

Directionality of spillovers in the EU

Evidence from the sovereign debt crisis

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Introduction

- The presence of large systemic shocks on the European continent, such as the European Debt Crisis and more recently Covid-19, highlighted the fragility of the sovereign debt market
- Our proposal aims at shedding light on this issue, relying on the use of the Diebold and Yilmaz methodology for the computation of directional spillover indices alongside a wavelet decomposition, in order to analyze the linkages among bonds yields and volatility in a sample of EU countries
- *We find two cluster of countries: one contributing to increased volatility in bond yields and one mitigating volatility*
- *Focusing on Germany and Italy, yield volatility is occurring mainly on the high frequency scale, indicating that investors look at the short-term*

Background

- There is a growing literature aimed at studying the *causes and repercussions of sovereign debt market volatility*
- *Model based, parametric approaches suffer limitations*
- We adopt a methodology common in financial economics to estimate interdependence of assets
- *We shed light on the drivers of sovereign yields and risks studying the endogenous component* rather than the exogenous one depending on macroeconomic country characteristics
- **Research questions:**
 - With what intensity are Eurozone countries interlinked?
 - Are there some cluster of countries? do they influence each other? if yes, with which sign?
 - Does spillovers trend change with the crisis occurred?

Motivation

- Covid-19 highlighted the main weaknesses of Europe, the presence of countries with different and significant levels of sovereign risk
- *Large systemic shocks require coordinated response to manage volatility*
- We are moving towards not only deeper structural integration in Europe, but also financial integration (Eurobonds)
- We aim to *highlight the importance of country interconnections in light of the development of the structure of the EU*
- Novel methodological approach to proxy financial contagion

Related Literature

- *Determinants of sovereign yields:*
 - Edwards (1986), Eichengreen and Portes (1989), Calvo et al. (1993), Cantor and Packer (1996), Dooley et al. (1996), Fernandez-Arias (1996), Montiel and Reinhart (1999), Mody and Taylor (2002)
- *Financial networks:*
 - Alter and Beyer (2014), Heinz and Sun (2014), Cho and Choi (2015), Yilmaz and Bostanci (2020)
- *Covid-19 and volatility in sovereign debt markets:*
 - Arora et al. (2020), Baber (2020), Esteves and Sussman (2020), Friesenhahn and Kwan (2020), Rizwan et al. (2020)

- 1 Diebold and Yilmaz (2011) spillovers computation methodology
 - Use generalized VAR models to estimate the *FEVD* percentage of countries i yields curve explained by shock from j , and vice versa, for all countries
- 2 Further decompose our series with a wavelet decomposition using a maximal overlap discrete wavelet transform to gain insight on investor behaviour
 - *Decompose series at different scale frequencies*
 - Compare the results pre and post onset of the European debt crisis

- 5y sovereign bond yields on 10 Eurozone countries: Italy, France, Netherlands, Spain, Germany Norway, Denmark, Sweden, UK, Portugal
- *FactSet* daily data from 10/05/2006 to 13/11/2020
- Split sample as pre-crisis (2009 and before) and post-crisis (after 2009)

Spillover indices

- Based on **forecast error variance decomposition**:

$$\theta_{ij}^g(H) = \frac{\sigma_{jj}^{-1} \sum_{h=0}^{H-1} (e_i' \Theta_h \Sigma e_j)^2}{\sum_{h=0}^{H-1} (e_i' \Theta_h \Sigma \Theta_h' e_i)} \quad (1)$$

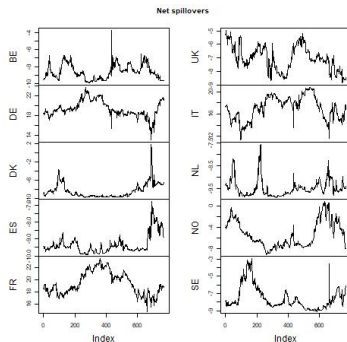
- Total*:

$$S^g(H) = \frac{\sum_{i,j=1}^N \theta_{ij}^g(H)}{N} \quad (2)$$

- Deconstructed into *net, received, transmitted*:

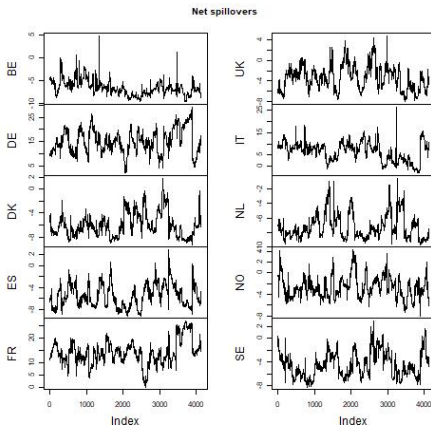
$$S_{i \leftarrow j}^g(H) = \frac{\sum_{j=1, j \neq i}^N \theta_{ij}^g(H)}{N} \quad (3)$$

Yields spillovers pre-2009



- France, Italy and Germany account for the highest share of total transmitted spillovers;
- Largest and most systematically important countries which underpin EU financial system;
- **Cluster of countries transmitting spillovers and a cluster of countries that are subject to**

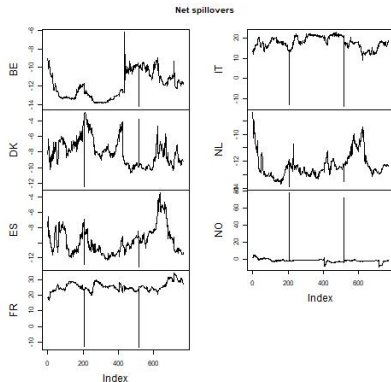
Yields spillovers post-2009



- Similar clustering pattern of countries, with overall intensity increasing

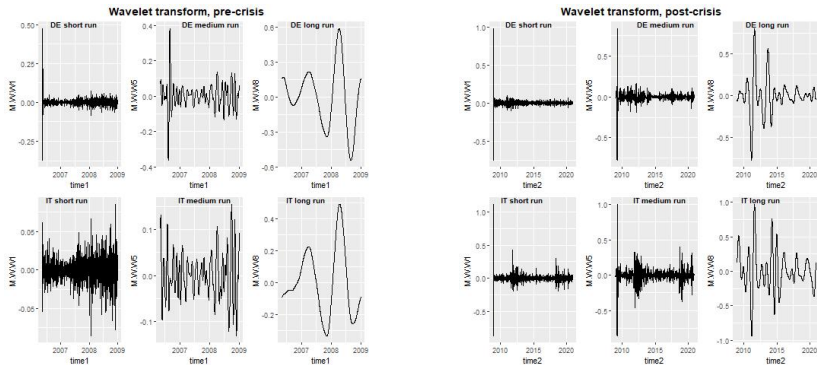
Static indices

Volatility spillovers



- *Model volatility of bond yields with the best fit: eGARCH(1,1);*
- Germany is discarded (very stable yields over the time span) previous evidence → **Irrelevance in transmitting instability;**
- **Same patterns and clusters for volatility and yields spillovers**

Wavelet decomposition



- *Germany yields curve is not influenced by short-run investors behaviors, rather by long run ones (i.e., linked to country economic fundamentals);*
- **Not for Italy: long-run variations are weaker and short-run stronger;**
- **Post-crisis period: long and medium-run variations gain relevance and drive movements in bond yields → Renew confidence in the sovereign?**

Conclusions

- **Total spillovers – both for returns and volatility – have steadily increased** through the period of analysis, spiking through the crisis;
- **Two clusters of countries in EU responsible for contributing to and absorbing spillovers - the so-called "frugali"**;
- **Most of the changes occur at high-frequency scale**, with time and countries heterogeneity, while **long and medium run gain relevance after the crisis**;
- **Policy implications:**
 - ① EU countries are deeply integrated and *only through coordinated and heterogeneous policies* relevant public finance issues can be addressed;
 - ② In light of the NGEU, policy makers should design effective plan to *stimulate growth and avoid adverse volatility in bond markets*

Next steps

- Preliminary results are in support of underlying hypothesis: **financial contagion between countries is driven by a banking channel**
- *Spillovers are heterogeneous across countries and time but persistent*
- **Limitations:**
 - 1 Medium-term bond and raw data;
 - 2 Bond yields are not the best proxy for sovereign risk;
 - 3 Our exercise is mostly descriptive
- Next step is to confirm these results through:
 - 1 CDS and micro-data (bank CDS);
 - 2 Real economy effects (e.g., labor market);
 - 3 Establish a link between Italian post-2012 reforms³ and spillovers.

³E.g. Fornero reform, Art. 81, Jobs act.

Thank You

Appendix

Static spillover indices, pre-crises

		From									
		BE	DE	DK	ES	FR	UK	IT	NL	NO	SE
To	BE	0.01	0.33	0.00	0.00	0.33	0.02	0.30	0.00	0.00	0.01
	DE	0.00	0.34	0.01	0.00	0.33	0.01	0.30	0.00	0.00	0.01
	DK	0.00	0.30	0.05	0.00	0.30	0.03	0.31	0.01	0.00	0.01
	ES	0.00	0.33	0.01	0.01	0.33	0.02	0.30	0.00	0.00	0.01
	FR	0.00	0.33	0.01	0.00	0.34	0.01	0.30	0.00	0.00	0.01
	UK	0.01	0.19	0.01	0.03	0.20	0.34	0.20	0.02	0.00	0.01
	IT	0.00	0.32	0.01	0.00	0.32	0.01	0.33	0.00	0.00	0.01
	NL	0.00	0.32	0.01	0.00	0.32	0.01	0.32	0.01	0.00	0.01
	NO	0.02	0.13	0.00	0.00	0.12	0.01	0.10	0.03	0.59	0.00
	SE	0.00	0.26	0.01	0.00	0.28	0.02	0.27	0.00	0.00	0.15

Static spillover indices, post-crises

		From									
		BE	DE	DK	ES	FR	UK	IT	NL	NO	SE
To	BE	0.37	0.08	0.04	0.07	0.11	0.03	0.18	0.04	0.07	0.01
	DE	0.01	0.39	0.03	0.01	0.34	0.01	0.12	0.01	0.04	0.04
	DK	0.00	0.25	0.15	0.03	0.29	0.00	0.12	0.01	0.06	0.07
	ES	0.04	0.12	0.07	0.16	0.14	0.03	0.23	0.02	0.13	0.05
	FR	0.00	0.27	0.04	0.00	0.40	0.01	0.20	0.01	0.03	0.04
	UK	0.03	0.31	0.03	0.02	0.26	0.23	0.09	0.01	0.01	0.01
	IT	0.01	0.08	0.06	0.01	0.13	0.02	0.66	0.03	0.01	0.00
	NL	0.02	0.18	0.06	0.02	0.28	0.00	0.23	0.13	0.04	0.03
	NO	0.04	0.18	0.03	0.01	0.17	0.02	0.08	0.01	0.44	0.02
	SE	0.00	0.12	0.03	0.01	0.08	0.01	0.02	0.02	0.12	0.59

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References

- Diebold, F. X., and K. Yilmaz. 2011. “Better to Give than to Receive: Predictive Directional Measurement of Volatility Spillovers.” *International Journal of Forecasting*.