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

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\textsuperscript{3}USI and SFI
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.
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
What do we know? Previous Literature


- 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


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
Sovereign Spreads
Research Hypotheses

Ex-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

- $H_{AI}$: **Sovereign risk channel**: the nexus reflects a risk of tax hikes ([Corsetti et al. 2013; Lee, Naranjo, and Sirmans 2016])
  ⇒ The effect of COVID-19 on the nexus should be stronger in the Periphery

- $H_{AII}$: **Bailout channel**: spillovers are on account of government support ([Acharya, Drechsler, and Schnabl 2014, Kelly, Lustig, and Van Nieuwerburgh 2016])
  ⇒ The effect of COVID-19 on the nexus should be stronger in the Core
Baseline Model

Panel regression:

\[
\Delta \log(CDS \ Corp)_{ijt} = \alpha_i + \beta_0 + \beta_1 \Delta \log(CDS \ Sov)_{jt} \\
+ \beta_2 \Delta \log(CDS \ Sov)_{jt} \times E \\
+ \gamma_1 X_{ijt} + \gamma_2 X_{ijt} \times E + \gamma_3 E + \varepsilon_{ijt}
\]

- \(E\) dummy is 1 starting with Feb 24, 2020
- Coefficient of interest \(\beta_2\)
- FE captured by \(\alpha_i\)
- \(X_{ijt}\) 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

<table>
<thead>
<tr>
<th></th>
<th>Equally Weighted</th>
<th>Value Weighted</th>
<th>Entropy Balanced</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1) Core</td>
<td>(2) Periphery</td>
<td>(3) Core</td>
</tr>
<tr>
<td>( \Delta \log(\text{CDS sovereign})_{jt} )</td>
<td>0.127*** (0.013)</td>
<td>0.208*** (0.036)</td>
<td>0.170*** (0.015)</td>
</tr>
<tr>
<td>( \Delta \log(\text{CDS sovereign})_{jt} \times E )</td>
<td>0.125*** (0.016)</td>
<td>0.052 (0.032)</td>
<td>0.151*** (0.025)</td>
</tr>
<tr>
<td>Controls</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Controls ( \times E )</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Firm FE</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>No. Obs.</td>
<td>41,967</td>
<td>10,282</td>
<td>41,536</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.274</td>
<td>0.285</td>
<td>0.315</td>
</tr>
<tr>
<td>No. Firms</td>
<td>99</td>
<td>24</td>
<td>98</td>
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</table>

\( p \)-value for \( \beta_{2 \text{Core}} = \beta_{2 \text{Periphery}} \): 0.019 0.006 0.010

- Increase in sensitivity only in core countries \( \Rightarrow H_{A_{II}} \) Bailout channel \( \checkmark \)
**Baseline Results**

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<td>(6) Periphery</td>
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<tr>
<td>$\Delta \log (\text{CDS sovereign})_{jt}$</td>
<td>0.127***</td>
<td>0.208***</td>
<td>0.170***</td>
<td>0.325***</td>
<td>0.126***</td>
<td>0.294***</td>
</tr>
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<td></td>
<td>(0.013)</td>
<td>(0.036)</td>
<td>(0.015)</td>
<td>(0.037)</td>
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<td>$\Delta \log (\text{CDS sovereign})_{jt} \times E$</td>
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<td>0.052</td>
<td>0.151***</td>
<td>0.049</td>
<td>0.124***</td>
<td>0.008</td>
</tr>
<tr>
<td></td>
<td>(0.016)</td>
<td>(0.032)</td>
<td>(0.025)</td>
<td>(0.037)</td>
<td>(0.016)</td>
<td>(0.044)</td>
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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 $(\beta_{2}^{\text{Core}} = \beta_{2}^{\text{Periphery}})$: 0.019 0.006 0.010

- Increase in sensitivity only in core countries $\Rightarrow H_{A_{II}}$ Bailout channel

Jappelli, Pelizzon and Plazzi

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August 26, 2021
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\( p \text{-value for } (\beta^\text{Core}_2 = \beta^\text{Periphery}_2) \) 0.019 0.006 0.010

- Increase in sensitivity only in core countries \( \Rightarrow H_{A_{ll}} \) Bailout channel

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<td>( p )-value for ( \beta_2^{Core} = \beta_2^{Periphery} )</td>
<td>0.019</td>
<td>0.006</td>
<td>0.010</td>
</tr>
</tbody>
</table>

- Increase in sensitivity only in core countries \( \Rightarrow H_{A_{II}} \) **Bailout channel** ✓
## Results by Country and Industry

### Table 2: Corporate-sovereign Nexus, Estimates by Country

<table>
<thead>
<tr>
<th>Variables</th>
<th>Core</th>
<th>Periphery</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1) BEL</td>
<td>(6) GRE</td>
</tr>
<tr>
<td></td>
<td>(2) FIN</td>
<td>(7) ITA</td>
</tr>
<tr>
<td></td>
<td>(3) FRA</td>
<td>(8) PTG</td>
</tr>
<tr>
<td></td>
<td>(4) GER</td>
<td>(9) SPA</td>
</tr>
<tr>
<td></td>
<td>(5) NED</td>
<td></td>
</tr>
<tr>
<td>∆log(CDS sov)_{jt}</td>
<td>0.076**</td>
<td>0.130</td>
</tr>
<tr>
<td></td>
<td>(0.023)</td>
<td>(0.122)</td>
</tr>
<tr>
<td></td>
<td>0.018***</td>
<td>0.158***</td>
</tr>
<tr>
<td></td>
<td>(0.005)</td>
<td>(0.046)</td>
</tr>
<tr>
<td></td>
<td>0.210***</td>
<td>0.264**</td>
</tr>
<tr>
<td></td>
<td>(0.019)</td>
<td>(0.015)</td>
</tr>
<tr>
<td></td>
<td>0.146***</td>
<td>0.326***</td>
</tr>
<tr>
<td></td>
<td>(0.026)</td>
<td>(0.064)</td>
</tr>
<tr>
<td></td>
<td>0.121***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.012)</td>
<td></td>
</tr>
<tr>
<td>∆log(CDS sov)_{jt} × E</td>
<td>0.121**</td>
<td>-0.051</td>
</tr>
<tr>
<td></td>
<td>(0.042)</td>
<td>(0.080)</td>
</tr>
<tr>
<td></td>
<td>0.076***</td>
<td>0.060</td>
</tr>
<tr>
<td></td>
<td>(0.019)</td>
<td>(0.036)</td>
</tr>
<tr>
<td></td>
<td>0.136***</td>
<td>0.130</td>
</tr>
<tr>
<td></td>
<td>(0.027)</td>
<td>(0.073)</td>
</tr>
<tr>
<td></td>
<td>0.156***</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>(0.034)</td>
<td>(0.032)</td>
</tr>
<tr>
<td></td>
<td>0.158***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.018)</td>
<td></td>
</tr>
</tbody>
</table>

### Table 3: Corporate-sovereign Nexus, Estimates by Sector

<table>
<thead>
<tr>
<th>Variables</th>
<th>(1) Energy and Utilities</th>
<th>(2) Industrial Technology</th>
<th>(3) Technology</th>
<th>(4) Goods and Services</th>
<th>(5) Financials</th>
</tr>
</thead>
<tbody>
<tr>
<td>∆log(CDS sov)_{jt}</td>
<td>0.169***</td>
<td>0.110***</td>
<td>0.125***</td>
<td>0.146***</td>
<td>0.170***</td>
</tr>
<tr>
<td></td>
<td>(0.039)</td>
<td>(0.024)</td>
<td>(0.040)</td>
<td>(0.015)</td>
<td>(0.036)</td>
</tr>
<tr>
<td>∆log(CDS sov)_{jt} × E</td>
<td>0.106***</td>
<td>0.104***</td>
<td>0.055**</td>
<td>0.120***</td>
<td>0.047*</td>
</tr>
<tr>
<td></td>
<td>(0.032)</td>
<td>(0.030)</td>
<td>(0.025)</td>
<td>(0.026)</td>
<td>(0.027)</td>
</tr>
</tbody>
</table>
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

\[ \text{CDS}_{i,t} = a_t + b_{1,t} \text{Merton Spread}_{i,t} + b_{2,t} \text{Size}_{i,t} + b_{3,t} \text{Leverage}_{i,t} + \varepsilon_{i,t} \]
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 \( \lambda_t \)
- Jump in \( \mathbb{Q} \)-default intensity \( J_{t+1}^{\lambda} \sim \mathcal{N}(\theta_{\lambda}, \delta_{\lambda}) \) 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 \( J \)

\[
J_{t+1}^{c} = \min\{J_{t+1}^{\lambda}, J\}
\]

- Government default intensity

\[
\Delta \lambda_{t+1}^{g} = \begin{cases} 
\mu_{t}^{g} + \phi_{g} \sigma_{i} \eta_{t+1} & \text{No Disaster} \\
\mu_{t}^{g} + \phi_{g} \sigma_{i} \eta_{t+1} + \max\{J_{t+1}^{\lambda} - J, 0\} & \text{Disaster}
\end{cases}
\]
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 $\lambda_t$
- Jump in $Q$-default intensity $J^\lambda_t \sim \mathcal{N}(\theta_\lambda, \delta_\lambda)$ without intervention, w.p. $p_i$
- Corporate default intensity follows:

$$\Delta \lambda^c_{t+1} = \begin{cases} 
\mu^c_t + \phi^c \sigma_i \eta_{t+1} + \sigma^c \varepsilon_{t+1} & \text{No Disaster} \\
\mu^c_t + \phi^c \sigma_i \eta_{t+1} + \sigma^c \varepsilon_{t+1} + \kappa^c J^c_{t+1} & \text{Disaster}
\end{cases}$$

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

$$J^c_{t+1} = \min\{J^\lambda_{t+1}, J\}$$

- Government default intensity

$$\Delta \lambda^g_{t+1} = \begin{cases} 
\mu^g_t + \phi^g \sigma_i \eta_{t+1} & \text{No Disaster} \\
\mu^g_t + \phi^g \sigma_i \eta_{t+1} + \max\{J^\lambda_{t+1} - J, 0\} & \text{Disaster}
\end{cases}$$
**Model - Results**

**Proposition 1:** assuming a constant recovery rate $R$,

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

**Proposition 2**

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

**Corollary:** Nexus is increasing in the strength of government support

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

Proposition 1: assuming a constant recovery rate $R$,

$$\Delta CDS_{t+1} \approx (1 - R) \Delta \lambda_{t+1}$$

Proposition 2

$$\text{Cov}(\Delta CDS_{\text{corp}}^{t+1}, \Delta CDS_{\text{sov}}^{t+1}) \approx \phi_g \phi_c \sigma_i^2 + p_i (1 - p_i) (1 - \Phi) J (\theta + \frac{\delta \varphi}{1 - \Phi} - J) \kappa_c$$

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$$\frac{\partial \text{Cov}(\Delta CDS_{\text{corp}}^{t+1}, \Delta CDS_{\text{sov}}^{t+1})}{\partial(-J)} > 0 \quad \text{provided} \quad J > 0.5 (\theta + \frac{\phi}{1 - \Phi})$$
Model - Results

Proposition 1: assuming a constant recovery rate $R$,

$$\Delta CDS_{t+1} \approx (1 - R)\Delta \lambda_{t+1}$$

Proposition 2

$$\text{Cov}(\Delta CDS_{corp}^{t+1}, \Delta CDS_{sov}^{t+1}) \approx \phi_g \phi_c \sigma_i^2 + p_i (1 - p_i) (1 - \Phi) \lambda (\theta + \frac{\delta \phi}{1 - \Phi} - \lambda) \kappa_c$$

Corollary: Nexus is increasing in the strength of government support

$$\frac{\partial \text{Cov}(\Delta CDS_{corp}^{t+1}, \Delta CDS_{sov}^{t+1})}{\partial (-\lambda)} > 0$$ provided $\lambda > 0.5 (\theta + \frac{\phi}{1 - \Phi})$
From the model, COVID-induced changes in the nexus depend on:
- Strength of guarantees; we would expect $J_{\text{Core}} < J_{\text{Peri}}$
- Firm sensitivity to bailout; $\kappa_c^{\text{Core}}$ vs $\kappa_c^{\text{Peri}}$

We identify their contribution through a synthetic control method (Almeida et al. 2017)

Treatment of region $j$: $1_{E=1} \times 1_{J=j}$, with $j = \{ \text{Core}, \text{Peri} \}$

Unobservable counterfactual: $\text{CDS}^j(1_{E=1} \times 1_{J=j})$

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 $\kappa_c$ keeping support fixed
Firm sensitivity to bailout stronger in the Core, $\kappa^C_{\text{Core}} > \kappa^C_{\text{Peri}}$

Model-implied ratio of (risk-neutral) bailout guarantees priced in CDS

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

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


References II


References III


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

Brunnermeier et al. (2016)