The Core, The Periphery, and the Disaster: Corporate-Sovereign Nexus in COVID-19 Times

Ruggero Jappelli[1] Loriana Pelizzon[1,2] Alberto Plazzi[3]

National Bank of Belgium

[1]SAFE and Goethe University Frankfurt

[2]Ca' Foscari University of Venice and CEPR

[3]USI and SFI

Research question & Contribution

- How do sovereign and domestic corporate credit risk interact?
  - Financial firms $\rightarrow$ "doom loop"
  - Non-financials $\rightarrow$ several channels

- Government risk externalities are generally perceived to be stronger in countries with low fiscal space (*sovereign risk channel*)

$\rightarrow$ We examine the "corporate-sovereign nexus" – sensitivity of CDS spreads on non-financial corporations to those on government – in the cross-section of EU countries in the aftermath of COVID-19

$\rightarrow$ In the face of a tail event episode, the prediction above is not supported by the data: stronger nexus in core EU countries

$\rightarrow$ We develop a disaster risk model augmented with public guarantees to interpret our evidence

Research question & Contribution

- How do sovereign and domestic corporate credit risk interact?
  - Financial firms $\rightarrow$ "doom loop"
  - Non-financials $\rightarrow$ several channels
- Government risk externalities are generally perceived to be stronger in countries with low fiscal space (*sovereign risk channel*)

$\rightarrow$ We examine the "corporate-sovereign nexus" – sensitivity of CDS spreads on non-financial corporations to those on government – in the cross-section of EU countries in the aftermath of COVID-19

$\rightarrow$ In the face of a tail event episode, the prediction above is not supported by the data: stronger nexus in core EU countries

$\rightarrow$ We develop a disaster risk model augmented with public guarantees to interpret our evidence

Research question & Contribution

- How do sovereign and domestic corporate credit risk interact?
  - Financial firms → "doom loop"
  - Non-financials → several channels

- Government risk externalities are generally perceived to be stronger in countries with low fiscal space (*sovereign risk channel*)

→ We examine the "corporate-sovereign nexus" – sensitivity of CDS spreads on non-financial corporations to those on government – in the cross-section of EU countries in the aftermath of COVID-19

→ In the face of a tail event episode, the prediction above is not supported by the data: stronger nexus in core EU countries

→ We develop a disaster risk model augmented with public guarantees to interpret our evidence

What do we know? Previous Literature

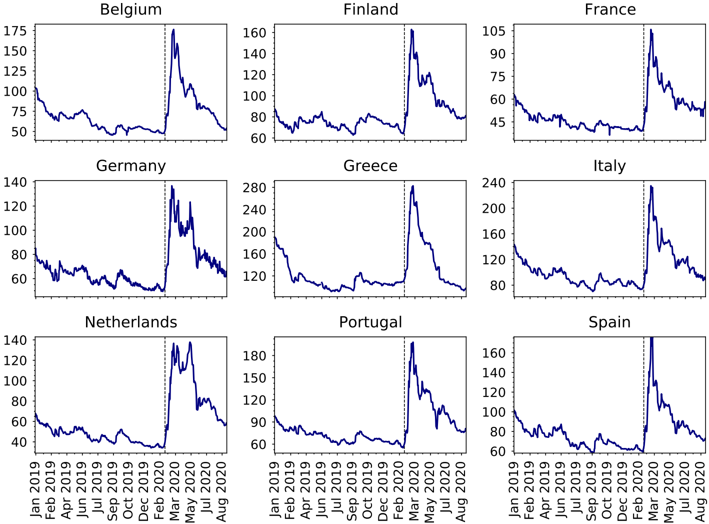
- Pass-through of credit risk between government and financial sector chart
  Acharya, Drechsler, and Schnabl 2014, Bocola 2016, Brunnermeier et al. 2016
- Spillovers to non-financials: Corsetti et al. 2013, Bedendo and Colla 2015, Lee, Naranjo, and Sirmans 2016, Almeida et al. 2017, Augustin et al. 2018
- Effects of the pandemic on financial markets: Augustin et al. 2021, Gerding, Martin, and Nagler 2020, Pagano, Wagner, and Zechner 2020
- Credit default swaps: Duffie 1999, Longstaff, Mithal, and Neis 2005, Pan and Singleton 2008, Longstaff et al. 2011, Ang and Longstaff 2013
- Disaster models: Rietz 1988, Barro 2006, Gabaix 2012, Kelly, Lustig, and Van Nieuwerburgh 2016, Gandhi, Lustig, and Plazzi 2020

Research Design and Data

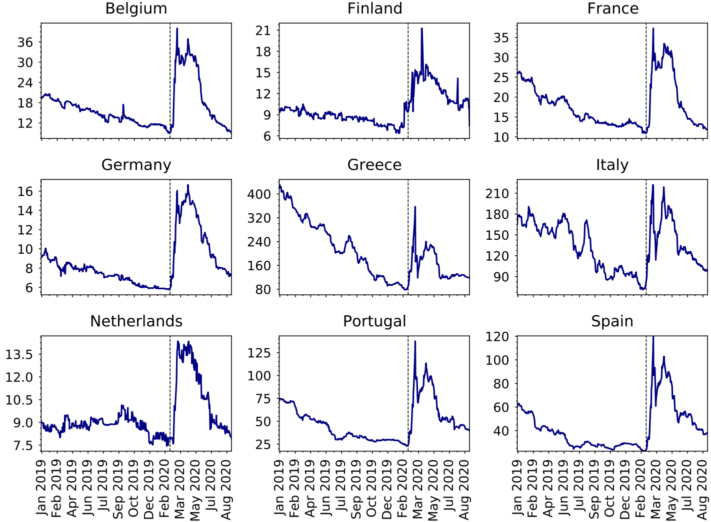
- Focus: interaction between sovereign and domestic non-financial corporate credit risk, which we measure with 5-year CDS spreads (IHS Markit)
- Where and when: 9 countries in the Euro Area around the COVID pandemic, from Jan 2019 to Sept 2020
- Core/Periphery classification in Ehrmann and Fratzscher 2017
  - **Core**: Belgium, Finland, France, Germany, Netherlands
  - **Periphery**: Greece, Italy, Portugal and Spain
- Advantage: homogeneous MP, exchange rate, epidemiologic intensity

Fiscal Capacity

Corporate Spreads



Sovereign Spreads



Empirical Challenges

- The relation between corporate and sovereign spreads could be influenced by confounding factors
- Example: credit risk of both governments and corporations responds to macroeconomic shocks
- A cross-sectional approach would therefore suffer from endogeneity concerns
- Disaster that triggers a swift surge in credit risk does not anywise affect fiscal capacity right away
- Wishlist:
  - Contraction be exogenous to pre-existing structure of the nexus and the fiscal capacity of countries
  - Shock to reach simultaneously and homogeneously the sample

Sovereign Risk Channel

- Transmission of aggregate demand shocks to domestic firms is amplified in countries with already high levels of sovereign credit spreads and limited fiscal space
- The nexus reflects risk of tax hikes, expropriations, disruptive strikes, political instability
- Theoretical model of Corsetti et al. 2013; Empirical evidence by Almeida et al. 2017 and Lee, Naranjo, and Sirmans 2016

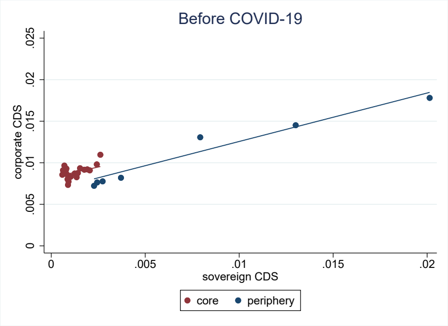
⇒ The effect of COVID-19 on the nexus should be stronger in the periphery

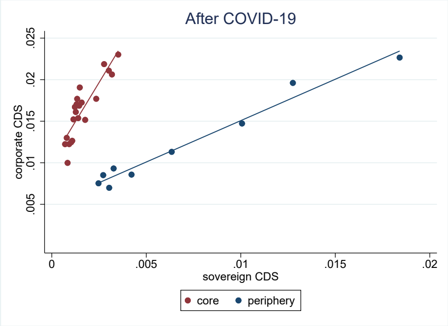
Public Support Channel

- First time a widespread halt to economic activity was imposed
- Market participants could anticipate government intervention to rescue corporate sector
- For financial companies, effect of pricing of public support (guarantees) studied by Acharya, Drechsler, and Schnabl 2014 and Kelly, Lustig, and Van Nieuwerburgh 2016
- Idea of a backstop option to domestic firms in the face of a systemic shock

⇒ The effect of COVID-19 on the nexus should be stronger in the core

First-pass Evidence





Baseline Model

Panel regression:

$$\begin{aligned}\Delta log(\text{CDS Corp})_{ijt} &= \alpha_i + \beta_0 + \beta_1 \Delta log(\text{CDS Sov})_{jt} \\ &+\beta_2 \Delta log(\text{CDS Sov})_{jt} \times E \\ &+\gamma_1 X_{ijt} + \gamma_2 X_{ijt} \times E + \gamma_3 E + \varepsilon_{ijt}\end{aligned}$$

- E dummy is 1 starting with Feb 24, 2020
- Coefficient of interest β_2
- FE captured by α_i
- X_{ijt} includes:
  - Lagged corporate spreads
  - Equity returns R_{ijt}, based on Merton model (Acharya, Drechsler, and Schnabl 2014)
  - CBOE VIX, capturing risk appetite and aggregate uncertainty

Baseline Results

TABLE 1: **Corporate-sovereign Nexus, Pooled Model**

	Equally Weighted		Value Weighted		Entropy Balanced	
	(1) Core	(2) Periphery	(3) Core	(4) Periphery	(5) Core	(6) Periphery
$\Delta log(\text{CDS sovereign})_{jt}$	0.127***	0.208***	0.170***	0.325***	0.126***	0.294***
	(0.013)	(0.036)	(0.015)	(0.037)	(0.013)	(0.040)
$\Delta log(\text{CDS sovereign})_{jt} \times E$	0.125***	0.052	0.151***	0.049	0.124***	0.008
	(0.016)	(0.032)	(0.025)	(0.037)	(0.016)	(0.044)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Controls × E	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
No. Obs.	41,967	10,282	41,536	10,282	40,685	9,420
R-squared	0.274	0.285	0.315	0.434	0.278	0.386
No. Firms	99	24	98	24	96	22
p-value for $\left(\beta_2^{Core} = \beta_2^{\text{Periphery}}\right)$	0.019		0.006		0.010	

- Increase in sensitivity only in core countries => **Public support channel** ✓

Baseline Results

Table 1: **Corporate-sovereign Nexus, Pooled Model**

	Equally Weighted		Value Weighted		Entropy Balanced	
	(1) Core	(2) Periphery	(3) Core	(4) Periphery	(5) Core	(6) Periphery
$\Delta log(\text{CDS sovereign})_{jt}$	0.127***	0.208***	0.170***	0.325***	0.126***	0.294***
	(0.013)	(0.036)	(0.015)	(0.037)	(0.013)	(0.040)
$\Delta log(\text{CDS sovereign})_{jt} \times E$	0.125***	0.052	0.151***	0.049	0.124***	0.008
	(0.016)	(0.032)	(0.025)	(0.037)	(0.016)	(0.044)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Controls $\times$ E	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
No. Obs.	41,967	10,282	41,536	10,282	40,685	9,420
R-squared	0.274	0.285	0.315	0.434	0.278	0.386
No. Firms	99	24	98	24	96	22
p-value for $\left(\beta_2^{Core} = \beta_2^{\text{Periphery}}\right)$	0.019		0.006		0.010	

- Increase in sensitivity only in core countries => **Public support channel** ✓

Baseline Results

TABLE 1: **Corporate-sovereign Nexus, Pooled Model**

	Equally Weighted		Value Weighted		Entropy Balanced	
	(1) Core	(2) Periphery	(3) Core	(4) Periphery	(5) Core	(6) Periphery
$\Delta log(\text{CDS sovereign})_{jt}$	0.127***	0.208***	0.170***	0.325***	0.126***	0.294***
	(0.013)	(0.036)	(0.015)	(0.037)	(0.013)	(0.040)
$\Delta log(\text{CDS sovereign})_{jt} \times E$	0.125***	0.052	0.151***	0.049	0.124***	0.008
	(0.016)	(0.032)	(0.025)	(0.037)	(0.016)	(0.044)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Controls $\times$ E	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
No. Obs.	41,967	10,282	41,536	10,282	40,685	9,420
R-squared	0.274	0.285	0.315	0.434	0.278	0.386
No. Firms	99	24	98	24	96	22
p-value for $\left(\beta_2^{Core} = \beta_2^{\text{Periphery}}\right)$	0.019		0.006		0.010	

- Increase in sensitivity only in core countries => **Public support channel** ✓

Baseline Results

TABLE 1: **Corporate-sovereign Nexus, Pooled Model**

	Equally Weighted		Value Weighted		Entropy Balanced	
	(1) Core	(2) Periphery	(3) Core	(4) Periphery	(5) Core	(6) Periphery
$\Delta log(\text{CDS sovereign})_{jt}$	0.127***	0.208***	0.170***	0.325***	0.126***	0.294***
	(0.013)	(0.036)	(0.015)	(0.037)	(0.013)	(0.040)
$\Delta log(\text{CDS sovereign})_{jt} \times E$	0.125***	0.052	0.151***	0.049	0.124***	0.008
	(0.016)	(0.032)	(0.025)	(0.037)	(0.016)	(0.044)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Controls × E	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
No. Obs.	41,967	10,282	41,536	10,282	40,685	9,420
R-squared	0.274	0.285	0.315	0.434	0.278	0.386
No. Firms	99	24	98	24	96	22
p-value for $\left(\beta_2^{Core} = \beta_2^{\text{Periphery}}\right)$	0.019		0.006		0.010	

- Increase in sensitivity only in core countries => **Public support channel** ✓

Results by Country and Industry

TABLE 2: **Corporate-sovereign Nexus, Estimates by Country**

	Core					Periphery			
Variables	(1) BEL	(2) FIN	(3) FRA	(4) GER	(5) NED	(6) GRE	(7) ITA	(8) PTG	(9) SPA
$\Delta log(\text{CDS sov})_{jt}$	0.076**	0.018***	0.210***	0.146***	0.121***	0.130	0.158***	0.264**	0.326***
	(0.023)	(0.005)	(0.019)	(0.026)	(0.012)	(0.122)	(0.046)	(0.015)	(0.064)
$\Delta log(\text{CDS sov})_{jt} \times E$	0.121**	0.076***	0.136***	0.156***	0.158***	-0.051	0.060	0.130	0.000
	(0.042)	(0.019)	(0.027)	(0.034)	(0.018)	(0.080)	(0.036)	(0.073)	(0.032)

TABLE 3: **Corporate-sovereign Nexus, Estimates by Sector**

Variables	(1) Energy and Utilities	(2) Industrial	(3) Technology	(4) Goods and Services	(5) Financials
$\Delta log(\text{CDS sov})_{jt}$	0.169***	0.110***	0.125***	0.146***	0.170***
	(0.039)	(0.024)	(0.040)	(0.015)	(0.036)
$\Delta log(\text{CDS sov})_{jt} \times E$	0.106***	0.104***	0.055**	0.120***	0.047*
	(0.032)	(0.030)	(0.025)	(0.026)	(0.027)

Alternative Channels: Firm-Level characteristics

- An alternative story is that core and peripheral firms were differently exposed to the shock
- Add firm-level characteristics proxying for resilience to shock

- Wenzhi et al. 2021: the pandemic-induced drop in stock prices was milder among firms with larger pre-2020 profitability => *PPE*, profit before taxes over employees (PPE)
- Fahlenbrach, Rageth, and Stulz 2020: firms with greater financial flexibility exhibited stronger resiliency to COVID-19 and were less in need of policy responses => *Liquidity*, current assets minus stocks over current liabilities
- Acharya and Steffen 2020: firms' ex-ante funding structure is priced in the cross section of stock returns => *Loans*, the log of a firm's ratio of short-term financial debt to total debt

Alternative Channels: Firm-Level characteristics, results

	(1)	(2)	(3)	(4)	(5)	(6)
	Core	Periphery	Core	Periphery	Core	Periphery
Variables	$Z = PPE$		$Z = Liquidity$		$Z = Loans$	
$\Delta log(\text{CDS sovereign})_{jt}$	0.142***	0.253***	0.136***	0.216***	0.136***	0.207***
	(0.013)	(0.060)	(0.013)	(0.038)	(0.013)	(0.040)
$\Delta log(\text{CDS sovereign})_{jt} \times E$	0.114***	0.045	0.120***	0.063	0.117***	0.056
	(0.014)	(0.041)	(0.014)	(0.039)	(0.015)	(0.037)
Z_{it}	-0.000	-0.001	0.000	0.000	-0.003	-0.002
	(0.000)	(0.001)	(0.000)	(0.001)	(0.003)	(0.004)
$Z_{it} \times E$	-0.000	-0.001	-0.000	-0.002*	0.003	0.008
	(0.000)	(0.001)	(0.000)	(0.001)	(0.002)	(0.009)
$\Delta log(\text{CDS sovereign})_{jt} \times Z_{it}$	-0.009***	-0.023	-0.015***	0.028	0.172	-0.403
	(0.003)	(0.031)	(0.002)	(0.030)	(0.176)	(0.404)
$\Delta log(\text{CDS sovereign})_{jt} \times Z_{it} \times E$	0.027	0.135	-0.009***	0.185**	0.088	-0.595
	(0.031)	(0.140)	(0.003)	(0.068)	(0.676)	(1.539)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
No. Obs.	35,498	8,479	36,282	8,833	35,420	8,833
R-squared	0.283	0.323	0.282	0.330	0.279	0.331
Firms	85	21	86	21	84	21

Alternative Channels: Country-Level characteristics

- An alternative story is that core and peripheral countries were differently exposed to the shock (for reasons unrelated to fiscal cap)
- Add country-level characteristics proxying for resilience to shock

- Trade openness (import plus exports over GDP)
- Number of hospital beds per thousand inhabitants
- Government Policy Tracker
- Share of GDP generated by tourism per country and year

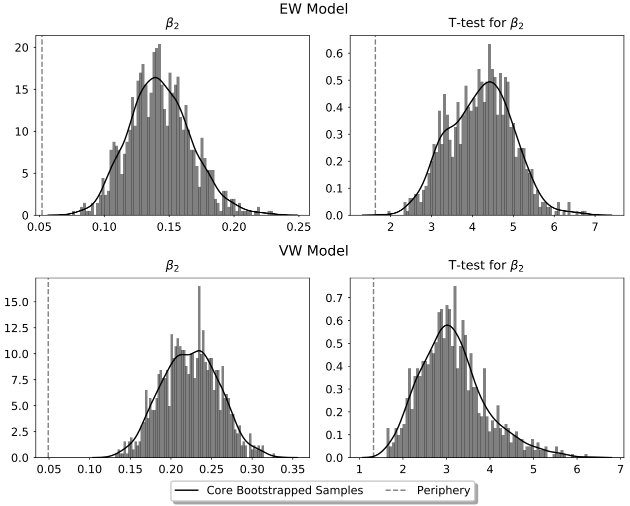
Alternative Channels: Country-Level characteristics, results

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$\text{Core}_i \times \Delta log(\text{CDS sovereign})_{jt}$	-0.061	-0.061	-0.061	-0.059	-0.061	-0.052	-0.094**
	(0.044)	(0.044)	(0.044)	(0.044)	(0.044)	(0.043)	(0.044)
$\text{Core}_i \times \Delta log(\text{CDS sovereign})_{jt} \times E$	0.113***	0.113***	0.113***	0.109***	0.113***	0.095**	0.119***
	(0.039)	(0.039)	(0.039)	(0.039)	(0.039)	(0.038)	(0.043)
$\Delta log(\text{CDS sovereign})_{jt} \times E$	0.020	0.020	0.020	0.020	0.020	0.060*	0.049
	(0.036)	(0.036)	(0.036)	(0.036)	(0.036)	(0.034)	(0.038)
$\Delta log(\text{CDS sovereign})_{jt}$	0.189***	0.189***	0.189***	0.187***	0.189***	0.149***	0.193***
	(0.041)	(0.041)	(0.041)	(0.041)	(0.041)	(0.041)	(0.042)
$\text{Trade Openness}_{jt}$		0.000					
		(0.000)					
$\text{Hospital Beds}_{jt}$			-0.001				
			(0.003)				
Oxford GPT_{jt}				-0.000***			
				(0.000)			
Tourism_{jt}					-0.000		
					(0.001)		
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Week × Sector FE	No	No	No	No	No	Yes	No
Week × Country FE	No	No	No	No	No	No	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. Obs	52,249	52,249	52,249	52,249	52,249	52,249	52,249
R-squared	0.272	0.272	0.272	0.275	0.272	0.322	0.319
Firms	123	123	123	123	123	123	123

Alternative Channels, contd

- Test for other coexisting channels:
  - ✓ Sovereign ceiling: firms with pre-COVID CDS higher than sovereign
  - ✓ Government ownership ⏩ table
  - ✓ Cross-areas spillovers: add other area PC1 as proxy for fiscal union ⏩ table
  - ✓ Factor structure of credit swaps ⏩ table
  - ✓ Fundamentals of credit risk ⏩ table
- Subsample:
  - ✓ Working on firms not targeted by PEPP
  - ✓ 1-month of COVID-19 sample
- Model design and econometric specification ⏩ table

Bootstrapped core samples



- Results strongly robust to differences in size and industrial composition.

Fiscal Capacity Measures

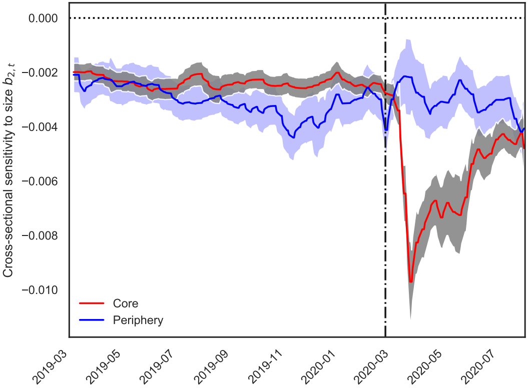
TABLE 4: **Corporate-sovereign Nexus, Fiscal Strength**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
				FiscalCap$_j$ measure			
	− Debt	− Debt Exp.	Wealth	− LT Rate	Rule of Law	Govt. Eff.	PC1
$FiscalCap_j \times \Delta log(\text{CDS sov})_{jt}$	-0.081*	-0.024	-0.080***	-0.008	-0.056*	-0.057	-0.015*
	(0.041)	(0.019)	(0.020)	(0.024)	(0.033)	(0.035)	(0.009)
$FiscalCap_j \times \Delta log(\text{CDS sov})_{jt} \times E$	0.119**	0.049**	0.032	0.079***	0.085**	0.097**	0.023**
	(0.052)	(0.021)	(0.031)	(0.019)	(0.035)	(0.040)	(0.010)
$\Delta log(\text{CDS sovereign})_{jt}$	0.059	0.105***	0.102***	0.136***	0.220***	0.219***	0.154***
	(0.040)	(0.027)	(0.010)	(0.013)	(0.053)	(0.055)	(0.017)
$\Delta log(\text{CDS sovereign})_{jt} \times E$	0.229***	0.182***	0.120***	0.137***	-0.013	-0.025	0.088***
	(0.057)	(0.035)	(0.020)	(0.016)	(0.052)	(0.057)	(0.017)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. Obs	52,249	52,249	52,249	52,249	52,249	52,249	52,249
R-squared	0.272	0.272	0.273	0.274	0.272	0.272	0.272
Firms	123	123	123	123	123	123	123

- Nexus increase positively associated to direct proxies of fiscal capacity

Deviations from Credit Risk Fundamentals

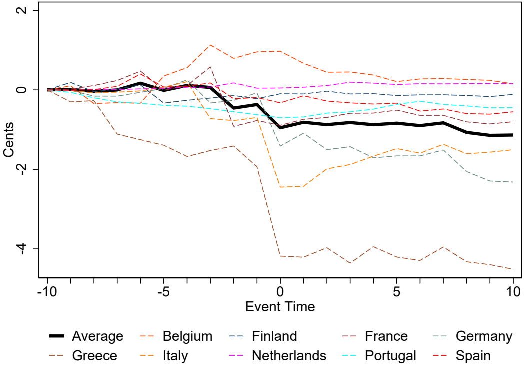
$$\text{CDS}_{i,t} = a_t + b_{1,t}\text{Merton Spread}_{i,t} + b_{2,t}\text{Size}_{i,t} + b_{3,t}\text{Leverage}_{i,t} + \varepsilon_{i,t}$$



Bottom line: importance of size and fiscal capacity measures points towards reliance on government support, "Public guarantees channel"

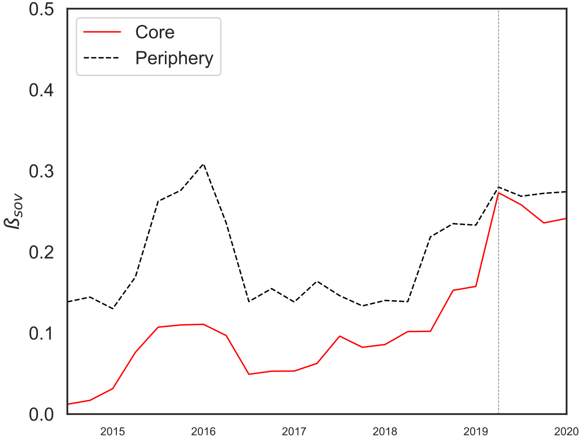
Event Study

$\text{CDS}_{j,t} - \text{Merton Spread}_{j,t}$ around fiscal policy announcements



The case of Lufthansa

Longer Time Series



$$\Delta log(\text{CDS Corp})_{ijt} = \alpha_i + \beta_0 + \beta_{\text{Sov}}\Delta log(\text{CDS Sov})_{jt} + \gamma X_{ijt} + \varepsilon_{ijt}$$

Larger Cross Section

	(1)	(2)	(3)	(4)
	Daily		Weekly	
Variables	Core	Periphery	Core	Periphery
$\Delta log(\text{CDS sovereign})_{jt}$	0.022*	0.102***	0.104***	0.122***
	(0.011)	(0.012)	(0.017)	(0.015)
$\Delta log(\text{CDS sovereign})_{jt} \times E$	0.172***	0.048**	0.160***	-0.020
	(0.023)	(0.020)	(0.021)	(0.029)
Firm FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
No. Obs.	81,333	25,571	16,641	5,242
R-squared	0.076	0.047	0.067	0.123
Firms	194	61	194	61

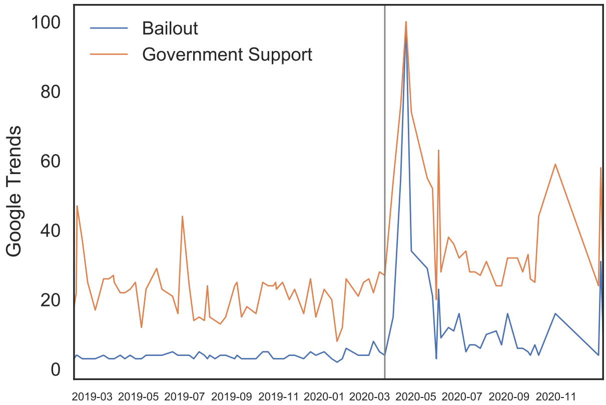
- Estimate baseline measuring credit risk of corporations on bond sample
- For each firm, YtM = average across issues weighted by amt outstanding
- Credit spread = YtM - R_f corresponding to modified duration bucket
- Sample of 255 firms largely representative of European public firms

Institutional Details

On 19 March 2020, the EU Commission adopted a State aid Temporary Framework. Member states were allowed to provide

- Direct grants, equity injections, selective tax advantages and advance payments;
- State guarantees for loans taken by companies;
- Subsidised public loans to companies, including subordinated loans;
- Safeguards for banks that channel State aid to the real economy;
- Public short-term export credit insurance.

Search Trends



- Search trends (Google normalizes 100 = max)

Contributions (I)

Empirical Evidence

Elasticity of corporate to sovereign CDS:

- **Ex disaster, larger in the Periphery.**
- COVID-19 → increased sensitivity *only* at the Core of the EU.
- Stronger degree of comovement in sensitive sectors.

Contributions (I)

Empirical Evidence

Elasticity of corporate to sovereign CDS:

- Ex disaster, larger in the Periphery.
- **COVID-19 → increased sensitivity only at the Core of the EU.**
- Stronger degree of comovement in sensitive sectors.

Contributions (I)

Empirical Evidence

Elasticity of corporate to sovereign CDS:

- Ex disaster, larger in the Periphery.
- COVID-19 ➔ increased sensitivity *only* at the Core of the EU.
- Stronger degree of comovement in sensitive sectors.

Contributions (I)

Empirical Evidence

Elasticity of corporate to sovereign CDS:

- Ex disaster, larger in the Periphery.
- COVID-19 → increased sensitivity *only* at the Core of the EU.
- **Stronger degree of comovement in sensitive sectors.**

Model - Motivation & Setup

- Understand how the increase in corporate-sovereign credit risk sensitivities relates to a disaster and government aid.
- Comparative statics.

- Intensity-based credit risk model
- All distributions are specified under $\mathbb{Q}$
- Disaster of stochastic intensity hits the economy w.p. $p_i \sim \Pi$.
- Repricing: agents observe disaster and infer the underlying state has high p_i

Model - Setup

- Default event at the first jump of a Poisson process with intensity λ_t
- Jump in default intensity $J_t^\lambda \sim \mathcal{N}(\theta_\lambda, \delta)$ without intervention, w.p. p_i
- Corporate default intensity is discrete time Ornstein-Uhlenbeck process

$$\Delta\lambda_{t+1}^c = \begin{cases} \mu_t^c + \phi_c \sigma_i \eta_{t+1} + \sigma_c \varepsilon_{t+1}, & \text{Ex Disaster} \\ \mu_t^c + \phi_c \sigma_i \eta_{t+1} + \sigma_c \varepsilon_{t+1} + \kappa_c J_{t+1}^a. & \text{Disaster} \end{cases}$$

- $J^\lambda \neq J^a$ if government steps in to shield corporations

Model - Setup

- Default event at the first jump of a Poisson process with intensity λ_t
- Jump in default intensity $J_t^\lambda \sim \mathcal{N}(\theta_\lambda, \delta)$ without intervention, w.p. p_i
- Corporate default intensity is discrete time Ornstein-Uhlenbeck process

$$\Delta\lambda_{t+1}^c = \begin{cases} \mu_t^c + \phi_c \sigma_i \eta_{t+1} + \sigma_c \varepsilon_{t+1}, & \text{Ex Disaster} \\ \mu_t^c + \phi_c \sigma_i \eta_{t+1} + \sigma_c \varepsilon_{t+1} + \kappa_c J_{t+1}^a. & \text{Disaster} \end{cases}$$

- $J^\lambda \neq J^a$ if government steps in to shield corporations

Model - Setup

- Default event at the first jump of a Poisson process with intensity λ_t
- Jump in default intensity $J_t^\lambda \sim \mathcal{N}(\theta_\lambda, \delta)$ without intervention, w.p. p_i
- Corporate default intensity is discrete time Ornstein-Uhlenbeck process

$$\Delta\lambda_{t+1}^c = \begin{cases} \mu_t^c + \phi_c\sigma_i\eta_{t+1} + \sigma_c\varepsilon_{t+1}, & \text{Ex Disaster} \\ \mu_t^c + \phi_c\sigma_i\eta_{t+1} + \sigma_c\varepsilon_{t+1} + \kappa_c J_{t+1}^a. & \text{Disaster} \end{cases}$$

- $J^\lambda \neq J^a$ if government steps in to shield corporations

Model - Setup

- Default event at the first jump of a Poisson process with intensity λ_t
- Jump in default intensity $J_t^\lambda \sim \mathcal{N}(\theta_\lambda, \delta)$ without intervention, w.p. p_i
- Corporate default intensity is discrete time Ornstein-Uhlenbeck process

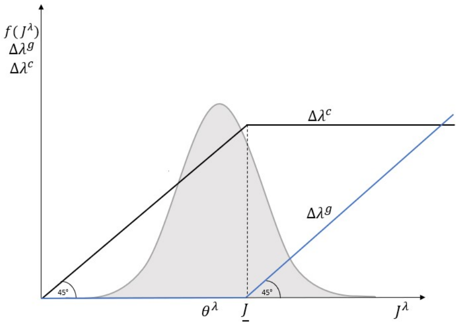
$$\Delta\lambda_{t+1}^c = \begin{cases} \mu_t^c + \phi_c \sigma_i \eta_{t+1} + \sigma_c \varepsilon_{t+1}, & \text{Ex Disaster} \\ \mu_t^c + \phi_c \sigma_i \eta_{t+1} + \sigma_c \varepsilon_{t+1} + \kappa_c J_{t+1}^a. & \text{Disaster} \end{cases}$$

- $J^\lambda \neq J^a$ if government steps in to shield corporations

Model - Setup

Fiscal Policy Function

$$J_t^a = \min\{J_t^\lambda, \underline{J}\}$$



Model - Setup

- Government default intensity

$$\Delta\lambda^g_{t+1} = \begin{cases} \mu^g_t + \phi_g \sigma_i \eta_{t+1}, & \text{Ex Disaster} \\ \mu^g_t + \phi_g \sigma_i \eta_{t+1} + \max\{J^\lambda_{t+1} - \underline{J}, 0\}. & \text{Disaster} \end{cases}$$

- Larger fiscal capacity $\Rightarrow$ lower $\underline{J}$
- Comparing regions, potentially
  - $\phi_g^{Core} < \phi_g^{Periphery}$
  - $\underline{J}^{Core} < \underline{J}^{Periphery}$
  - κ_c^{Core} vs $\kappa_c^{Periphery}$

Model - Setup

- Government default intensity

$$\Delta\lambda^{g}_{t+1} = \begin{cases} \mu^{g}_{t} + \phi_{g}\sigma_{i}\eta_{t+1}, & \text{Ex Disaster} \\ \mu^{g}_{t} + \phi_{g}\sigma_{i}\eta_{t+1} + \max\{J^{\lambda}_{t+1} - \underline{J}, 0\}. & \text{Disaster} \end{cases}$$

- Larger fiscal capacity $\Rightarrow$ lower $\underline{J}$
- Comparing regions, potentially
  - $\phi_{g}^{Core} < \phi_{g}^{Periphery}$
  - $\underline{J}^{Core} < \underline{J}^{Periphery}$
  - κ_{c}^{Core} vs $\kappa_{c}^{Periphery}$

Model - Setup

- Government default intensity

$$\Delta\lambda^{g}_{t+1} = \begin{cases} \mu^{g}_{t} + \phi_{g}\sigma_{i}\eta_{t+1}, & \text{Ex Disaster} \\ \mu^{g}_{t} + \phi_{g}\sigma_{i}\eta_{t+1} + \max\{J^{\lambda}_{t+1} - \underline{J}, 0\}. & \text{Disaster} \end{cases}$$

- Larger fiscal capacity $\Rightarrow$ lower $\underline{J}$
- Comparing regions, potentially
  - $\phi_{g}^{Core} < \phi_{g}^{Periphery}$
  - $\underline{J}^{Core} < \underline{J}^{Periphery}$
  - κ_{c}^{Core} vs $\kappa_{c}^{Periphery}$

Model - Setup

- Government default intensity

$$\Delta\lambda^{g}_{t+1} = \begin{cases} \mu^{g}_{t} + \phi_{g}\sigma_{i}\eta_{t+1}, & \text{Ex Disaster} \\ \mu^{g}_{t} + \phi_{g}\sigma_{i}\eta_{t+1} + \max\{J^{\lambda}_{t+1} - \underline{J}, 0\}. & \text{Disaster} \end{cases}$$

- Larger fiscal capacity $\Rightarrow$ lower $\underline{J}$
- Comparing regions, potentially
  - $\phi_{g}^{Core} < \phi_{g}^{Periphery}$
  - $\underline{J}^{Core} < \underline{J}^{Periphery}$
  - κ_{c}^{Core} vs $\kappa_{c}^{Periphery}$

Model - Setup

- Government default intensity

$$\Delta\lambda^g_{t+1} = \begin{cases} \mu^g_t + \phi_g \sigma_i \eta_{t+1}, & \text{Ex Disaster} \\ \mu^g_t + \phi_g \sigma_i \eta_{t+1} + \max\{J^\lambda_{t+1} - \underline{J}, 0\}. & \text{Disaster} \end{cases}$$

- Larger fiscal capacity $\Rightarrow$ lower $\underline{J}$
- Comparing regions, potentially
  - $\phi_g^{Core} < \phi_g^{Periphery}$
  - $\underline{J}^{Core} < \underline{J}^{Periphery}$
  - κ_c^{Core} vs $\kappa_c^{Periphery}$

Model - Setup

- Government default intensity

$$\Delta\lambda^{g}_{t+1} = \begin{cases} \mu^{g}_{t} + \phi_{g}\sigma_{i}\eta_{t+1}, & \text{Ex Disaster} \\ \mu^{g}_{t} + \phi_{g}\sigma_{i}\eta_{t+1} + \max\{J^{\lambda}_{t+1} - \underline{J}, 0\}. & \text{Disaster} \end{cases}$$

- Larger fiscal capacity $\Rightarrow$ lower $\underline{J}$
- Comparing regions, potentially
  - $\phi_{g}^{Core} < \phi_{g}^{Periphery}$
  - $\underline{J}^{Core} < \underline{J}^{Periphery}$
  - κ_{c}^{Core} vs $\kappa_{c}^{Periphery}$

Model - Results

Let Φ and φ be the Gaussian CDF and pdf evaluated at $\frac{\underline{J}-\theta_\lambda}{\delta}$.

Proposition I

$$\mathrm{Cov}(\Delta\lambda^g_{t+1}, \Delta\lambda^c_{t+1}) = \phi_g\phi_c\sigma_i^2 + p_i\kappa_c\mathbb{E}_t[\max\{J^\lambda_{t+1} - \underline{J}, 0\}](\underline{J} - p_i\min\{J^\lambda_t, \underline{J}\})$$

Assume a constant recovery rate R.

Proposition II

$$\Delta\mathrm{CDS}_{t+1} \approx (1-R)\Delta\lambda_{t+1}$$

Model - Results

Model-implied corporate-sovereign nexus.

Corollary I

$$\mathrm{Cov}(\Delta \mathsf{CDS}^{sov}_{t+1}, \Delta \mathsf{CDS}^{corp}_{t+1}) \approx \phi_g \overset{\substack{\text{ex disaster}\\ \downarrow}}{\phi_c} \sigma_i^2 + p_i \kappa_c \mathbb{E}_t[\max\{J^{\lambda}_{t+1} - \overset{\substack{\text{disaster risk}\\ \downarrow}}{\underline{J}}, 0\}](\underline{J} - p_i \min\{J^{\lambda}_t, \underline{J}\})$$

Effect of government support.

Corollary II

$$\frac{\partial \mathrm{Cov}(\Delta \mathsf{CDS}^{sov}_{t+1}, \Delta \mathsf{CDS}^{corp}_{t+1})}{\partial Guarantees} > 0 \text{ provided } \underline{J} > .5(\theta_\lambda + \frac{\phi}{1-\Phi})$$

Baseline Results - Interpretation

TABLE 5: **Corporate-sovereign Nexus, Pooled Model**

Variables	(1) Core	(2) Periphery	(3) Core, VW	(4) Periphery, VW
$\Delta log(\text{CDS Sov})_{jt}$	0.127***	0.208***	0.170***	0.325***
	(0.013)	(0.036)	(0.015)	(0.037)
$\Delta log(\text{CDS Sov})_{jt} \times E$	0.125***	0.052	0.151***	0.049
	(0.042)	(0.044)	(0.027)	(0.025)
Controls	Yes	Yes	Yes	Yes
Controls × E	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Robust SE	Yes	Yes	Yes	Yes
No. Obs.	41,967	10,282	41,536	10,282
R-squared	0.274	0.285	0.315	0.434
No. Firms	99	24	98	24

The Role of Fiscal Capacity

- **The perceived strength of the support is what matters in the pricing of credit risk claims and thus sculpts the comovement between corporate and sovereign.**
- Credibility of prolonged intervention to support firms during the crisis plays a key role in calming corporate spreads.
- Increase in covariance significant only at the core, pointing towards a "public support channel" determinant of the corporate-sovereign nexus conditionally on a disaster.

The Role of Fiscal Capacity

- The perceived strength of the support is what matters in the pricing of credit risk claims and thus sculpts the comovement between corporate and sovereign.
- **Credibility of prolonged intervention to support firms during the crisis plays a key role in calming corporate spreads.**
- Increase in covariance significant only at the core, pointing towards a "public support channel" determinant of the corporate-sovereign nexus conditionally on a disaster.

The Role of Fiscal Capacity

- The perceived strength of the support is what matters in the pricing of credit risk claims and thus sculpts the comovement between corporate and sovereign.
- Credibility of prolonged intervention to support firms during the crisis plays a key role in calming corporate spreads.
- **Increase in covariance significant only at the core, pointing towards a "public support channel" determinant of the corporate-sovereign nexus conditionally on a disaster.**

Contributions (II)

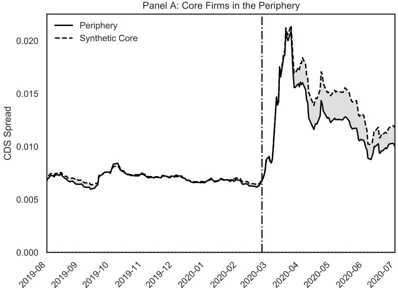
Disaster-Risk Guarantee-Augmented Intensity Model

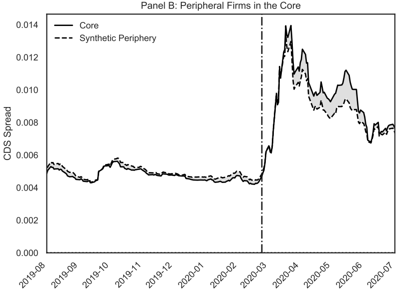
- Brings the Gandhi, Lustig, and Plazzi 2020 disaster-risk fwk to intensity-based model.
- Public support results in risk-bearing public debt.
- Closed formulas for credit risk spillovers
  - Relative contribution of business cycle comovement and disaster risk.
  - Effect of government guarantees on the nexus.

Synthetic Control Method - Setup

- We identify guarantees $\underline{J}$ by a synthetic control method (Almeida et al. 2017)
- Treatment of region j: $\mathbb{1}_{E=1} \times \mathbb{1}_{\underline{J}=\underline{J}^j}$
- Outcome variable default swap spreads.
- Unobservable counterfactual: $CDS^j(\mathbb{1}_{E=1} \times \mathbb{1}_{\underline{J}=\underline{J}^{-j}})$
- Matching variables:
  - 5-year credit rating.
  - Historical market beta and volatility.
  - Market capitalization.
  - Share price over book value per share.
  - Total debt over total capital.
- When shock hits, synthetic core quotes exposed to $\underline{J}^{Periphery}$, *ceteris paribus*.

Synthetic Control Method - Results





$$\frac{\left[CDS^{\text{Synth. Core}} - CDS^{\text{Peri}} \middle| E=1\right]}{\left[CDS^{\text{Core}} - CDS^{\text{Synth. Peri}} \middle| E=1\right]} = \frac{\widehat{\underline{J}^{Peri}}}{\underline{J}^{Core}} = \frac{0.00169}{0.00065} = 2.60.$$

- Model-implied ratio of public guarantees, risk-neutral cap to default intensity disaster exposures.

Contributions (III)

Synthetic Control Method

- Artificial counterfactual following Abadie, Diamond, and Hainmueller 2010.
- Simulate exposure of Core firms to guarantees in the Periphery at the onset of the disaster, and *vice versa*.
- Model-implied Core to Periphery ratio of public guarantees ≈ 2.6.

Conclusion

- First time a considerable government support is extended to nonfinancial firms, important to understand its consequences.
- The ant and the cicada: even if public debt is cheap with low for long interest rates (Blanchard 2019) thoughtful fiscal capacity buffers are beneficial for domestic firms
- COVID-19 data show that fiscal capacity determines the *effectiveness* of government fiscal intervention
- Corporate-sovereign nexus not necessarily a concerning characteristic of credit risk markets
- We are working on the model calibration

Thank you!

alberto.plazzi@usi.ch

References I

[1] Alberto Abadie, Alexis Diamond, and Jens Hainmueller. "Synthetic control methods for comparative case studies: Estimating the effect of California's tobacco control program". In: *Journal of the American Statistical Association* 105.490 (2010), pp. 493–505.

[2] Viral Acharya, Itamar Drechsler, and Philipp Schnabl. "A pyrrhic victory? Bank bailouts and sovereign credit risk". In: *The Journal of Finance* 69.6 (2014), pp. 2689–739.

[3] Viral V Acharya and Sascha Steffen. "The risk of being a fallen angel and the corporate dash for cash in the midst of COVID". In: *The Review of Corporate Finance Studies* 9.3 (2020), pp. 430–71.

[4] Heitor Almeida et al. "The real effects of credit ratings: The sovereign ceiling channel". In: *The Journal of Finance* 72.1 (2017), pp. 249–90.

[5] Andrew Ang and Francis A Longstaff. "Systemic sovereign credit risk: Lessons from the U.S. and Europe". In: *Journal of Monetary Economics* 60.5 (2013), pp. 493–510.

[6] Patrick Augustin et al. *In sickness and in debt: The COVID-19 impact on sovereign credit risk*. *Journal of Financial Economics*. 2021. DOI: https://doi.org/10.1016/j.jfineco.2021.05.009.

[7] Patrick Augustin et al. "Sovereign to corporate risk spillovers". In: *Journal of Money, Credit and Banking* 50.5 (2018), pp. 857–91.

[8] Robert J Barro. "Rare disasters and asset markets in the twentieth century". In: *The Quarterly Journal of Economics* 121.3 (2006), pp. 823–66.

[9] Mascia Bedendo and Paolo Colla. "Sovereign and corporate credit risk: Evidence from the Eurozone". In: *Journal of Corporate Finance* 33 (2015), pp. 34–52.

[10] Olivier Blanchard. "Public debt and low interest rates". In: *American Economic Review* 109.4 (2019), pp. 1197–229.

References II

[11] Luigi Bocola. "The pass-through of sovereign risk". In: *Journal of Political Economy* 124.4 (2016), pp. 879–926.

[12] Markus K Brunnermeier et al. "The sovereign-bank diabolic loop and ESBies". In: *American Economic Review* 106.5 (2016), pp. 508–12.

[13] Giancarlo Corsetti et al. "Sovereign risk, fiscal policy, and macroeconomic stability". In: *The Economic Journal* 123.566 (2013), pp. 99–132.

[14] Darrell Duffie. "Credit swap valuation". In: *Financial Analysts Journal* 55.1 (1999), pp. 73–87.

[15] Michael Ehrmann and Marcel Fratzscher. "Euro area government bonds–Fragmentation and contagion during the sovereign debt crisis". In: *Journal of International Money and Finance* 70 (2017), pp. 26–44.

[16] Rüdiger Fahlenbrach, Kevin Rageth, and René M Stulz. "How Valuable Is Financial Flexibility when Revenue Stops? Evidence from the COVID-19 Crisis". In: *The Review of Financial Studies* (Dec. 2020). ISSN: 0893-9454. DOI: 10.1093/rfs/hhaa134. eprint: https://academic.oup.com/rfs/advance-article-pdf/doi/10.1093/rfs/hhaa134/35588955/hhaa134.pdf.

[17] Xavier Gabaix. "Variable rare disasters: An exactly solved framework for ten puzzles in macro-finance". In: *The Quarterly Journal of Economics* 127.2 (2012), pp. 645–700.

[18] Priyank Gandhi, Hanno Lustig, and Alberto Plazzi. "Equity is cheap for large financial institutions". In: *The Review of Financial Studies* 33.9 (2020), pp. 4231–71.

[19] Felix Gerding, Thorsten Martin, and Florian Nagler. "Sovereign Debt and Equity Returns in the Face of Disaster". Working Paper, https://dx.doi.org/10.2139/ssrn.3572839. 2020.

References III

[20] Bryan Kelly, Hanno Lustig, and Stijn Van Nieuwerburgh. "Too-systemic-to-fail: What option markets imply about sector-wide government guarantees". In: *American Economic Review* 106.6 (2016), pp. 1278–1319.

[21] Jongsub Lee, Andy Naranjo, and Stace Sirmans. "Exodus from sovereign risk: Global asset and information networks in the pricing of corporate credit risk". In: *The Journal of Finance* 71.4 (2016), pp. 1813–6.

[22] Francis A Longstaff, Sanjay Mithal, and Eric Neis. "Corporate yield spreads: Default risk or liquidity? New evidence from the credit default swap market". In: *The Journal of Finance* 60.5 (2005), pp. 2213–53.

[23] Francis A Longstaff et al. "How sovereign is sovereign credit risk?" In: *American Economic Journal: Macroeconomics* 3.2 (2011), pp. 75–103.

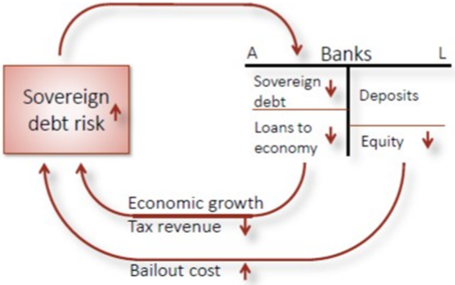
[24] Marco Pagano, Christian Wagner, and Josef Zechner. "Disaster resilience and asset prices". CEPR Discussion Paper 14773. 2020.

[25] Jun Pan and Kenneth J Singleton. "Default and recovery implicit in the term structure of sovereign CDS spreads". In: *The Journal of Finance* 63.5 (2008), pp. 2345–84.

[26] Thomas A Rietz. "The equity risk premium a solution". In: *Journal of Monetary Economics* 22.1 (1988), pp. 117–31.

[27] Ding Wenzhi et al. "Corporate immunity to the COVID-19 pandemic". In: *Journal of Financial Economics* 141.2 (2021), pp. 802–30. ISSN: 0304-405X.

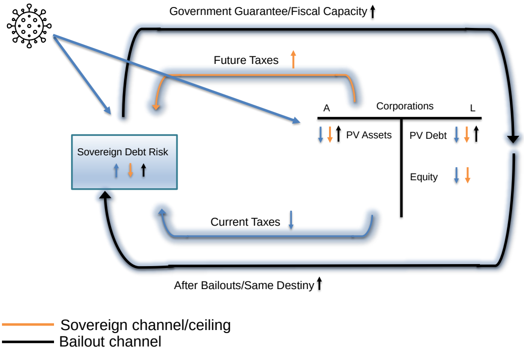
Let's take a step back: the bank-sovereign nexus...



Brunnermeier et al. (2016)

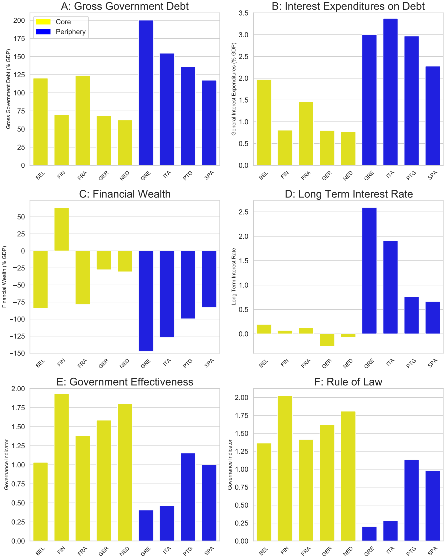
back

… and the the corporate-sovereign nexus



back

Fiscal Capacity



Source: OECD, ECB Statistical Data Warehouse and World Bank Worldwide Governance Indicators.

back

Robustness Checks

	(1)	(2)	(3)	(4)	(5)	(6)
	Implied Volatility		Non-PEPP		End March 24, 2020	
Variables	Core	Periphery	Core	Periphery	Core	Periphery
$\Delta log(\text{CDS Sov})_{jt}$	0.132***	0.219***	0.073**	0.186***	0.127***	0.208***
	(0.014)	(0.041)	(0.031)	(0.045)	(0.013)	(0.036)
$\Delta log(\text{CDS Sov})_{jt} \times E$	0.125***	0.032	0.109**	0.065	0.153***	0.058
	(0.016)	(0.036)	(0.047)	(0.049)	(0.020)	(0.041)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
No. Obs.	38,297	8,374	10,582	5,579	30,273	7,480
R-squared	0.286	0.279	0.224	0.246	0.330	0.313
Firms	92	20	25	13	99	24
	(7)	(8)	(9)	(10)	(11)	(12)
	Arellano–Bover/Blundell–Bond		Weekly Aggregation		CR Clause	
Variables	Core	Periphery	Core	Periphery	Core	Periphery
$\Delta log(\text{CDS Sov})_{jt}$	0.135***	0.268***	0.149***	0.161***	0.134***	0.246***
	(0.013)	(0.037)	(0.022)	(0.035)	(0.013)	(0.038)
$\Delta log(\text{CDS Sov})_{jt} \times E$	0.159***	-0.013	0.155***	0.071	0.127***	0.006
	(0.021)	(0.031)	(0.030)	(0.044)	(0.014)	(0.033)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
No. Obs.	32,957	8,096	8,458	2,075	35,848	7,319
R-squared	-	-	0.405	0.376	0.288	0.330
Firms	99	24	99	24	84	17

back

Government Ownership

	(1)	(2)	(3)	(4)
	Govt. Own. $= 0$		Govt. Own. > 0	
	Core	Periphery	Core	Periphery
$\Delta log(\text{CDS Sov})_{jt}$	0.126***	0.184***	0.132***	0.269***
	(0.013)	(0.044)	(0.037)	(0.050)
$\Delta log(\text{CDS Sov })_{jt} \times E$	0.130***	0.076**	0.097***	-0.010
	(0.018)	(0.031)	(0.030)	(0.075)
Firm FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
No. Obs.	36,767	7,700	5,200	2,582
$\overline{R}^2$	0.269	0.246	0.322	0.382
Firms	87	18	13	6

Data from FactSet

back

Robustness Checks

	(1)	(2)	(3)	(4)
	Sovereign Ceiling		Cross-Spillovers	
Variables	Core	Periphery	Core	Periphery
$\Delta log(\text{CDS Sov})_{jt}$	0.127***	0.237***	0.128***	0.181***
	(0.013)	(0.048)	(0.013)	(0.033)
$\Delta log(\text{CDS Sov})_{jt} \times E$	0.125***	0.050	0.073***	0.035
	(0.016)	(0.036)	(0.016)	(0.029)
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
No. Obs.	41,967	6,872	41,078	10,066
$\overline{R}^2$	0.274	0.284	0.217	0.221
Firms	99	16	99	24

back

Systematic Credit Risk

	(1)	(2)	(3)	(4)	(5)	(6)
	Equally Weighted		Value Weighted		Entropy Balanced	
Variables	Core	Periphery	Core	Periphery	Core	Periphery
$\Delta log(\text{CDS sovereign})_{jt}$	0.057***	0.083***	0.076***	0.147***	0.057***	0.132***
	(0.007)	(0.019)	(0.007)	(0.026)	(0.008)	(0.026)
$\Delta log(\text{CDS sovereign})_{jt} \times E$	0.026**	0.021	0.052**	-0.007	0.027**	-0.049
	(0.012)	(0.032)	(0.023)	(0.038)	(0.012)	(0.038)
$\Delta log(\text{iTraxx}_t)$	0.422***	0.337***	0.490***	0.457***	0.420***	0.432***
	(0.024)	(0.047)	(0.040)	(0.044)	(0.024)	(0.067)
$\Delta log(\text{iTraxx}_t) \times E$	0.029	-0.009	-0.006	0.019	0.029	0.081**
	(0.019)	(0.025)	(0.016)	(0.024)	(0.020)	(0.034)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
No. Obs.	40,789	9,996	40,370	9,996	39,543	9,158
$\overline{R}^2$	0.396	0.362	0.452	0.542	0.397	0.510
Firms	99	24	98	24	96	22

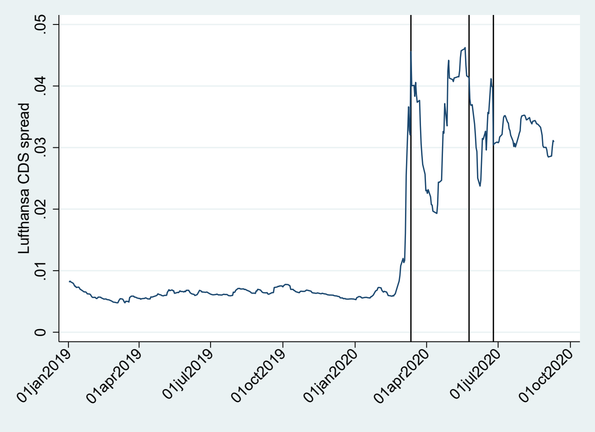
back

Additional Controls

	CDS sample			Bond sample		
Core$_i$ × Δlog(CDS sovereign)$_{jt}$	-0.057	-0.090*	-0.085*	-0.107***	-0.103***	-0.109***
	(0.043)	(0.048)	(0.048)	(0.017)	(0.017)	(0.018)
Core$_i$ × Δlog(CDS sovereign)$_{jt}$ × E	0.098**	0.105**	0.087*	0.141***	0.125***	0.130***
	(0.044)	(0.044)	(0.051)	(0.033)	(0.032)	(0.033)
Δlog(CDS sovereign)$_{jt}$	0.185***	0.216***	0.212***	0.114***	0.105***	0.111***
	(0.041)	(0.046)	(0.045)	(0.014)	(0.013)	(0.014)
Δlog(CDS sovereign)$_{jt}$ × E	0.032	0.032	0.049	0.053**	0.053**	0.045*
	(0.040)	(0.041)	(0.047)	(0.023)	(0.023)	(0.024)
Trailing Return Volatility$_{it}$		0.081***	0.082***		0.087*	0.081
		(0.020)	(0.020)		(0.048)	(0.050)
Trailing Return Volatility$_{it}$ × E		-0.088***	-0.112***		0.077	0.082
		(0.029)	(0.029)		(0.071)	(0.073)
Asset Growth$_{it}$		0.001	0.001		-0.004	-0.005*
		(0.002)	(0.002)		(0.002)	(0.003)
Asset Growth$_{it}$ × E		-0.001	-0.000		0.007	0.009*
		(0.006)	(0.006)		(0.005)	(0.005)
Leverage$_{it}$		-0.001	-0.002		-0.004	-0.005
		(0.001)	(0.002)		(0.006)	(0.007)
Leverage$_{it}$ × E		0.002	0.003**		-0.001	-0.001
		(0.001)	(0.001)		(0.003)	(0.003)
Equity Market β_{it}	0.001		-0.001	-0.000		-0.004***
	(0.001)		(0.001)	(0.002)		(0.001)
Equity Market β_{it} × E	0.001		0.002**	0.000		-0.001
	(0.001)		(0.001)	(0.001)		(0.002)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
No. Obs.	50,144	46,282	45,066	90,927	88,078	83,537
$\overline{R}^2$	0.269	0.275	0.272	0.052	0.058	0.058
Firms	120	109	108	228	214	210

back

Case Study



- First widespread intervention of the German government on 13 March 2020
- Germany announces acquiring 20% of the shares on 25 May 2020
- Bailout was approved by the EU on 25 June 2020

back

Summary Statistics

Panel A: CDS spreads

Region		Corporate					Sovereign		
		Obs.	Firms	Mean	Median	Std	Mean	Median	Std
Core	E = 0	28,309	99	0.0088	0.0060	0.0101	0.0012	0.0011	0.0002
	E = 1	13,856	99	0.0160	0.0071	0.0320	0.0015	0.0014	0.0005
		42,165	99	0.0112	0.0063	0.0205	0.0013	0.0012	0.0004
Periphery	E = 0	7000	24	0.0123	0.0075	0.0112	0.0095	0.0091	0.0028
	E = 1	3,330	24	0.0156	0.0105	0.0128	0.0105	0.0093	0.0029
		10,330	24	0.0133	0.0087	0.0119	0.0098	0.0093	0.0029
Total		52,495	123	0.0116	0.0067	0.0191	0.0055	0.0050	0.0018

Panel B: Firm characteristics

	Debt/Assets		Market Cap		Volatility		Market Beta		Rating
	Mean	Std	Mean	Std	Mean	Std	Mean	Std	Mean
Core	29.45	13.50	29.71	35.45	0.2642	0.0735	1.0176	0.4137	AA
Periphery	38.09	12.18	20.11	18.77	0.2350	0.0620	0.7601	0.2498	AA
Total	31.04	13.68	27.94	33.22	0.2588	0.0724	0.9702	0.4014	AA