statistically significant relationship.

Table IX: Union Bargaining Power and CDS Spread Regressions

Table IX presents results from reduced form regressions of annual state spreads on fiscal condition variables along with union membership. Each column indicates the numerator of the right hand side variable, which is then scaled by state-level GDP, except for the union membership variables. Union membership and representation data is collected by the BLS. Donation spending is taken from the National Instiute on Money in State Politics. The sample is based on annual data, where spreads are picked to match the end of fiscal years. Rev represents total revenue, Exp is total expenses, CL is current liabilities, NCL is noncurrent liabilities, PL is pension liabilities, CA is capital assets, and PL Local is local (i.e. non-state level) pension liabilities. All non-dummy variables are scaled by their sample standard deviations. Thus, a coefficient represents the marginal effect of a standard deviation in the right hand side variable on the debt spread in basis points. All columns include annual fixed effects and cluster standard errors at the state level. Within R^2 is the R^2 once controlling for annual fixed effects (i.e. cross-sectional R^2). R^2 is adjusted R^2.

	(1)	(2)	(3)	(4)	(5)
Rev-Exp	-8.780*	-10.73*	-10.75*	-6.682	-6.882
	(-2.26)	(-2.53)	(-2.49)	(-1.62)	(-1.65)
CA-CL	-3.416	-3.938	-3.976	-4.344	-4.188
	(-0.74)	(-0.80)	(-0.81)	(-0.91)	(-0.89)
A-LTL	-13.20*	-10.61*	-10.58*	-8.793	-9.673
	(-2.64)	(-2.19)	(-2.30)	(-1.17)	(-1.35)
PA-PL	-17.94**	-18.11**	-17.94***	-19.00**	-21.38*
	(-3.26)	(-3.33)	(-3.74)	(-3.64)	(-2.77)
Union Donation		7.949	7.507		
		(1.87)	(1.15)		
Donat. x PA-PL			-0.286		
			(-0.07)		
Union Mem. %				7.107	8.294
				(1.08)	(1.03)
Union x PA-PL					1.360
					(0.31)
N	210	210	210	210	210
R^2	0.611	0.620	0.618	0.616	0.614
Within R^2	0.346	0.361	0.358	0.353	0.350
Year FE	Yes	Yes	Yes	Yes	Yes
Cluster	State	State	State	State	State

t statistics in parentheses

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

B. Local Pensions and Political Economy

Finally, I investigate the relationship between local public pensions and state spreads. Gao et al. (2017) separate "Proactive" states that are more hands on Chapter 9 bankruptcies for municipalities. They highlight that localities in these states have lower spreads due to decreased default risk resulting from greater institutional oversight. I instead look at the effect on state debt spreads themselves. While these proactive policies help municipalities, it comes at a cost to the state and may adversely affect its own default risk. In addition to this, I look at the relationship between *local* pension liabilities and spreads. In states with municipalities in fiscal trouble, governments may need to spend more resources aiding in a crisis. This is particularly true in states that have shown to be more proactive in these situations. Thus, I use the PPD data to aggregate pension liabilities from plans within a state which only cover local employees, and include that in the main regression. Results from these analyses are in table X.

Specifications 2 and 3 show a negative and statistically significant relationship between local pension funding and state debt spreads. The economic magnitude is similar to that of state pensions. This suggests that investors are concerned with the "crowding-out" effects of local pensions on spreads. Meanwhile, specifications 4 and 5 suggest that "proactive" states do not have higher CDS spreads than those that are more hands off in Chapter 9 bankruptcy. My null result may come from a lack of power due to the lack of observations. Including local pensions along with the proactive dummy does not change the results. Bond data results can be found in table XVI, which shows a more statistically significant relationship.

Regression 6 interacts Proactive with the local pension deficit number. Here we see a statistically significant and positive coefficient. This suggests that the effect of local pension funding on state borrowing costs is negated in proactive states (note the similar signs of opposite signs on the interaction and the ratio itself). The results imply that markets see local pension funding as nonmaterial for borrowing costs in proactive states.

The results in this section provide evidence, albeit weak, that investors are concerned about the relative seniority of pension liabilities in assessing default risk for state debt. States with larger union presence show weak evidence of higher spreads suggesting that pension liabilities are seen as more senior in these states. Meanwhile, states with larger local pension liabilities also exhibit higher spreads. This implies that investors may foresee situations in which states would need to divert resources to aid municipalities in danger of not meeting pension liabilities, which adds to their own default risk through a crowding-out effect. Although this result may also result from local pension issues signaling additional fiscal issues at the state level which are not already captured in a state's pension funding ratio. Taken together, these results demonstrate a unique relationship between pension liabilities and state debt spreads which policy makers should take into account when making decisions regarding pension funding.

Table X: Local Pension Funding and CDS Spread Regressions

Table X presents results from reduced form regressions of annual state spreads on fiscal condition variables along with local pension liabilities, and various political economy indicators. Each column indicates the numerator of the right hand side variable, which is then scaled by state-level GDP. Rev represents total revenue, Exp is total expenses, CL is current liabilities, NCL is noncurrent liabilities, PL is pension liabilities, CA is capital assets, and PL Local is local (i.e. non-state level) pension liabilities. Proactive is an indicator for whether or not the state has "proactive" policies in helping with municipal fiscal crises as defined in Gao and Qi (2013). The sample is based on annual data, where spreads are picked to match the end of fiscal years. All non-dummy variables are scaled by their sample standard deviations. Thus, a coefficient represents the marginal effect of a standard deviation in the right hand side variable on the debt spread in basis points. All columns include annual fixed effects and cluster standard errors at the state level. Within R^2 is the R^2 once controlling for annual fixed effects (i.e. cross-sectional R^2). R^2 is adjusted R^2.

	(1)	(2)	(3)	(4)	(5)	(6)
Rev-Exp	-8.780*	-9.438	-6.049	-8.839*	-5.693	-5.736
	(-2.26)	(-0.94)	(-0.65)	(-2.32)	(-0.61)	(-0.62)
CA-CL	-3.416	3.584	-0.678	-3.681	0.00902	-0.393
	(-0.74)	(0.92)	(-0.13)	(-0.81)	(0.00)	(-0.08)
A-LTL	-13.20*	-24.90*	-13.80	-12.70*	-13.09	-13.27
	(-2.64)	(-2.75)	(-1.94)	(-2.19)	(-1.89)	(-1.49)
PA-PL	-17.94**		-15.94*	-17.95**	-16.96**	-4.346
	(-3.26)		(-2.62)	(-3.22)	(-3.10)	(-0.56)
PL Local Def/GDP		-15.11	-16.01*		-17.08*	-35.43***
		(-1.73)	(-2.66)		(-2.89)	(-4.76)
Proactive				3.501	-7.263	23.23
				(0.33)	(-0.54)	(1.37)
Proac. x Local Def						32.57**
						(3.02)
N	210	140	140	210	140	140
R^2	0.611	0.586	0.611	0.610	0.609	0.636
Within R^2	0.346	0.344	0.382	0.343	0.380	0.422
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	State	State	State	State	State	State

t statistics in parentheses

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

VI. Conclusion

In this paper I find a robust and statistically significant relationship between public pension liabilities and U.S. state credit default swap spreads. A one standard deviation higher net pension liability to GDP ratio for a state is associated with a 18 basis point higher CDS spread, about 20% of the average total spread. The point estimate is quantitatively similar for long term debt liabilities. This result suggests that markets view pension liabilities similar to bonded debt in economic magnitudes as they relate to default risk. These results are robust to controlling for economic conditions at the state level, and also to an instrumental variables approach. Moreover, they appear to be driven primarily by states in which pension liabilities have explicit constitutional protections.

I find weak evidence that states with higher union presence also have higher debt spreads, which suggests that increased bargaining power may increase the "seniority" of pension liabilities in the event of a fiscal crisis. Finally, I find that local government pension liabilities have a statistically significant and positive relationship with state level debt spreads. This suggests that while previous research has shown these proactive policies reduce local debt yields, they may have an adverse affect on a state's own borrowing cost.

These results magnify the importance of public pension policy in the coming years. The public pension funding crisis is not merely about future insolvency. Future obligations are having an effect on debt spreads right now. Poor funding ratios are increasing borrowing costs for states, which compounds fiscal problems, given that states must devote more resources to debt service. States should take more care to fix these pension funding problems sooner rather than later as they are already paying the cost of potential future troubles. Not doing so will lead to higher and higher borrowing costs which will exacerbate fiscal issues at the state level and push them closer and closer to actual insolvency.

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Appendix A. Municipal Bond Data Analysis

In this appendix I present the main analyses using municipal bond data instead of the CDS spreads. I first describe the bond data, and then present results

Municipal Bond Data

For bond yield data, I rely on two databases: the Mergent Municipal Bond Securities Database(MSRB) and the Municipal Securities Rulemaking Board's (MSRB) Electronic Municipal Market Access Database (EMMA). Mergent provides issue level information such as CUSIP, offering date, maturity date, offering amount, bond type and other characteristics such as option flags. EMMA is a transaction database, which tracks trades of municipal bonds and contains information on trade date, traded yield, and amount. I link the two datasets by CUSIP to obtain both original issue characteristics and updated pricing (yield) information. This provides me updated pricing information along with original bond characteristics which I can control for in my regression analyses. I filter these for only bonds issued by the state government itself (i.e. I exclude lower municipalities).

For each month I take the last observed trade for each bond as the observation for that month[12]. If a bond does not have a trade in a given month it has no observation in the data. I then merge these yields and characteristics to my fiscal data based on the fiscal year ends. As with CDS, using average yields in a given year does not materially change my analysis. For each bond I also calculate the difference between the traded yield and a maturity matched treasury to obtain the bond spread. To obtain the maturity matched treasury I interpolate between points on the treasury yield curve to correspond to the current time-to-maturity (TTM) of an issue[13]. These spreads are used in my analyses. In my analyses using bond yields I control for a number of issue characteristics for each issue. These include time-to-maturity, bond-type (e.g. revenue vs. general obligation), issue amount and flags for callability, redeemability, and whether or not the bond is insured. For some analyses I use only general obligation or general obligation and non-insured bond. General obligation bonds are backed by the "full faith and government" and thus likely represent the purest measure of state's default risk/borrowing costs.

[12]Results are not changed if I take the average yield for each bond in a given month

[13]Results are insensitive to the use of a linear interpolation or a cubic spline. Reported results use the linear interpolation.

Summary statistics by state are contained in table XI. There is large cross-sectional variation among states. States such as California are prolific issuers with 568 bonds in the sample with an average offering of over 1 billion. Meanwhile, Idaho only issued 11 bonds for an average offering of 427 million. The average maturity across states is relatively consistent, being between five and ten years. Finally, there is large variation in spreads across states. Illinois had average spreads of over 224 basis points, while Hawaii had an average spread of 67 basis points. Unsurprisingly the patterns are very similar to those in the CDS data.

Table XI: State Bond Summary Statistics

Table XI presents summary stats from state-level municipal bond data. Data is a combination of issue information from Mergent, and trade information from EMMA. y represents the yield of the bond minus a maturity matched treasury. GO Pct. is the percentage of General Obligation bonds. TTM is time-to-maturity. Avg. Monthly Trades is per bond. Time period covered is 2002 - 2016.

State	Avg. Offer Amt. (Mln.)	N Bonds	Go Pct.	$\hat{y}$	med(y)	$\sigma(y)$	Avg. Monthly Trades	$\hat{\text{TTM}}$
AK	155.00	145.00	1.00	78.76	61.72	57.13	4.18	7.47
AL	112.00	43.00	1.00	75.28	63.40	45.48	3.46	9.53
AR	63.80	495.00	0.89	101.97	93.95	57.18	2.58	8.06
AZ	218.00	199.00	0.00	117.37	112.72	69.92	3.91	5.61
CA	1520.00	568.00	0.98	140.70	128.29	144.74	18.01	10.08
CT	346.00	833.00	1.00	88.64	92.25	67.51	5.33	8.01
DE	210.00	185.00	1.00	93.13	50.08	251.75	3.59	8.33
FL	207.00	424.00	0.28	96.73	92.19	126.68	4.79	9.14
GA	293.00	803.00	1.00	84.42	65.04	70.47	4.67	7.02
HI	328.00	323.00	1.00	66.87	58.63	53.99	3.28	8.96
IA	427.00	13.00	0.00	224.58	354.87	252.34	8.64	22.06
ID	461.00	11.00	0.18	41.75	34.06	37.73	2.33	0.50
IL	783.00	648.00	0.97	224.54	228.86	89.04	9.40	9.24
IN	76.00	768.00	0.00	105.96	104.14	155.88	3.68	8.54
LA	272.00	470.00	0.97	89.05	85.73	74.69	4.40	7.02
MA	368.00	717.00	0.03	64.82	66.43	68.86	7.65	8.18
MD	300.00	285.00	1.00	53.59	45.35	32.74	6.28	7.05
ME	55.00	277.00	0.94	112.01	84.72	81.08	2.56	3.21
MI	189.00	72.00	0.85	86.06	79.00	56.50	3.47	7.06
MN	296.00	793.00	0.96	67.97	61.81	59.50	4.97	7.55
MS	136.00	191.00	1.00	101.50	103.19	44.90	3.51	8.52
MT	9.74	321.00	0.90	84.97	75.35	82.42	1.59	5.86
NC	333.00	485.00	0.97	63.26	63.87	90.33	6.10	5.89
NH	71.40	475.00	1.00	96.50	83.14	100.58	3.37	6.51
NJ	359.00	328.00	0.96	96.42	91.85	70.76	7.89	5.62
NM	129.00	84.00	0.85	65.96	56.24	43.80	3.08	2.99
NV	49.60	724.00	0.01	96.12	90.73	57.58	2.80	7.54
NY	217.00	268.00	1.00	94.36	90.65	55.75	5.61	8.91
OH	114.00	296.00	0.84	66.07	64.02	32.79	2.81	7.99
OR	58.00	459.00	0.94	73.92	69.98	51.81	2.16	10.14
PA	501.00	550.00	1.00	91.76	83.55	61.23	7.63	7.73
RI	75.70	395.00	0.91	111.26	96.54	80.61	2.83	6.42
SC	28.40	375.00	0.33	56.34	44.88	41.31	2.21	7.04
TN	159.00	449.00	0.92	79.19	67.05	60.54	3.85	7.51
TX	387.00	771.00	0.91	72.50	72.57	75.76	2.94	10.02
UT	337.00	202.00	0.96	68.58	55.76	51.73	6.92	3.93
VA	131.00	557.00	0.97	75.79	68.72	48.31	3.40	7.75
VT	35.80	601.00	0.98	85.58	72.84	70.69	2.31	6.18
WA	309.00	830.00	0.53	85.40	76.30	53.31	7.35	9.26
WI	274.00	119.00	1.00	74.40	73.21	32.30	2.56	8.98
WV	99.80	184.00	1.00	106.47	97.39	150.09	3.34	5.60
WY	802.00	2.00	0.00	217.68	217.68	NaN	3.57	16.92

Table XII: Bond Spread and Fiscal Deficit Regressions with Economic Indices

Table XII presents results from reduced form regressions of annual state bond spreads on fiscal condition deficit variables. Each column indicates the numerator of the right hand side variable, which is then scaled by state-level revenue. The sample is based on annual data, where spreads are picked to match the end of fiscal years. Rev represents total revenue, Exp is total expenses, CL is current liabilities, NCL is noncurrent liabilities, PL is pension liabilities, CA is capital assets, and PL Local is local (i.e. non-state level) pension liabilities. Columns 3-5 include annual year fixed effects. All non-dummy variables are scaled by their sample standard deviations. Thus, a coefficient represents the marginal effect of a standard deviation in the right hand side variable on the debt spread in basis points. Columns 2, 4, and 5 standard errors are clustered at the state level. Econ. Index is the state economic index calculated by the Philadelphia Fed. Housing Index is the Case-Shiller HPI Index. Within R^2 is the R^2 once controlling for annual fixed effects (i.e. cross-sectional R^2). R^2 is adjusted R^2.

	(1)	(2)	(3)
Rev-Exp	-5.920***	-3.511**	-4.523***
	(-4.18)	(-2.90)	(-3.72)
CA-CL	16.56*	12.25	18.54*
	(1.97)	(1.45)	(2.24)
A-LTL	-48.80***	-37.97***	-26.60**
	(-5.19)	(-4.08)	(-2.77)
PA-PL	-22.13***	-23.46***	-21.63***
	(-6.70)	(-6.79)	(-6.32)
Econ. Index		-28.70***	-8.118
		(-5.30)	(-1.43)
Housing Index			-28.11***
			(-7.42)
N	57469	56802	56802
R^2	0.0699	0.0703	0.0736
Within R^2	0.0455	0.0460	0.0493
Year FE	Yes	Yes	Yes
State FE	YES	YES	YES
Cluster	CUSIP	CUSIP	CUSIP

t statistics in parentheses

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

Municipal Bond Results

For the bonded data, all the qualitative results above hold. In fact the magnitude of the pension coefficient is larger at 27 basis points. Also, the long-term debt ratio is no longer statistically significant in any specification other than 3. Bond data provides even stronger evidence that pension funding is more related to spreads than general indebtedness. I also perform two additional sensitivities by subsetting the data into only GO bonds, and also all non-insured GO bonds. Results are not changed. For the majority of the specifications I use state fixed effects to control for other fiscal/economic conditions at the state government level. Standard errors are also clustered at the bond level to control for correlation within each issue.

Table XIII: Bond Debt Spreads and Fiscal Ratio Regressions

Table XIII presents results from reduced form regressions of annual state debt bond spreads on fiscal condition variables. Each column indicates the numerator of the right hand side variable, which is then scaled by state-level GDP. The sample is based on annual data, where spreads are picked to match the end of fiscal years. Rev represents total revenue, Exp is total expenses, CL is current liabilities, NCL is noncurrent liabilities, PL is pension liabilities, CA is capital assets, and PL Local is local (i.e. non-state level) pension liabilities. Columns 3 and 4 include annual year fixed effects. All non-dummy variables are scaled by their sample standard deviations. Thus, a coefficient represents the marginal effect of a standard deviation in the right hand side variable on the debt spread in basis points. Columns 2 and 4 standard errors are clustered at the state level. Within R^2 is the R^2 once controlling for annual fixed effects (i.e. cross-sectional R^2). R^2 is adjusted R^2.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Rev-Exp	-22.31***	-22.31***	-5.258*	-5.258***	-5.920***	-8.024***	-8.838***
	(-14.27)	(-13.30)	(-2.44)	(-3.84)	(-4.18)	(-5.04)	(-4.60)
CA-CL	7.899**	7.899*	12.65**	12.65***	16.56*	41.54***	14.25
	(2.60)	(2.46)	(3.02)	(3.96)	(1.97)	(4.27)	(1.01)
A-LTL	0.00598	0.00598	-13.22***	-13.22***	-48.80***	-61.86***	-69.07***
	(0.00)	(0.00)	(-3.48)	(-4.00)	(-5.19)	(-5.57)	(-10.34)
PA-PL	-5.609***	-5.609***	-7.935***	-7.935***	-22.13***	-15.51***	-13.16***
	(-6.08)	(-5.72)	(-8.29)	(-8.15)	(-6.70)	(-5.69)	(-4.20)
N	57469	57469	57469	57469	57469	43505	33815
R^2	0.0502	0.0502	0.0630	0.0630	0.0699	0.0818	0.0987
Within R^2			0.0504	0.0504	0.0455	0.0486	0.0558
Year FE	No	No	Yes	Yes	Yes	Yes	Yes
State FE	No	No	No	No	Yes	Yes	Yes
Bond Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample	All	All	All	All	All	GO	GO Non. Insur.
Cluster	-	CUSIP	-	CUSIP	CUSIP	CUSIP	CUSIP

t statistics in parentheses

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

Table XIV: Debt Spreads and Constitutional Pension Protections

Table XIV presents results from reduced form regressions of annual state debt bond spreads on fiscal condition variables, along with two non-IV regressions in changes. The pension funding ratio (PA-PL) is instrumented with the return on pension assets in the year. Each column indicates the numerator of the right hand side variable, which is then scaled by state-level GDP. The Econ. Index is the state level economy index constructed by the Federal Reserve Bank of Philadelphia. The sample is based on annual data, where spreads are picked to match the end of fiscal years. Rev represents total revenue, Exp is total expenses, CL is current liabilities, NCL is noncurrent liabilities, PL is pension liabilities, CA is capital assets, and PL Local is local (i.e. non-state level) pension liabilities. Columns 3 and 4 include annual year fixed effects. All non-dummy variables are scaled by their sample standard deviations. Thus, a coefficient represents the marginal effect of a standard deviation in the right hand side variable on the debt spread in basis points. Exp. Prot. represents states with explicit protections for pension liabilities in their state constitutions, while Protected are states with any constitutional contract protection for pension liabilities. Columns 2 and 4 standard errors are clustered at the state level. Within R^2 is the R^2 once controlling for annual fixed effects (i.e. cross-sectional R^2). R^2 is adjusted R^2.

	(1)	(2)	(3)
Rev-Exp	-5.920***	-4.481***	-5.857***
	(-4.18)	(-3.30)	(-4.08)
CA-CL	16.56*	7.970	20.57*
	(1.97)	(0.97)	(2.41)
A-LTL	-48.80***	-41.08***	-64.06***
	(-5.19)	(-4.50)	(-6.54)
PA-PL	-22.13***	-12.28**	22.38***
	(-6.70)	(-3.00)	(4.78)
Exp. Prot. x (PA-PL)/ GDP		-27.43***	
		(-6.01)	
Prot. x (PA-PL)/ GDP			-44.57***
			(-9.44)
N	57469	57469	57469
R^2	0.0699	0.0707	0.0706
Within R^2	0.0455	0.0463	0.0463
Year FE	Yes	Yes	Yes
State FE	Yes	Yes	Yes
Cluster	CUSIP	CUSIP	CUSIP

t statistics in parentheses

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

Table XV: Union Bargaining Power and Bond Spread Regressions

Table XV presents results from reduced form regressions of annual state bond spreads on fiscal condition variables along with union membership. Each column indicates the numerator of the right hand side variable, which is then scaled by state-level GDP, except for the union membership variables. Union membership and representation data is collected by the BLS. Donation spending is taken from the National Instiute on Money in State Politics. The sample is based on annual data, where spreads are picked to match the end of fiscal years. Rev represents total revenue, Exp is total expenses, CL is current liabilities, NCL is noncurrent liabilities, PL is pension liabilities, CA is capital assets, and PL Local is local (i.e. non-state level) pension liabilities. All non-dummy variables are scaled by their sample standard deviations. Thus, a coefficient represents the marginal effect of a standard deviation in the right hand side variable on the debt spread in basis points. All columns include annual fixed effects and cluster standard errors at the state level. Within R^2 is the R^2 once controlling for annual fixed effects (i.e. cross-sectional R^2). R^2 is adjusted R^2.

	(1)	(2)	(3)	(4)	(5)
Rev-Exp	-5.920***	-5.997***	-5.951***	-6.275***	-7.045***
	(-4.18)	(-4.22)	(-4.18)	(-4.40)	(-4.93)
CA-CL	16.56*	16.08	14.45	13.64	9.401
	(1.97)	(1.91)	(1.71)	(1.59)	(1.08)
A-LTL	-48.80***	-47.24***	-44.57***	-42.89***	-34.04***
	(-5.19)	(-5.01)	(-4.69)	(-4.41)	(-3.48)
PA-PL	-22.13***	-22.54***	-25.71***	-21.90***	2.066
	(-6.70)	(-6.80)	(-5.97)	(-6.65)	(0.40)
Union Donation		1.932	3.603*		
		(1.94)	(2.17)		
Donat. x PA-PL			1.344		
			(1.67)		
Union Mem. %				13.86**	3.496
				(2.93)	(0.64)
Union * PA-PL					-9.328***
					(-5.32)
N	57469	57322	57322	57152	57152
R^2	0.0699	0.0699	0.0699	0.0697	0.0701
Within R^2	0.0455	0.0455	0.0455	0.0455	0.0458
Year FE	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes
Cluster	CUSIP	CUSIP	CUSIP	CUSIP	CUSIP

t statistics in parentheses

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

Table XVI: Local Pension Funding and Bond Spread Regressions

Table X presents results from reduced form regressions of annual state spreads on fiscal condition variables along with local pension liabilities, and various political economy indicators. Each column indicates the numerator of the right hand side variable, which is then scaled by state-level GDP. Rev represents total revenue, Exp is total expenses, CL is current liabilities, NCL is noncurrent liabilities, PL is pension liabilities, CA is capital assets, and PL Local is local (i.e. non-state level) pension liabilities. Proactive is an indicator for whether or not the state has "proactive" policies in helping with municipal fiscal crises as defined in Gao and Qi (2013). The sample is based on annual data, where spreads are picked to match the end of fiscal years. All non-dummy variables are scaled by their sample standard deviations. Thus, a coefficient represents the marginal effect of a standard deviation in the right hand side variable on the debt spread in basis points. All columns include annual fixed effects and cluster standard errors at the state level. Within R^2 is the R^2 once controlling for annual fixed effects (i.e. cross-sectional R^2). R^2 is adjusted R^2.

	(1)	(2)	(3)	(4)	(5)	(6)
Rev-Exp	-5.920***	-25.51***	-25.94***	-5.920***	-25.94***	-25.81***
	(-4.18)	(-5.11)	(-5.28)	(-4.18)	(-5.28)	(-5.22)
CA-CL	16.56*	-24.54	-19.90	16.56*	-19.90	-20.14
	(1.97)	(-0.74)	(-0.61)	(1.97)	(-0.61)	(-0.62)
A-LTL	-48.80***	-75.37***	-68.82***	-48.80***	-68.82***	-68.07***
	(-5.19)	(-5.96)	(-5.22)	(-5.19)	(-5.22)	(-5.11)
PA-PL	-22.13***		-9.236*	-22.13***	-9.236*	-10.03*
	(-6.70)		(-2.08)	(-6.70)	(-2.08)	(-2.12)
PL Local Def/GDP		-26.47***	-23.55***		-23.55***	-23.03***
		(-9.13)	(-6.81)		(-6.81)	(-6.50)
Proactive				503113.7	0	0
				(0.00)	(.)	(.)
Proac. x Local Def						62.12
						(1.72)
N	57469	46859	46859	57469	46859	46859
R^2	0.0699	0.0717	0.0719	0.0699	0.0719	0.0719
Within R^2	0.0455	0.0465	0.0466	0.0455	0.0466	0.0467
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	CUSIP	CUSIP	CUSIP	CUSIP	CUSIP	CUSIP

t statistics in parentheses

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

Appendix B. Common Components in Spreads

I use principal components analysis (PCA) to assess the degree of commonality in state spreads. This approach is different than that of Ang and Longstaff (2013). There, the authors use an affine structural framework to assess the systemic component of spreads across ten U.S. states from March 2008 - January 2011. However, their approach puts a specific affine Poisson arrival structure on the systemic shock. Using principal components analysis abstracts from any such structure. I allow variation in the data to speak for itself. This may allow me to pick up systemic factors that could be missed within their framework. Once I have extracted the principal components I run multivariate regressions on various variables to find what drives credit spreads.

Appendix A. Principal Component Extraction

To run the PCA, I need a balanced panel of monthly spreads. I use a subset of states in order to maintain a balanced panel of 91 valid months within 2008 - 2016[14]. The spread series themselves are not stationary, so I calculate first differences to extract the principal components. I find that the first principal component (PC1) explains over 84% of the variation in spreads, while the second component explains over 4%. Thus, we see a very strong common component in state level spreads. This number is even higher than that generally found in sovereign spreads[15].

In figure 3 I plot the loadings of the first and second principal components. There is a consistent loading on the first principal component. This implies that the first factor is equivalent to a level shift in rates across all states. This finding is also similar to that in Longstaff et al. (2011) who find a level effect in sovereign spreads. California has the largest contribution, while Illinois, Michigan, New Jersey, Nevada, and New York all had slightly larger contributions. These are all the states who have had the highest spreads at some point during the sample. Therefore, the first component is helping to match these spreads.

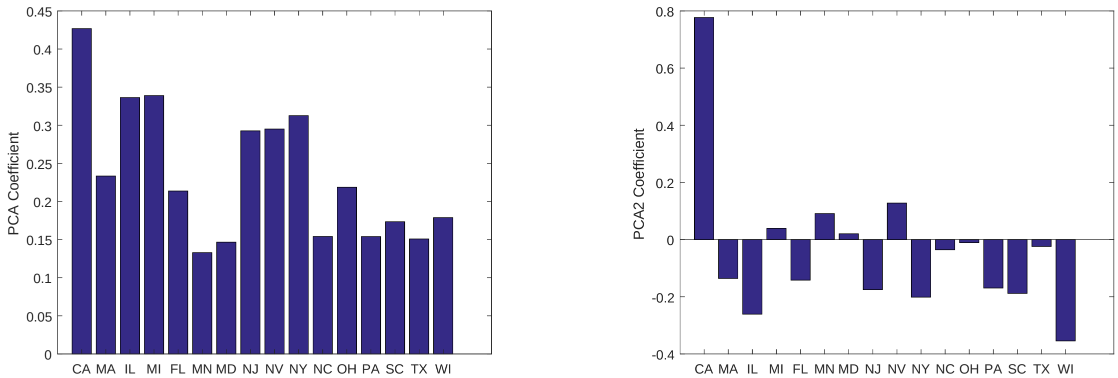
Meanwhile, the second component appears to be a "California" component. We see a very large loading on California, with very small and often negative loadings on the remaining states. This component is likely capturing the very large run-up in California's spread during the crisis, along

[14]This subset includes the following states: California, Florida, Illinois, Massachusetts, Minnesota, Maryland, New Jersey, Nevada, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Texas, and Wisconsin.

[15]Longstaff, Pan, Pedersen, and Singleton (2011) and Manzo (2013) find first principal components that share between $60-80\%$ of spreads.

Figure 3: Monthly Principal Component Loadings

Figure 3 presents loadings from a principal component analysis of spreads. Principal components are extracted from monthly spreads on the given states from 2008 - 2016. I plot the loadings on the first two factors.



(a) PC1 **(b)** PC2

with the large decline in subsequent years. Given that this component only explains 4% of the variation, while the first explains over 80% we should not be concerned about California's outsized effect on these conclusions. These results clearly show the large contribution of a single factor in driving the cross-section of spreads over time.

For robustness I perform one additional principal components sub-period analysis. Each year, I take the subset of countries with valid monthly observations for each month within the year. Then I extract the principal components from that subset. Results are presented in table XVII. We see that except for 2013 and 2014, the first principal component explains over 80% of the variation in spreads. These numbers are similar to those for the entire sample. Even for 2013 and 2014, the first and second components combined explain over 90% of the variation. Thus, even in the sub-period analysis there is strong evidence of a common component in state spreads. Given this, in the next section I explain what drives variation in the principal components.

Appendix B. Principal Component Regressions

I now attempt to explain what economic variables the principal components may be capturing. I run regressions of the first two components on various financial market variables. Given the strong first component, I include the first differences of spreads on the U.S. aggregate CDS. This is meant to capture national movements in credit risk. Although, this need not be the common

Table XVII: Annual PCA Analysis

Table XVII presents results from rolling annual principal components analysis. Each year I take the subset of states with valid observations each month. I then extract principal components from that subset. The table presents the amount explained by each of the first five principal components for each year from 2008-2016.

Year	Valid States	PC1	PC2	PC3	PC4	PC5
2008	12	99	1	0	0	0
2009	12	92	4	2	1	0
2010	12	82	11	3	2	1
2011	12	92	4	2	1	1
2012	12	87	3	3	2	2
2013	12	58	35	4	1	1
2014	12	63	33	2	1	1
2015	11	92	3	2	1	1
2016	9	80	11	5	2	1

factor, it is possible to have a latent factor driving state credit risk, that does not affect federal risk given the semi-sovereign nature of states (see Ang and Longstaff (2013)). However this is unlikely to be the case. I also include log differences in the VIX and TED spread. The VIX is a forward looking measure of financial market volatility which has been found to be related to CDS pricing in corporate and sovereign markets. The TED spread is the difference in rates between short-term government debt and interbank loans. It is generally considered a measure of credit risk, and in particular may capture counterparty risk which could be present in these markets. Regressions take the following form:

$$PC_{i,t} = \alpha_i + \gamma' \begin{bmatrix} \Delta CDS_t^{US} \\ \Delta VIX_t \\ \Delta TED_t \end{bmatrix} + \epsilon_{i,t} \tag{B1}$$

Where i is either the first or second component. Results are presented in table XVIII.

The first panel above shows that the first principal component, which explains over 80% of the variation in spreads, is highly correlated with the spreads for the U.S. aggregate CDS. This suggests that overall federal credit risk is closely related to state credit risk. Ang and Longstaff (2013) propose that sort of mechanism in their structural approach to extracting systemic sovereign credit risk. Meanwhile, the VIX and TED spreads do not have a statistical relationship with state spreads.

Table XVIII: Principal Component Regression Results

Table XVIII presents results from regressions of the first two principal components from CDS spreads on various financial market variables. Principal components are extracted from monthly spread differences on the given states from 2008 - 2016. Regressions are run of the components on differences in the RHS variable to match the fact that components were extracted from first differences.

	PC1			
	Constant	ΔCDS_t^{US}	ΔVIX_t	ΔTED_t
Coeff.	-0.00	2.57	0.00	-0.00
t-stat	-0.78	2.29	1.11	-0.37

	PC2			
	Constant	ΔCDS_t^{US}	ΔVIX_t	ΔTED_t
Coeff.	0.00	0.28	-0.00	-0.00
t-stat	0.51	1.11	-0.70	-1.94

The second component on the other hand is more correlated with changes in the TED spread. While both the US CDS and TED spread are in themselves associated with credit risk, these regressions imply differential effects of both. The second principal component has a negative relationship with the spread. This may represent an incremental credit risk among firms (through the interbank lending rate) that affects state credit risk. It may also represent counterparty risk playing a role in spreads.

Overall the results above show strong common components across spreads. This is robust to the frequency of the data and subset of states used to calculate. The result is somewhat at odds with Ang and Longstaff (2013) who find a relatively low contribution of systemic risk in their structural model. This difference is not merely due to sample size. My results appear more consistent with general results for sovereign credit risk, as in Longstaff et al. (2011). Despite this common variation, it is still important to understand state specific determinants of credit risk. These determinants may be within a state government's control and have meaningful affects on spreads, even if the predominant effect is from systemic components.

Appendix C. Government Data Construction Detail

As mentioned in the introduction, currently there is a lack of a readily available panel data set of state level finances. The only currently available source is the US Census State Finances data. Each year the Census asks state governments by survey to fill in a number of accounting variables, which are then compiled by the Census Bureau. Each state has responded historically, so there is not a response bias. However, the Census focuses primarily on revenue and expense variables. While these values capture government flows, they do not collect the stock balance sheet information in a comprehensive manner. Under a structural framework, it is the balance sheet which is most important for understanding spread. More broadly, state leverage information is vital for understanding fiscal health across states. Thus, I construct a more detailed dataset of state government finances in which I intend to focus on balance sheet variables.

Each year, state governments release a Comprehensive Annual Financial Report (CAFR). These reflect state government fiscal years that end June 30[16]. These 10-K like reports include a Statement of Net Position and Statement of Activities which are balance sheet, and income statement equivalents. I use primarily these two statements to construct the fiscal data. I focus on 2002-2015 as beginning in 2002 GASB required a more standardized CAFR format. The sample ends in 2015, as many states have yet to release their 2016 CAFRs. A more detailed explanation of my data construction can be found in appendix C.

Ultimately I collect information on revenues, taxes, expenses, assets, liabilities and debt. In addition to total revenues and expenses I capture detailed breakdowns of tax revenues. I split taxes into personal income taxes, corporate income taxes, sales taxes, insurance taxes, property taxes, motor vehicle taxes, and other. Unfortunately, certain states have varying levels of granularity in reporting taxes, including some who do not provide easy to decipher breakdowns. As such, I do not focus on these variables in this work.

I also break down assets into current, non-current and capital assets. Capital assets include government buildings and infrastructure which generally is not allowed to be sold. Thus, these assets may not be relevant for debt pricing given their inability to meet liability needs. Net assets captures assets minus liabilities for both restricted and unrestricted assets. Certain government

[16]The only exceptions are the following: Alabama, Michigan (Sep. 30), New York (March 31), and Texas (Aug. 31).

assets are restricted for certain purposes, thus states report restricted assets and net assets in these two categories.

Finally, I collect more detailed information on state outstanding debt. In addition to capturing the total amount of debt outstanding each year, I break it out into the following categories: general obligation bonds, revenue bonds, limited obligation bonds, capital leases, and certificates of participation. Again, states have some variance in how they report this debt, and therefore at this point I do not do any analysis on the breakdown of debt types. Details on the specific ratios I use in my analysis can be found in the main body of the paper.

Statements of Net Position in CAFRs generally exclude pension assets and liability. Given that pensions are a significant portion of state finances, I have to supplement this data. To do this I use the Public Plans Database (PPD) constructed by the Center for Retirement Research at Boston College. The data contains plan level asset and liabilities data by fiscal year. Thus, I aggregate by state and year to obtain a matching panel dataset. Pension fundring ratio (Funding Ratio) is then calculated as total pension assets divided by liabilities. The PPD data uses GASB standards to calculate pension liabilities. That is, pension liabilities are generally discounted at the return of assets. As pointed out recently by Novy-Marx and Rauh (2009) this may drastically underestimate the value of pension liabilities given that they are in effect riskless[17]. Nevertheless, I maintain the pension liabilities as reported for this analysis. This assumption may change the magnitude of effects in my regressions but should not contribute to differences in statistical significance or overall exploratory power.

In the next three pages I copy the Statement of Net Position and Activities from the 2015 Massachusetts CAFR. The first two pages are the Statement of Net Position. The Government Wide column contains the line-items I enter into the data. I collect the large items such as current/noncurrent assets and liabilities. However, I do collect some more detailed information on current assets with items such as cash (the sum of the first two line items), total receivables, and investments. Moreover, I collect the net asset numbers from the second page of the CAFR. This includes collecting capital asset numbers separately along with restricted and unrestricted items.

Meanwhile, the third page of the included CAFR is the equivalent of a income statement. I collect total revenue and expense numbers, along with detailed information on taxes from the final

[17]Many state constitutions include provisions preventing them from defaulting on public pension debt.

page of the document. Certain CAFRs are not quite as clear-cut as this example. For some, current vs. non-current assets/liabilities are not broken up into separate totaled line items. In this case I have to add line items manually to arrive at a number. Additionally, some states do not break down tax revenues, and thus I can only obtain total tax receipt numbers for those states. I try to stay as consistent as possible in using the same sub-items for each variable across states. This is also true of my collection of outstanding debt figures, as some states have different naming conditions for bonds. More detailed information on a state by state basis is available upon request.

Statement of Net Position

June 30, 2015

(Amounts in thousands)

	Primary Government			
	Governmental Activities	Business-Type Activities	Government Wide Total	Component Units
ASSETS AND DEFERRED OUTFLOWS				
Current assets:				
Cash, cash equivalents and short-term investments	$ 3,206,633	$ 1,010,314	$ 4,216,947	$ 2,842,328
Cash with fiscal agent	197,836	—	197,836	—
Assets held in trust	—	—	—	148,066
Receivables, net of allowance for uncollectibles:				
Taxes	3,084,006	—	3,084,006	—
Federal grants and reimbursements receivable	2,135,280	100,702	2,235,982	155,141
Loans	8,998	47,616	56,614	424,108
Other receivables	435,791	549,743	985,534	305,440
Due from cities and towns	19,722	—	19,722	—
Due from component units	488	383	871	—
Due from primary government	—	—	—	689,469
Other current assets	—	51,711	51,711	57,046
Total current assets	9,088,754	1,760,469	10,849,223	4,621,598
Noncurrent assets:				
Cash and cash equivalents - restricted	—	752,683	752,683	855,081
Long-term investments	—	914,457	914,457	1,708,327
Investments, restricted investments and annuity contracts	2,662,627	843	2,663,470	165,392
Receivables, net of allowance for uncollectibles:				
Taxes	463,648	—	463,648	—
Federal grants and reimbursements receivable	48,735	—	48,735	—
Loans	101,218	9,292	110,510	4,199,099
Other receivables	43,757	47,909	91,666	22,147
Due from component units	9,508	—	9,508	—
Non-depreciable capital assets	1,822,239	878,231	2,700,470	8,905,874
Depreciable capital assets, net	2,780,083	5,805,985	8,586,068	25,247,444
Other noncurrent assets	—	20,955	20,955	36,894
Other noncurrent assets - restricted	—	1,008,476	1,008,476	—
Total noncurrent assets	7,931,815	9,438,831	17,370,646	41,140,258
Deferred outflows of resources:				
Deferred change in fair value of interest rate swaps	329,833	46,111	375,944	241,180
Deferred loss on refunding	142,805	114,672	257,477	363,301
Deferred outflows related to pension	1,827,615	74,097	1,901,712	163,903
Total deferred outflows of resources	2,300,253	234,880	2,535,133	768,384
Total assets and deferred outflows	19,320,822	11,434,180	30,755,002	46,530,240
LIABILITIES AND DEFERRED INFLOWS				
Current liabilities:				
Accounts payable and other liabilities	3,314,917	280,168	3,595,085	1,156,283
Accrued payroll	212,696	200,958	413,654	1,946
Compensated absences	371,870	146,271	518,141	26,739
Accrued interest payable	367,821	22,915	390,736	221,782
Tax refunds and abatements payable	1,058,406	46,600	1,105,006	—
Due to component units	637,298	224	637,522	—
Due to primary government	—	—	—	871
Due to federal government	24,504	—	24,504	—
Claims and judgments	11,819	—	11,819	—
Unearned revenue	—	22,665	22,665	308,721

Statement of Net Position

June 30, 2015

(Amounts in thousands)

	Primary Government			
	Governmental Activities	Business-Type Activities	Government Wide Total	Component Units
Deposits and unearned revenue	—	74,510	74,510	—
School construction grants payable	357,100	—	357,100	—
Capital leases	7,876	2,471	10,347	4,569
Massachusetts School Building Authority notes payable	435,000	—	435,000	—
Massachusetts School Building Authority bonds and unamortized premiums	173,529	—	173,529	—
Bonds payable and unamortized premiums	1,743,338	250,229	1,993,567	739,773
Environmental remediation liability	10,932	11	10,943	—
Total current liabilities	8,727,106	1,047,022	9,774,128	2,460,684
Noncurrent liabilities:				
Compensated absences	205,446	66,729	272,175	21,598
Accrued interest payable	—	—	—	215,127
Due to primary government	—	—	—	9,508
Due to federal government - grants	—	10,692	10,692	—
Unearned revenue	—	—	—	38,722
Prizes payable	1,243,000	—	1,243,000	—
Capital leases	35,052	7,424	42,476	61,246
Bonds payable and unamortized premiums	23,047,571	4,302,876	27,350,447	10,944,888
Massachusetts School Building Authority bonds and unamortized premiums	6,027,865	—	6,027,865	—
School construction grants payable	723,919	—	723,919	—
Environmental remediation liability	197,047	—	197,047	—
Liability for derivative instruments	329,833	72,517	402,350	483,309
Net pension liability	24,531,950	403,393	24,935,343	1,399,888
Post-employment benefits obligations (other than pensions)	5,605,000	—	5,605,000	856,556
Other noncurrent liabilities	468,795	120,314	589,109	228,974
Total noncurrent liabilities	62,415,478	4,983,945	67,399,423	14,259,816
Deferred inflows of resources:				
Deferred service concession arrangements	—	16,923	16,923	—
Deferred inflows related to pension	2,969,528	90,883	3,060,411	82,917
Deferred gain on refunding	62,151	122	62,273	300
Governmental voluntary nonexchange transactions	—	3,000	3,000	—
Total deferred inflows of resources	3,031,679	110,928	3,142,607	83,217
Total liabilities and deferred inflows	74,174,263	6,141,895	80,316,158	16,803,717
NET POSITION				
Net investment in capital assets	(553,272)	3,055,444	2,502,172	27,480,236
Restricted for:				
Unemployment benefits	—	1,320,347	1,320,347	—
Retirement of indebtedness	1,164,045	—	1,164,045	—
Higher education endowment funds	—	18,920	18,920	—
Higher education academic support and programs	—	2,961	2,961	—
Higher education scholarships and fellowships:				
Nonexpendable	—	3,553	3,553	—
Expendable	—	6,442	6,442	—
Other nonexpendable purposes	—	3,536	3,536	—
Capital projects - expendable purposes	—	2,206	2,206	—
Other purposes	377,521	181,820	559,341	3,772,412
Unrestricted (deficits)	(55,841,735)	697,056	(55,144,679)	(1,526,125)
Total net position	$ (54,853,441)	$ 5,292,285	$ (49,561,156)	$ 29,726,523

The notes to the financial statements are an integral part of this statement. (concluded)

Statement of Activities

Fiscal Year Ended June 30, 2015

(Amounts in thousands)

Functions/Programs	Expenses	Program Revenues: Charges for Services	Program Revenues: Operating Grants and Contributions	Program Revenues: Capital Grants and Contributions	Net (Expenses) Revenues and Changes in Net Assets — Primary Government: Governmental Activities	Business-Type Activities	Total	Component Units
Primary government:								
Governmental Activities:								
General government	$ 2,703,519	$ 634,289	$ 643,770	$ —	$ (1,425,460)	$ —	$ (1,425,460)	$ —
Judiciary	1,026,429	105,521	1,213	—	(919,695)	—	(919,695)	—
Direct local aid	5,469,412	—	—	—	(5,469,412)	—	(5,469,412)	—
Medicaid	15,086,742	1,052,170	8,709,401	80,237	(5,244,934)	—	(5,244,934)	—
Group health insurance	1,657,018	755,712	—	—	(901,306)	—	(901,306)	—
Energy and environmental affairs	671,801	253,856	496,978	—	79,033	—	79,033	—
Housing and economic development	1,314,980	164,438	56,780	—	(1,093,762)	—	(1,093,762)	—
Health and human services	7,605,180	405,710	2,499,315	—	(4,700,155)	—	(4,700,155)	—
Transportation and public works	2,689,975	577,430	217	1,238	(2,111,090)	—	(2,111,090)	—
Early elementary and secondary education	4,654,161	7,649	1,192,664	—	(3,453,848)	—	(3,453,848)	—
Public safety and homeland security	2,486,107	256,596	178,224	—	(2,051,287)	—	(2,051,287)	—
Labor and workforce development	309,091	175,130	171,665	—	37,704	—	37,704	—
Lottery	4,109,611	5,193,545	—	—	1,083,934	—	1,083,934	—
Interest (unallocated)	1,263,218	—	—	—	(1,263,218)	—	(1,263,218)	—
Total governmental activities	**51,047,244**	**9,582,046**	**13,950,227**	**81,475**	**(27,433,496)**	**—**	**(27,433,496)**	**—**
Business-Type Activities:								
Unemployment Compensation	1,598,084	1,492,067	59,941	—	—	(46,076)	(46,076)	—
Higher Education:								
University of Massachusetts	2,809,062	1,602,043	517,360	62,582	—	(627,077)	(627,077)	—
State Universities	994,341	583,671	105,881	104,146	—	(200,643)	(200,643)	—
Community Colleges	891,906	266,956	253,735	39,400	—	(331,815)	(331,815)	—
Total business-type activities	**6,293,393**	**3,944,737**	**936,917**	**206,128**	**—**	**(1,205,611)**	**(1,205,611)**	**—**
Total primary government	**$ 57,340,637**	**$ 13,526,783**	**$ 14,887,144**	**$ 287,603**	**(27,433,496)**	**(1,205,611)**	**(28,639,107)**	**—**
Component Units:								
Massachusetts Department of Transportation	$ 5,485,652	$ 1,419,950	$ 2,122,152	$ 3,087,321	—	—	—	$ 1,143,771
Commonwealth Health Insurance Connector	576,085	501,008	80,436	—	—	—	—	5,359
Massachusetts Clean Water Trust	148,939	154,534	30,375	76,099	—	—	—	112,069
Other nonmajor component units	513,557	388,965	107,169	(54,708)	—	—	—	(72,131)
Total component units	**$ 6,724,233**	**$ 2,464,457**	**$ 2,340,132**	**$ 3,108,712**	**—**	**—**	**—**	**1,189,068**

(continued)

General revenues:	Primary Government: Governmental Activities	Business-Type Activities	Total	Component Units
Taxes:				
Income	14,326,957	—	14,326,957	—
Sales taxes	5,832,151	—	5,832,151	—
Corporate taxes	2,264,787	—	2,264,787	—
Motor and special fuel taxes	757,503	—	757,503	—
Other taxes	2,028,428	—	2,028,428	—
Miscellaneous:				
Investment earnings/(loss)	26,972	(132,238)	(105,266)	4,751
Tobacco settlement	241,025	—	241,025	—
Contribution from municipalities	61,991	—	61,991	—
Other revenue	921,205	139,774	1,060,979	234,170
Transfers	(1,429,174)	1,429,174	—	—
Total general revenues and transfers	**25,031,845**	**1,436,710**	**26,468,555**	**238,921**
Change in net position	**(2,401,651)**	**231,099**	**(2,170,552)**	**1,427,989**
Net position (deficits) - beginning, as restated	(52,451,790)	5,061,186	(47,390,604)	28,298,534
Net position (deficits) - ending	**$ (54,853,441)**	**$ 5,292,285**	**$ (49,561,156)**	**$ 29,726,523**

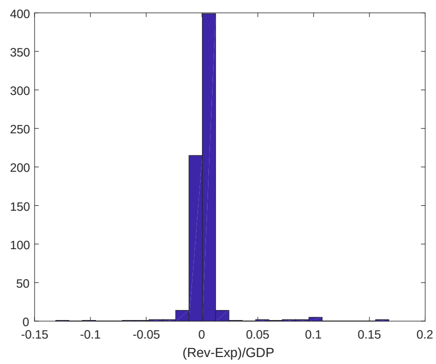
The notes to the financial statements are an integral part of this statement.

(concluded)

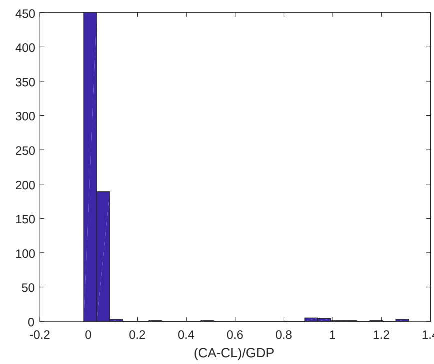
Appendix D. Additional Figures and Tables

Figure 4: Financial Ratio Distributions: 2002-2016 (Full Sample)

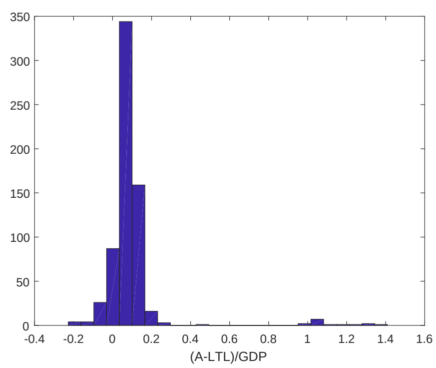
Table 4 presents distributions of annual observations for the main explanatory variables used in the paper. The distributions represent fiscal data for all 27 states which have a valid CDS price over the period. A state need not have a valid CDS spread for the given year to be represented here. Rev represents total revenue, Exp is total expenses. CA and CL are current assets and liabilities respectively. A is long-term assets, and LTL is long-term liabilities. PA is pension assets and PA is pension liabilities. All variables are scaled by annual state GDP. Ratios are multiplied by 1000 for presentation.



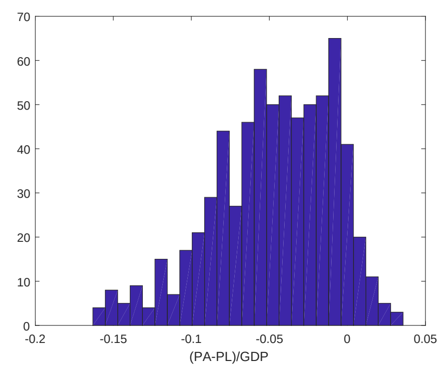
(a)



(b)



(c)



(d)

Table XIX: Explanatory Variable Time Series Summary Statistics - Full Sample

Table XIX presents time-series summary statistics of annual observations for the main explanatory variables used in the paper. The distributions represent fiscal data for all 27 states which have a valid CDS price over the period. A state need have a valid CDS spread for the given year to be represented here. Rev represents total revenue, Exp is total expenses. CA and CL are current assets and liabilities respectively. A is long-term assets, and LTL is long-term liabilities. PA is pension assets and PA is pension liabilities. All variables are scaled by annual state GDP. Ratios are multiplied by 1000 for presentation.

	(Rev-Exp)/GDP						(A-LTL)/GDP				
Year	Mean	StDev.	Min.	Med.	Max	Year	Mean	StDev.	Min.	Med.	Max
2005	6.52	12.73	-7.86	4.35	81.52	2005	96.88	149.51	-25.31	77.56	1000.16
2006	8.11	15.09	-1.84	5.87	100.52	2006	97.12	146.70	-23.44	80.62	994.56
2007	8.77	23.51	-3.26	4.55	156.55	2007	99.98	156.57	-24.68	85.01	1059.76
2008	1.91	15.47	-11.43	0.20	97.80	2008	98.87	151.56	-30.94	82.26	1037.87
2009	-9.83	19.66	-131.09	-5.56	6.39	2009	93.08	151.21	-43.87	77.87	1023.97
2010	0.03	14.54	-15.39	-0.26	87.97	2010	88.77	155.71	-59.91	72.43	1042.50
2011	8.67	27.48	-10.61	3.84	167.43	2011	90.32	168.03	-69.33	69.59	1127.88
2012	3.12	10.49	-12.52	3.24	63.23	2012	90.77	171.53	-79.02	62.12	1151.63
2013	5.69	14.82	-12.63	4.12	98.36	2013	94.44	188.23	-85.88	64.49	1270.82
2014	7.26	17.64	-7.55	3.91	104.90	2014	110.14	206.09	-91.45	68.50	1408.98
2015	2.56	8.70	-48.24	3.94	11.81	2015	77.45	206.49	-205.56	52.15	1336.96
2016	1.90	20.71	-101.61	3.19	90.96	2016	73.70	209.10	-227.07	47.57	1337.61

	(CA-CL)/GDP						(PA-PL)/GDP				
Year	Mean	StDev.	Min.	Med.	Max	Year	Mean	StDev.	Min.	Med.	Max
2005	45.69	134.91	8.36	20.25	894.08	2005	-35.17	31.00	-105.89	-34.44	15.03
2006	47.98	133.68	8.22	22.49	898.32	2006	-35.02	30.78	-105.49	-31.47	14.20
2007	51.47	144.28	9.01	24.29	968.65	2007	-32.61	30.45	-103.37	-32.06	31.38
2008	49.51	139.15	-20.30	26.09	953.24	2008	-37.80	32.08	-91.04	-35.27	35.68
2009	44.69	136.06	1.01	20.61	928.67	2009	-55.52	36.10	-133.44	-54.46	14.52
2010	43.72	139.01	-1.39	18.59	948.21	2010	-59.20	39.12	-147.19	-54.10	12.09
2011	46.88	152.63	1.25	20.70	1041.27	2011	-59.07	38.73	-134.93	-54.76	11.71
2012	48.31	156.29	2.78	21.57	1067.53	2012	-64.14	40.47	-144.89	-58.49	12.07
2013	53.41	173.21	2.59	25.03	1184.18	2013	-63.95	41.23	-154.29	-58.46	4.91
2014	68.03	193.68	2.40	24.56	1311.14	2014	-59.24	40.40	-152.91	-52.05	0.00
2015	56.24	188.02	2.12	23.81	1309.69	2015	-60.82	39.59	-156.65	-55.98	0.00
2016	54.84	184.36	0.63	22.37	1271.93	2016	-66.55	43.52	-163.08	-55.63	0.00

Table XX: Explanatory Variable Cross-Sectional Summary Statistics

Table XX presents cross-sectional summary statistics of annual observations for the main explanatory variables used in the paper. The distributions represent fiscal data for all 27 states which have a valid CDS price over the period. A state need not have a valid CDS spread for the given year to be represented here. The subsample of fiscal data for observations with valid spreads can be found in appendix D. Rev represents total revenue, CL is current liabilities, NCL is noncurrent liabilities, PL is pension liabilities, CA is capital assets, and PL Local is local (i.e. non-state level) pension liabilities. All variables are scaled by annual state GDP.

	Mean					
State	Rev/GDP	CL/GDP	NCL/GDP	PL/GDP	CA/GDP	PL Local/GDP
AK	0.1850	0.1850	0.1850	0.1850	0.1850	0.1850
AL	0.1138	0.0106	0.0185	0.2261	0.0972	NaN
AR	0.1179	0.0115	0.0396	0.1576	NaN	NaN
AZ	NaN	NaN	NaN	NaN	NaN	NaN
CA	0.1025	0.0217	0.0635	0.2316	0.0381	0.0945
CO	0.0723	0.0723	0.0723	0.0723	0.0723	0.0723
CT	0.1090	0.0181	0.1298	0.1779	0.0327	NaN
DE	0.1127	0.0168	0.0630	0.1164	0.0734	NaN
FL	0.0892	0.0141	0.0516	0.1719	0.0771	0.0028
GA	0.0964	0.0136	0.0297	0.1787	0.0413	0.0036
HI	0.1275	0.0187	0.1316	0.2600	0.0809	NaN
IA	0.0906	0.0906	0.0906	0.0906	0.0906	0.0906
ID	0.1051	0.1051	0.1051	0.1051	0.1051	0.1051
IL	0.0884	0.0226	0.0977	0.2332	0.0213	0.0701
IN	0.0588	0.0588	0.0588	0.0588	0.0588	0.0588
KS	0.0752	0.0752	0.0752	0.0752	0.0752	0.0752
KY	0.1369	0.1369	0.1369	0.1369	0.1369	0.1369
LA	0.0817	0.0817	0.0817	0.0817	0.0817	0.0817
MA	0.1148	0.0200	0.1032	0.1412	0.0057	0.0180
MD	0.0967	0.0173	0.0623	0.1570	0.0518	0.0098
ME	0.1135	0.1135	0.1135	0.1135	0.1135	0.1135
MI	0.1213	0.0135	0.0298	0.1934	0.0423	0.0098
MN	0.1074	0.0205	0.0253	0.1946	0.0338	0.0169
MO	0.0702	0.0702	0.0702	0.0702	0.0702	0.0702
MS	0.1631	0.0222	0.0508	0.3182	0.1183	NaN
NC	0.0973	0.0182	0.0219	0.1727	0.0812	NaN
ND	0.0923	0.0923	0.0923	0.0923	0.0923	0.0923
NE	0.0398	0.0398	0.0398	0.0398	0.0398	0.0398
NH	0.0716	0.0716	0.0716	0.0716	0.0716	0.0716
NJ	0.1056	0.0119	0.1985	0.2399	0.0148	NaN
NM	0.1550	0.1550	0.1550	0.1550	0.1550	0.1550
NV	0.0647	0.0165	0.0360	0.2592	0.0318	NaN
NY	0.1142	0.0207	0.0597	0.1988	0.0552	0.1301
OH	0.1091	0.0088	0.0752	0.3682	0.0419	0.0040
OK	0.0685	0.0685	0.0685	0.0685	0.0685	0.0685
OR	0.1060	0.1060	0.1060	0.1060	0.1060	0.1060
PA	0.1071	0.0203	0.0296	0.1918	0.0389	0.0153
RI	0.1486	0.0184	0.0612	0.2452	0.0341	NaN
SC	0.1349	0.0243	0.0468	0.2404	0.0730	NaN
SD	0.0817	0.0817	0.0817	0.0817	0.0817	0.0817
TN	0.0982	0.0071	0.0100	0.1367	0.0889	0.0088
TX	0.0890	0.0211	0.0343	0.1569	0.0543	0.0072
UT	0.0890	0.0081	0.0422	0.1820	0.0959	NaN
VA	0.0783	0.0117	0.0245	0.1568	0.0396	0.0056
VT	0.1046	0.1046	0.1046	0.1046	0.1046	0.1046
WA	0.1126	0.0173	0.1214	0.0750	0.0455	0.0069
WI	0.1223	0.0279	0.0516	0.3093	0.0694	0.0168
WV	0.1217	0.1217	0.1217	0.1217	0.1217	0.1217
WY	0.1263	0.1263	0.1263	0.1263	0.1263	0.1263

Table XXI: Explanatory Variable Cross-Sectional Summary Statistics - StDev

Table XXI presents cross-sectional summary statistics of annual observations for the main explanatory variables used in the paper. The distributions represent fiscal data for all 27 states which have a valid CDS price over the period. A state need not have a valid CDS spread for the given year to be represented here. The subsample of fiscal data for observations with valid spreads can be found in appendix D. Rev represents total revenue, CL is current liabilities, NCL is noncurrent liabilities, PL is pension liabilities, CA is capital assets, and PL Local is local (i.e. non-state level) pension liabilities. All variables are scaled by annual state GDP.

	StDev					
State	Rev/GDP	CL/GDP	NCL/GDP	PL/GDP	CA/GDP	PL Local/GDP
AK	0.1547	0.1547	0.1547	0.1547	0.1547	0.1547
AL	0.0053	0.0014	0.0122	0.0132	0.0266	NaN
AR	0.0681	0.0066	0.0229	0.0910	NaN	NaN
AZ	NaN	NaN	NaN	NaN	NaN	NaN
CA	0.0061	0.0025	0.0156	0.0294	0.0119	0.0102
CO	0.0838	0.0838	0.0838	0.0838	0.0838	0.0838
CT	0.0087	0.0021	0.0525	0.0298	0.0032	NaN
DE	0.0100	0.0041	0.0227	0.0140	0.0054	NaN
FL	0.0204	0.0058	0.0116	0.0204	0.0065	0.0003
GA	0.0062	0.0040	0.0080	0.0172	0.0024	0.0004
HI	0.0069	0.0075	0.0377	0.0246	0.0276	NaN
IA	0.0885	0.0885	0.0885	0.0885	0.0885	0.0885
ID	0.1006	0.1006	0.1006	0.1006	0.1006	0.1006
IL	0.0062	0.0072	0.0455	0.0400	0.0018	0.0056
IN	0.0556	0.0556	0.0556	0.0556	0.0556	0.0556
KS	0.0723	0.0723	0.0723	0.0723	0.0723	0.0723
KY	0.1184	0.1184	0.1184	0.1184	0.1184	0.1184
LA	0.0883	0.0883	0.0883	0.0883	0.0883	0.0883
MA	0.0067	0.0015	0.0196	0.0115	0.0048	0.0010
MD	0.0052	0.0073	0.0262	0.0106	0.0032	0.0002
ME	0.1183	0.1183	0.1183	0.1183	0.1183	0.1183
MI	0.0117	0.0008	0.0074	0.0241	0.0025	0.0007
MN	0.0245	0.0052	0.0085	0.0447	0.0061	0.0174
MO	0.0936	0.0936	0.0936	0.0936	0.0936	0.0936
MS	0.0110	0.0027	0.0118	0.0302	0.0148	NaN
NC	0.0066	0.0062	0.0053	0.0108	0.0073	NaN
ND	0.0629	0.0629	0.0629	0.0629	0.0629	0.0629
NE	0.0415	0.0415	0.0415	0.0415	0.0415	0.0415
NH	0.0638	0.0638	0.0638	0.0638	0.0638	0.0638
NJ	0.0025	0.0008	0.0744	0.0195	0.0011	NaN
NM	0.1584	0.1584	0.1584	0.1584	0.1584	0.1584
NV	0.0096	0.0048	0.0042	0.0531	0.0038	NaN
NY	0.0070	0.0021	0.0062	0.0056	0.0054	0.0112
OH	0.0062	0.0077	0.0060	0.0320	0.0033	0.0002
OK	0.0708	0.0708	0.0708	0.0708	0.0708	0.0708
OR	0.1215	0.1215	0.1215	0.1215	0.1215	0.1215
PA	0.0050	0.0027	0.0110	0.0127	0.0032	0.0004
RI	0.0106	0.0024	0.0194	0.0201	0.0153	NaN
SC	0.0157	0.0098	0.0108	0.0212	0.0068	NaN
SD	0.0975	0.0975	0.0975	0.0975	0.0975	0.0975
TN	0.0068	0.0010	0.0023	0.0103	0.0031	0.0006
TX	0.0047	0.0051	0.0114	0.0067	0.0045	0.0016
UT	0.0033	0.0009	0.0048	0.0123	0.0072	NaN
VA	0.0033	0.0025	0.0050	0.0194	0.0068	0.0001
VT	0.0831	0.0831	0.0831	0.0831	0.0831	0.0831
WA	0.0056	0.0034	0.0132	0.0222	0.0080	0.0005
WI	0.0075	0.0031	0.0049	0.0102	0.0040	0.0005
WV	0.0850	0.0850	0.0850	0.0850	0.0850	0.0850
WY	0.0683	0.0683	0.0683	0.0683	0.0683	0.0683

Table XXII: Daily State CDS Summary Statistics

Table XXII presents summary stats from daily CDS data.

State	Mean	StDev.	Min	Median	Max	Serial Correlation	N	Start Date	EndDate
CA	110.95	96.38	5.45	80.15	465.89	1.00	3155.00	20040227.00	20160825.00
MA	77.43	43.90	7.50	68.41	257.00	0.96	2418.00	20070802.00	20170104.00
VA	52.51	28.06	13.00	45.00	155.00	0.99	2105.00	20080122.00	20170104.00
IL	183.04	84.97	7.00	184.44	360.80	1.00	2458.00	20050920.00	20170104.00
MI	113.88	75.82	25.50	83.01	404.50	1.00	2360.00	20071130.00	20170104.00
AL	100.66	19.43	64.77	98.50	168.00	0.98	657.00	20100226.00	20130506.00
CT	109.57	37.16	24.00	104.91	255.00	0.98	2156.00	20080505.00	20170104.00
DE	52.79	26.60	14.71	46.87	172.50	0.99	1776.00	20080407.00	20150610.00
FL	78.75	48.50	11.48	56.90	250.00	1.00	2390.00	20070919.00	20170104.00
GA	56.49	26.49	26.22	53.50	149.50	0.99	1925.00	20080919.00	20170104.00
HI	100.88	54.51	22.50	94.17	350.00	0.99	1950.00	20080506.00	20170104.00
MN	51.49	26.27	5.00	44.93	174.50	0.99	2258.00	20071130.00	20170104.00
MS	105.71	23.88	26.50	106.75	194.00	0.98	1965.00	20080612.00	20170104.00
MD	53.60	28.41	6.00	44.14	168.00	0.99	2212.00	20071130.00	20170104.00
NJ	123.80	63.84	5.57	123.46	332.50	1.00	2380.00	20070608.00	20170104.00
NV	106.50	68.92	15.50	96.00	350.00	1.00	2135.00	20071130.00	20161107.00
NY	84.62	70.89	4.33	51.88	348.13	1.00	2648.00	20060913.00	20170104.00
NC	53.59	29.44	5.20	45.00	149.00	0.99	2153.00	20071029.00	20170104.00
OH	81.34	42.18	23.97	62.00	254.42	1.00	2318.00	20071130.00	20170104.00
PA	83.61	34.49	11.50	87.34	198.50	0.99	2339.00	20071130.00	20170104.00
RI	94.45	36.79	42.66	99.78	173.23	1.00	1134.00	20100222.00	20140923.00
SC	56.77	31.82	10.50	44.53	177.50	0.99	2216.00	20071130.00	20170104.00
TN	87.75	32.45	40.50	78.00	157.50	0.99	381.00	20081231.00	20100917.00
TX	55.37	33.09	5.42	45.92	186.48	0.99	2441.00	20070711.00	20170104.00
UT	48.69	26.06	10.50	41.36	173.00	0.99	1950.00	20071130.00	20170104.00
WA	66.49	35.15	19.50	68.00	163.00	0.99	1962.00	20080506.00	20170104.00
WI	68.58	41.85	15.50	59.50	203.00	0.98	2137.00	20071130.00	20170104.00

Figure 5: State CDS Spreads: 2008-2016

Table 5 daily time-series of state level CDS spreads.

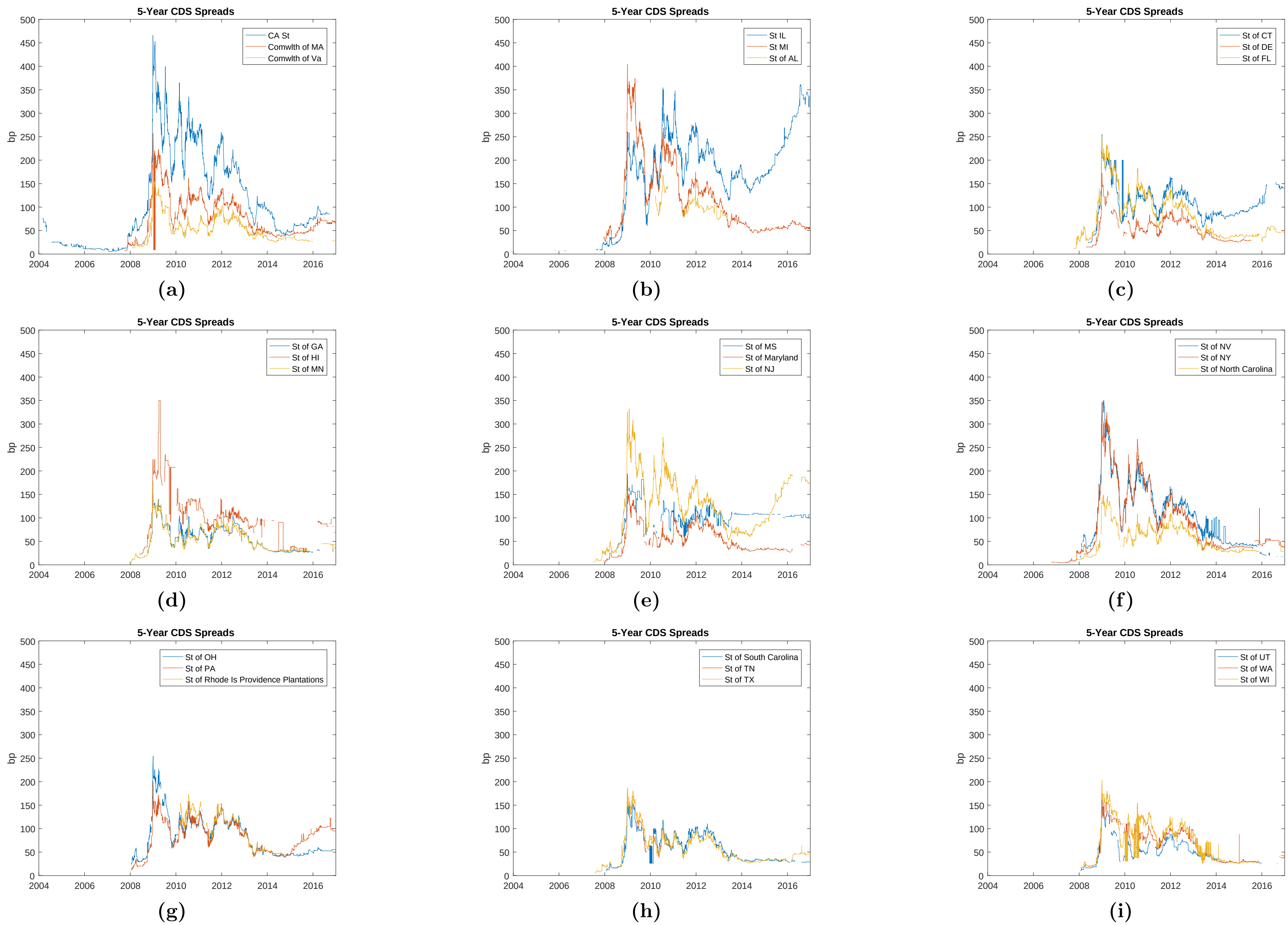


Table XXIII: State CDS Correlations: 2008-2016

Table XXIII presents correlations of daily CDS spreads from the Markit sample.

	CA	**MA**	**VA**	**IL**	**MI**	**AL**	**CT**	**DE**	**FL**	**GA**	**HI**	**MN**	**MS**	**MD**	**NJ**	**NV**	**NY**	**NC**	**OH**	**PA**	**RI**	**SC**	**TN**	**TX**	**UT**	**WA**	**WI**
CA	1.00	0.88	0.85	0.43	0.95	0.88	0.72	0.84	0.96	0.88	0.80	0.84	0.49	0.85	0.81	0.95	0.96	0.89	0.94	0.80	0.97	0.86	0.80	0.91	0.86	0.91	0.89
MA	0.88	1.00	0.88	0.45	0.90	0.78	0.78	0.86	0.92	0.87	0.76	0.89	0.55	0.88	0.81	0.88	0.90	0.91	0.92	0.85	0.98	0.88	0.85	0.92	0.87	0.86	0.89
VA	0.85	0.88	1.00	0.42	0.87	0.38	0.83	0.97	0.90	0.94	0.74	0.96	0.62	0.98	0.76	0.89	0.84	0.96	0.95	0.84	0.78	0.94	0.97	0.95	0.97	0.87	0.89
IL	0.43	0.45	0.42	1.00	0.25	0.87	0.64	0.58	0.29	0.32	0.16	0.47	0.30	0.42	0.76	0.32	0.31	0.52	0.31	0.73	0.89	0.38	0.21	0.37	0.46	0.36	0.40
MI	0.95	0.90	0.87	0.25	1.00	0.91	0.71	0.85	0.98	0.88	0.82	0.85	0.56	0.85	0.78	0.97	0.98	0.90	0.95	0.76	0.95	0.88	0.95	0.94	0.88	0.88	0.90
AL	0.88	0.78	0.38	0.87	0.91	1.00	0.58	0.37	0.90	0.50	0.78	0.32	0.48	0.29	0.91	0.89	0.89	0.56	0.73	0.77	0.86	0.63	0.88	0.65	0.44	0.52	0.38
CT	0.72	0.78	0.83	0.64	0.71	0.58	1.00	0.91	0.74	0.79	0.65	0.83	0.68	0.82	0.85	0.73	0.70	0.84	0.78	0.87	0.86	0.76	0.95	0.81	0.87	0.76	0.75
DE	0.84	0.86	0.97	0.58	0.85	0.37	0.91	1.00	0.89	0.95	0.77	0.97	0.61	0.98	0.83	0.88	0.82	0.96	0.95	0.88	0.78	0.95	0.98	0.95	0.98	0.90	0.88
FL	0.96	0.92	0.90	0.29	0.98	0.90	0.74	0.89	1.00	0.91	0.82	0.87	0.56	0.88	0.78	0.96	0.98	0.92	0.97	0.79	0.98	0.90	0.95	0.96	0.90	0.91	0.91
GA	0.88	0.87	0.94	0.32	0.88	0.50	0.79	0.95	0.91	1.00	0.71	0.95	0.52	0.94	0.74	0.90	0.86	0.95	0.96	0.86	0.86	0.96	0.92	0.92	0.93	0.89	0.90
HI	0.80	0.76	0.74	0.16	0.82	0.78	0.65	0.77	0.82	0.71	1.00	0.70	0.62	0.74	0.65	0.78	0.78	0.77	0.77	0.64	0.77	0.74	0.69	0.83	0.76	0.86	0.76
MN	0.84	0.89	0.96	0.47	0.85	0.32	0.83	0.97	0.87	0.95	0.70	1.00	0.57	0.98	0.77	0.86	0.83	0.97	0.94	0.87	0.80	0.94	0.97	0.93	0.96	0.87	0.90
MS	0.49	0.55	0.62	0.30	0.56	0.48	0.68	0.61	0.56	0.52	0.62	0.57	1.00	0.59	0.58	0.54	0.52	0.55	0.55	0.51	0.06	0.54	0.68	0.64	0.63	0.56	0.52
MD	0.85	0.88	0.98	0.42	0.85	0.29	0.82	0.98	0.88	0.94	0.74	0.98	0.59	1.00	0.72	0.86	0.82	0.97	0.94	0.85	0.76	0.95	0.97	0.94	0.97	0.89	0.89
NJ	0.81	0.81	0.76	0.76	0.78	0.91	0.85	0.83	0.78	0.74	0.65	0.77	0.58	0.72	1.00	0.76	0.81	0.79	0.77	0.90	0.96	0.71	0.86	0.81	0.78	0.75	0.75
NV	0.95	0.88	0.89	0.32	0.97	0.89	0.73	0.88	0.96	0.90	0.78	0.86	0.54	0.86	0.76	1.00	0.96	0.91	0.95	0.78	0.96	0.89	0.92	0.92	0.89	0.87	0.90
NY	0.96	0.90	0.84	0.31	0.98	0.89	0.70	0.82	0.98	0.86	0.78	0.83	0.52	0.82	0.81	0.96	1.00	0.88	0.94	0.77	0.95	0.87	0.87	0.92	0.84	0.87	0.88
NC	0.89	0.91	0.96	0.52	0.90	0.56	0.84	0.96	0.92	0.95	0.77	0.97	0.55	0.97	0.79	0.91	0.88	1.00	0.97	0.89	0.89	0.96	0.97	0.94	0.96	0.92	0.92
OH	0.94	0.92	0.95	0.31	0.95	0.73	0.78	0.95	0.97	0.96	0.77	0.94	0.55	0.94	0.77	0.95	0.94	0.97	1.00	0.83	0.97	0.95	0.97	0.96	0.95	0.91	0.94
PA	0.80	0.85	0.84	0.73	0.76	0.77	0.87	0.88	0.79	0.86	0.64	0.87	0.51	0.85	0.90	0.78	0.77	0.89	0.83	1.00	0.97	0.84	0.79	0.81	0.85	0.84	0.84
RI	0.97	0.98	0.78	0.89	0.95	0.86	0.86	0.78	0.98	0.86	0.77	0.80	0.06	0.76	0.96	0.96	0.95	0.89	0.97	0.97	1.00	0.90	0.89	0.92	0.81	0.93	0.86
SC	0.86	0.88	0.94	0.38	0.88	0.63	0.76	0.95	0.90	0.96	0.74	0.94	0.54	0.95	0.71	0.89	0.87	0.96	0.95	0.84	0.90	1.00	0.85	0.91	0.94	0.89	0.91
TN	0.80	0.85	0.97	0.21	0.95	0.88	0.95	0.98	0.95	0.92	0.69	0.97	0.68	0.97	0.86	0.92	0.87	0.97	0.97	0.79	0.89	0.85	1.00	0.97	0.99	0.76	0.73
TX	0.91	0.92	0.95	0.37	0.94	0.65	0.81	0.95	0.96	0.92	0.83	0.93	0.64	0.94	0.81	0.92	0.92	0.94	0.96	0.81	0.92	0.91	0.97	1.00	0.95	0.91	0.90
UT	0.86	0.87	0.97	0.46	0.88	0.44	0.87	0.98	0.90	0.93	0.76	0.96	0.63	0.97	0.78	0.89	0.84	0.96	0.95	0.85	0.81	0.94	0.99	0.95	1.00	0.87	0.88
WA	0.91	0.86	0.87	0.36	0.88	0.52	0.76	0.90	0.91	0.89	0.86	0.87	0.56	0.89	0.75	0.87	0.87	0.92	0.91	0.84	0.93	0.89	0.76	0.91	0.87	1.00	0.88
WI	0.89	0.89	0.89	0.40	0.90	0.38	0.75	0.88	0.91	0.90	0.76	0.90	0.52	0.89	0.75	0.90	0.88	0.92	0.94	0.84	0.86	0.91	0.73	0.90	0.88	0.88	1.00