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

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Research question & Contribution

- `Corporate-sovereign nexus`: comovement in the credit risk of government and nonfinancial corporations beyond economic fundamentals
- Structural models of credit risk are silent on sovereign risk spillovers
- Empirical studies point at different mechanisms: sovereign ceiling, bank financing, government ownership/support, ...

? Which channel is driving the nexus?

?? How is the latter shaped by fiscal space?

??? Does government risk play a role in the level of corporate spreads, and how?

=> We examine how the nexus varied in the cross-section of EU countries in the face of COVID-19, and develop a disaster risk bailout-augmented model to interpret our evidence

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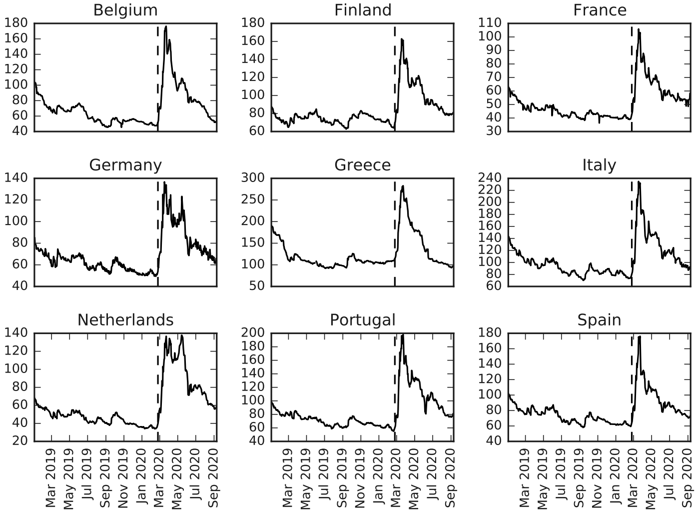
What do we know? Previous Literature

- Pass-through of credit risk between government and financial sector: Acharya, Drechsler, and Schnabl 2014, Bocola 2016, Brunnermeier et al. 2016 chart
- Spillovers to non-financials: Bedendo and Colla 2015, Almeida et al. 2017, Augustin et al. 2018
- Effects of the pandemic on financial markets: Augustin et al. 2020, Gerding, Martin, and Nagler 2020, Pagano, Wagner, and Zechner 2020
- Credit default swaps: Duffie 1999, Longstaff, Mithal, and Neis 2005, 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

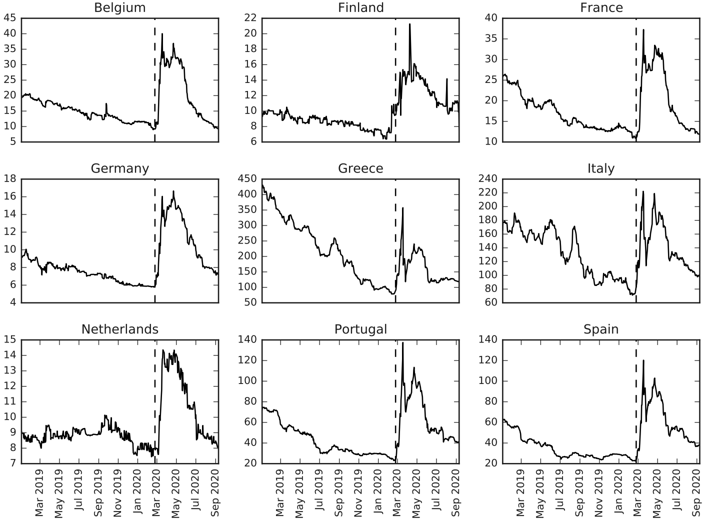
Research Design and data

- 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

Corporate Spreads



Sovereign Spreads



Research Hypotheses

*E*x-ante unclear *if* and *how* fiscal space should affect the nexus in the aftermath of COVID-19

- H_0: The nexus does not depend on fiscal capacity, so COVID-19 should have a similar effect between Core and Periphery
- H_{A_I}: **Sovereign risk channel**: the nexus reflects a risk of tax hikes (Corsetti et al. 2013; Lee, Naranjo, and Sirmans 2016)
  - $\Rightarrow$ The effect of COVID-19 on the nexus should be stronger in the Periphery
- $H_{A_{II}}$: **Bailout channel**: spillovers are on account of government support (Acharya, Drechsler, and Schnabl 2014, Kelly, Lustig, and Van Nieuwerburgh 2016)
  - $\Rightarrow$ The effect of COVID-19 on the nexus should be stronger in the Core

Baseline Model

Panel regression:

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

- 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 $=> H_{A_{II}}$ **Bailout channel** ✓

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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**

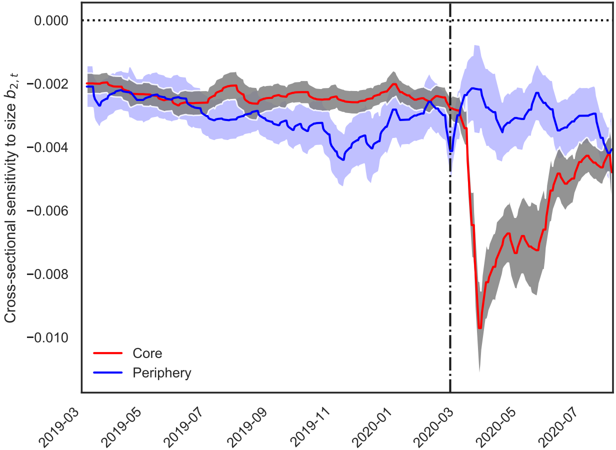
Variables	(1) Energy and Utilities	(2) Industrial	(3) Technology	(4) Goods and Services	(5) Financials
$\Delta log(\text{CDS sov})_{jt}$	0.169***	0.110***	0.125***	0.146***	0.170***
	(0.039)	(0.024)	(0.040)	(0.015)	(0.036)
$\Delta log(\text{CDS sov})_{jt} \times E$	0.106***	0.104***	0.055**	0.120***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

Robustness Checks

The results are robust to:

- ✓ Econometric specification
  - Adding firm-level implied vol
  - Working on firms not targeted by PEPP
  - 1-month of COVID-19 sample
  - GMM estimation
  - Weekly data
- ✓ Firm-level characteristics capturing sensitivity to COVID-19
  - Profitability
  - Liquidity
  - Reliance on bank financing
- ✓ Country-level characteristics capturing sensitivity to COVID-19
  - Openness to international trade
  - Importance of tourism sector
  - Hosp. beds
  - Strength of lockdown policies

Deviations from Structural Credit Risk



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

Disaster-Risk Bailout Augmented Intensity-Based Model

- Disaster of stochastic intensity hits the economy w.p. $p_i \sim \Pi$
- Default event at the first jump of a Poisson process with intensity λ_t
- Jump in $\mathbb{Q}$-default intensity $J_t^\lambda \sim \mathcal{N}(\theta_\lambda, \delta_\lambda)$ without intervention, w.p. p_i
- Corporate default intensity follows:

$$\Delta\lambda_{t+1}^c = \begin{cases} \mu_t^c + \phi_c \sigma_i \eta_{t+1} + \sigma_c \varepsilon_{t+1} & \text{No Disaster} \\ \mu_t^c + \phi_c \sigma_i \eta_{t+1} + \sigma_c \varepsilon_{t+1} + \kappa_c J_{t+1}^c & \text{Disaster} \end{cases}$$

- Fiscal Policy Function: stronger guarantees $\Rightarrow$ lower $\underline{J}$

$$J_{t+1}^c = \min\{J_{t+1}^\lambda, \underline{J}\}$$

- Government default intensity

$$\Delta\lambda_{t+1}^g = \begin{cases} \mu_t^g + \phi_g \sigma_i \eta_{t+1} & \text{No Disaster} \\ \mu_t^g + \phi_g \sigma_i \eta_{t+1} + \max\{J_{t+1}^\lambda - \underline{J}, 0\} & \text{Disaster} \end{cases}$$

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Model - Results

Proposition 1: assuming a constant recovery rate R,

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

Proposition 2

$$\mathrm{Cov}(\Delta \mathrm{CDS}_{t+1}^{corp}, \Delta \mathrm{CDS}_{t+1}^{sov}) \approx \phi_g \phi_c \sigma_i^2 + p_i\big(1-p_i\big)\big(1-\Phi\big)\underline{J}\big(\theta_\lambda + \frac{\delta\varphi}{1-\Phi} - \underline{J}\big)\kappa_c$$

Corollary: Nexus is increasing in the strength of government support

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

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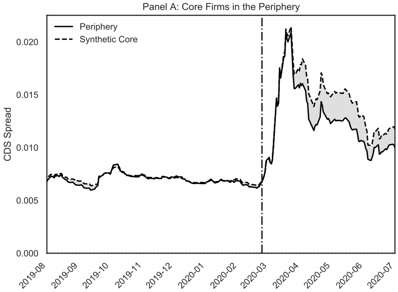
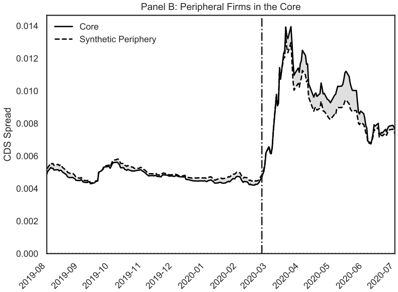
Synthetic Control Method – Setup

- From the model, COVID-induced changes in the nexus depend on:
  - Strength of guarantees; we would expect $\underline{J}^{Core} < \underline{J}^{Peri}$
  - Firm sensitivity to bailout; κ_c^{Core} vs κ_c^{Peri}
- We identify their contribution through a synthetic control method (Almeida et al. 2017)
- Treatment of region j: $\mathbb{1}_{E=1} \times \mathbb{1}_{\underline{J}=\underline{J}^j}$, with $j = \{Core, Peri\}$
- 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, size, share price over book value per share, total debt over total capital
- Synthetic quotes allow us to measure sensitivity κ_c keeping support fixed

Synthetic Control Method - Results





- Firm sensitivity to bailout stronger in the Core, $\kappa_c^{Core} > \kappa_c^{Peri}$
- Model-implied ratio of (risk-neutral) bailout guarantees priced in CDS

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

Summary

- COVID-19 pandemic accompanied by i) an increase in the elasticity of corporate to sovereign CDS and ii) systematic deviations from fundamental credit risk only at the Core of the EU, i.e. in countries with large fiscal capacity.
- A bailout-augmented disaster risk model allows us to quantify the effect of guarantees on the nexus conditional on a disaster taking place
- Synthetic counterfactual implies guarantees ratio of 2.60
- Corporate CDS spreads in virtuous countries are more insulated when disaster hits, which results in lower cost of capital

$\Rightarrow$ Even if public debt is cheap when rates are low for long (Blanchard 2019), fiscal capacity buffers are beneficial for domestic firms

References I

[1] 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. 2689–2739.

[2] Heitor Almeida et al. “The real effects of credit ratings: The sovereign ceiling channel”. In: *The Journal of Finance* 72.1 (2017), pp. 249–290.

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

[4] Patrick Augustin et al. “In Sickness and in Debt: The COVID-19 Impact on Sovereign Credit Risk”. In: *Available at SSRN 3613432* (2020).

[5] Patrick Augustin et al. “Sovereign to corporate risk spillovers”. In: *Journal of Money, Credit and Banking* 50.5 (2018), pp. 857–891.

[6] Robert J Barro. “Rare disasters and asset markets in the twentieth century”. In: *The Quarterly Journal of Economics* 121.3 (2006), pp. 823–866.

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

[8] Olivier Blanchard. “Public debt and low interest rates”. In: *American Economic Review* 109.4 (2019), pp. 1197–1229.

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

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

References II

[11] Giancarlo Corsetti et al. "Sovereign risk, fiscal policy, and macroeconomic stability". In: *The Economic Journal* 123.566 (2013), F99–F132.

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

[13] 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.

[14] 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.

[15] Priyank Gandhi, Hanno Lustig, and Alberto Plazzi. "Equity is cheap for large financial institutions". In: *The Review of Financial Studies* 33.9 (2020), pp. 4231–4271.

[16] Felix Gerding, Thorsten Martin, and Florian Nagler. "The value of fiscal capacity in the face of a rare disaster". In: *Available at SSRN 3572839* (2020).

[17] 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.

[18] 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. 1813–1856.

[19] 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. 2213–2253.

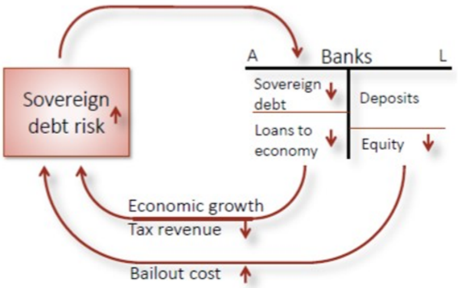
References III

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

[21] Marco Pagano, Christian Wagner, and Josef Zechner. "Disaster resilience and asset prices". *CEPR Discussion Paper No. DP14773*. 2020.

[22] Thomas A Rietz. "The equity risk premium a solution". In: *Journal of monetary Economics* 22.1 (1988), pp. 117–131.

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



Brunnermeier et al. (2016)

back