

Bond Convenience Yields in the Eurozone Currency Union

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October 10 2022, ECB

Bond Convenience Yields in a Currency Union

- Decompose sovereign bond yield in country i at time t :

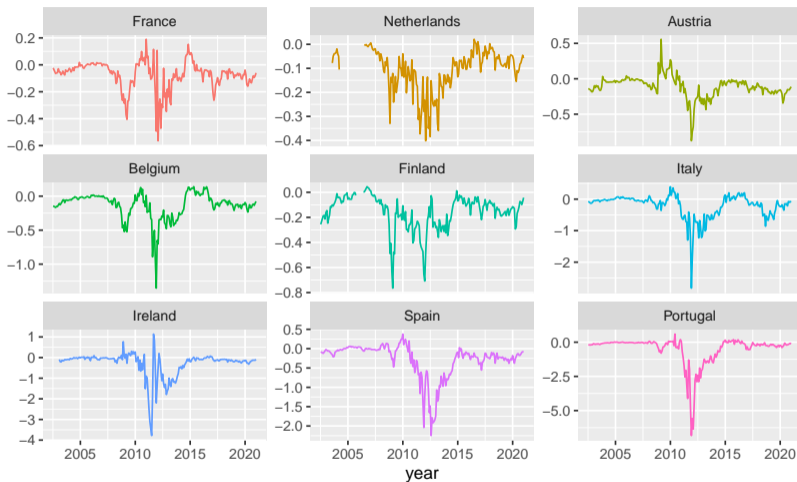
$$\underbrace{y_t^i}_{\text{Bond Yield}} = \underbrace{r_t}_{\text{Risk-Free Rate}} + \underbrace{\delta_t^i}_{\text{Default Spread}} - \underbrace{\lambda_t^i}_{\text{Conv. Yield}}$$

- Risk-free rate is common in a currency union. This implies:

$$(y_t^i - y_t^{DE}) = (\delta_t^i - \delta_t^{DE}) - (\lambda_t^i - \lambda_t^{DE})$$

- Observe relative convenience yield after removing relative default spread (using credit default swap data)

Bond Convenience Yields in a Currency Union



Time series of $\lambda_t^i - \lambda_t^{DE}$ for 5-year bonds

What We Do

- Develop model to understand the equilibrium determination of bond convenience yields in currency union
 - ▶ Intertemporal government budget condition points to fiscal determinants of the CYs
 - ▶ In currency union, CYs **absorb country-specific fiscal shocks**
- Empirically quantify the shock absorption role of convenience yields in Eurozone:
 - ▶ CYs account for the bulk of variation in Eurozone sovereign bond yields
 - ▶ Consistent with model, CYs respond to country-specific fiscal news
 - ▶ CYs imply large fiscal costs in peripheral countries

Theoretical Framework

Convenience Yield

- Bond valuation equation (risk-free):

$$\mathbb{E}_t[M_{t,t+1}P_{t+1}^{i,k}] = P_t^{i,k+1}$$

- ▶ $M_{t,t+1}$ is the one-period stochastic discount factor in the union
- ▶ $P_t^{i,k+1}$ is the price for bond issued by country i with maturity $k + 1$.

Convenience Yield

- Bond valuation equation (introducing default and convenience yield):

$$\mathbb{E}_t[M_{t,t+1} P_{t+1}^{i,k} \underbrace{(1 - \chi_{t+1}^i)}_{\text{Default Spread}} \underbrace{\exp(c_t^{i,k+1})}_{\text{Euler Wedge}}] = P_t^{i,k+1}$$

- $c_t^{i,k+1}$: how much extra investors are willing to pay for convenience of holding bond i compared to other securities with the same pecuniary payoffs
- Encompasses a number of phenomena:
 - ▶ Liquidity premium (Amihud and Mendelson (1991), Krishnamurthy (2002), Longstaff (2004))
 - ▶ Safety premium (Krishnamurthy and Vissing-Jorgensen (2012), He, Krishnamurthy, and Milbradt (2019), Jiang, Krishnamurthy, Lustig (2021))
 - ▶ Pledgeability as collateral, e.g. in repo market
 - ▶ Compensation for non-pecuniary quality, not an arbitrage opportunity

I. Equilibrium Bond Pricing

PROPOSITION

$$\underbrace{\sum_{h=0}^H Q_{t-1}^{i,h+1} e^{-(r_t^h + \delta_t^{i,h} - \lambda_t^{i,h})h}}_{\text{Valuation of Aggregate Debt Portfolio}} = \underbrace{\mathbb{E}_t \left[\sum_{j=0}^{\infty} M_{t,t+j} S_{t+j}^i \right]}_{\text{PV of Surplus}} + \underbrace{\mathbb{E}_t \left[\sum_{j=0}^{\infty} M_{t,t+j} \sum_{h=1}^H Q_{t+j}^{i,h} P_{t+j}^{i,h} (1 - e^{-c_{t+j}^{i,h}}) \right]}_{\text{PV of Seigniorage Revenue}}$$

- If exchange rates are flexible, the risk-free yield curve $r_t^{i,h}$ is country-specific and can adjust to country-specific shock to PV(surplus). Implies real exchange rate movement (Jiang 22).
- In a **currency union**, since exchange rates and risk-free rates are common, they cannot adjust in response to country-specific news. The default spread $\delta_t^{i,h}$ and the convenience yield $\lambda_t^{i,h}$ have to absorb the fiscal shocks.

I. Equilibrium Bond Pricing

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II. Variance Decomposition of Debt Valuation

- Let d_t^i denote the PV of government surplus and seigniorage revenue in country i .
- Let $\widehat{d}_t^i = d_t^i - d_t^a$ denote the deviation from the currency union aggregate level
- Assume countries have the same bond duration h

Fiscal news \widehat{d}_t^i has to be priced in either the convenience yield differential $\widehat{\lambda}_t^{i,h}$, the default spread differential $\widehat{\delta}_t^{i,h}$, or both:

$$\text{var}_{t-1} \left(\widehat{d}_t^i \right) = h \cdot \text{cov}_{t-1} \left(\widehat{\lambda}_t^{i,h}, \widehat{d}_t^i \right) - h \cdot \text{cov}_{t-1} \left(\widehat{\delta}_t^{i,h}, \widehat{d}_t^i \right).$$

III. Mechanism: Fiscal News Channel for Convenience Yields

- Assume downward-sloping demand curve for safe assets: exp. future CYs go down when exp. future debt supply increases

$$\text{cov}_{t-1} \left((\mathbb{E}_t - \mathbb{E}_{t-1}) M_{t,t+h} D_{t+h}^i, (\mathbb{E}_t - \mathbb{E}_{t-1}) \lambda_{t+h}^{i,1} \right) < 0.$$

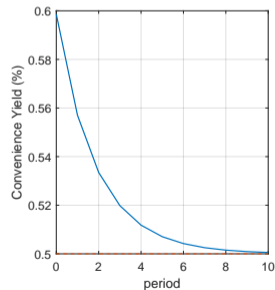
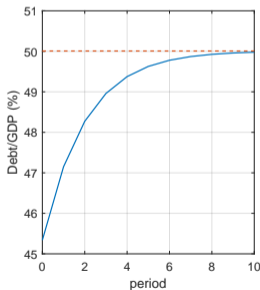
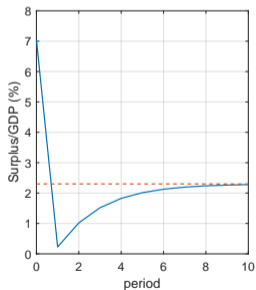
- Assume expectation hypothesis for convenience yields: $\lambda_t^h = \frac{1}{h} \mathbb{E}_t \sum_{j=0}^{h-1} \lambda_{t+j}^1$.

Positive fiscal news over horizon h increases the convenience yield:

$$\text{cov}_{t-1} \left((\mathbb{E}_t - \mathbb{E}_{t-1}) \sum_{j=1}^h M_{t,t+j} (T_{t+j}^i - G_{t+j}^i + \kappa_{t+j} D_{t+j}), (\mathbb{E}_t - \mathbb{E}_{t-1}) \lambda_t^{i,h} \right) > 0.$$

IV. Numerical Example

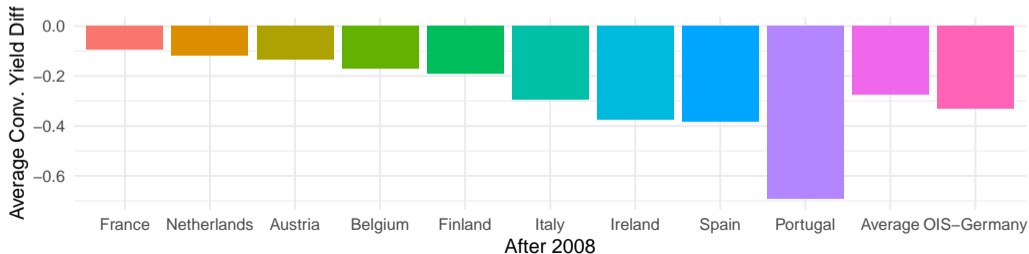
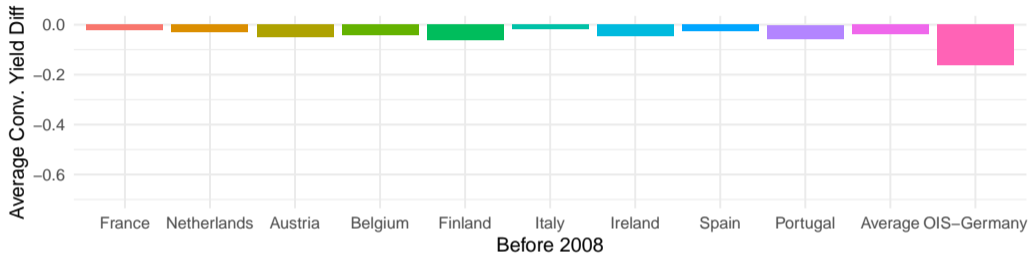
- Exponential debt maturity structure
- Debt supply follows an AR(1) in logs
- Convenience yield downward-sloping in debt supply: $c_t^i = \bar{c}^i \exp(-\beta(\log Q_t^i - \log \bar{Q}^i))$



Empirical Results

I. Summary Stats

$$\tilde{\lambda}_t^i = (\lambda_t^i - \lambda_t^{DE}) = (\delta_t^i - \delta_t^{DE}) - (y_t^i - y_t^{DE}) = \tilde{\delta}_t^i - \tilde{y}_t^i$$



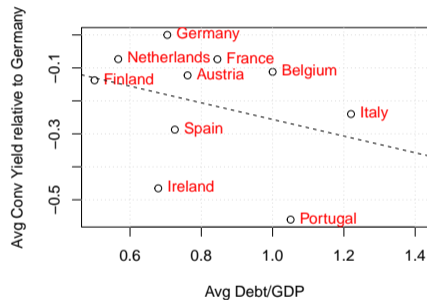
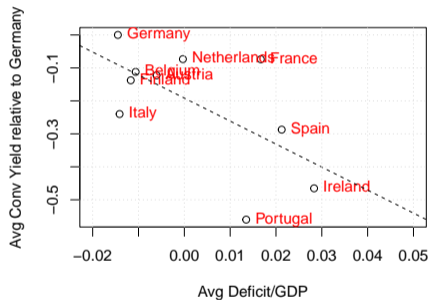
I. Variance Decomposition for 5-Year Bond Yield

$$1 = \frac{\text{cov}(\Delta \tilde{y}_t^i, \Delta \tilde{\delta}_t^i)}{\text{var}(\Delta \tilde{y}_t^i)} - \frac{\text{cov}(\Delta \tilde{y}_t^i, \Delta \tilde{\lambda}_t^i)}{\text{var}(\Delta \tilde{y}_t^i)}$$

<i>Panel (a) 2002–2007</i>		
Country	$\frac{\text{cov}(\Delta \tilde{y}_t^i, \Delta \tilde{\delta}_t^i)}{\text{var}(\Delta \tilde{y}_t^i)}$	$\frac{-\text{cov}(\Delta \tilde{y}_t^i, \Delta \tilde{\lambda}_t^i)}{\text{var}(\Delta \tilde{y}_t^i)}$
Average	0.02	0.98
<i>Panel (b) 2008–2020</i>		
France	0.43	0.57
Netherlands	0.19	0.81
Austria	0.50	0.50
Belgium	0.50	0.50
Finland	-0.01	1.01
Italy	0.57	0.43
Ireland	0.41	0.59
Spain	0.56	0.44
Portugal	0.65	0.35
Average	0.42	0.58

- Convenience yields account for more variation in sovereign bond yields than CDS

II. Convenience Yields and Fiscal Conditions: Cross-Section



II. Convenience Yields and Fiscal Conditions: Time Series

Panel (a): Surplus Alone

	(1)	(2)	(3)
	$\Delta\tilde{y}$	$\Delta\tilde{\lambda}$	$\Delta\tilde{\delta}$
$\Delta\text{Surplus/GDP (\%)}$	-0.33*** (0.03)	0.11 *** (0.01)	-0.22*** (0.02)
Observations	151	151	151
Adjusted R ²	0.42	0.31	0.37

Note:

*p<0.1; **p<0.05; ***p<0.01

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$$h \frac{\text{cov}_{t-1}(\hat{\lambda}_t^{i,h}, \hat{d}_t^i)}{\text{var}_{t-1}(\hat{d}_t^i)} / h \frac{\text{cov}_{t-1}(\hat{\delta}_t^{i,h}, \hat{d}_t^i)}{\text{var}_{t-1}(\hat{d}_t^i)} = 33\%/67\%$$

- One-third of response in market value of debt to fiscal shocks is absorbed by convenience yields.

II. Convenience Yields and Fiscal Conditions: Fiscal Forecasts

Like other asset prices, convenience yields are forward-looking.

<i>Panel (a): Forecast of Current Year Surplus</i>			
	(1)	(2)	(3)
	$\Delta\tilde{y}$	$\Delta\tilde{\lambda}$	$\Delta\tilde{\delta}$
Δ Surplus Forecast/GDP (%)	-0.13** (0.06)	0.07*** (0.02)	-0.05 (0.05)
Observations	230	230	230
Adjusted R ²	0.02	0.03	0.001
<i>Panel (b): Forecast of Next Year Surplus</i>			
	(1)	(2)	(3)
	$\Delta\tilde{y}$	$\Delta\tilde{\lambda}$	$\Delta\tilde{\delta}$
Δ Surplus Forecast/GDP (%)	-0.06 (0.06)	0.05* (0.03)	-0.01 (0.05)
Observations	230	230	230
Adjusted R ²	-0.001	0.01	-0.004

Note:

*p<0.1; **p<0.05; ***p<0.01

III. Feedback: Fiscal Costs of Convenience Yields

$$\underbrace{\sum_{h=0}^H Q_{t-1}^{i,h+1} e^{-(r_t^h + \delta_t^{i,h} - \lambda_t^{i,h})h}}_{\text{Debt Valuation}} = \underbrace{\mathbb{E}_t \left[\sum_{j=0}^{\infty} M_{t,t+j} S_{t+j}^i \right]}_{\text{PV of Surplus}} + \underbrace{\mathbb{E}_t \left[\sum_{j=0}^{\infty} M_{t,t+j} \sum_{h=1}^H Q_{t+j}^{i,h} P_{t+j}^{i,h} (1 - e^{-c_{t+j}^{i,h}}) \right]}_{\text{PV of Seigniorage Revenue}}$$

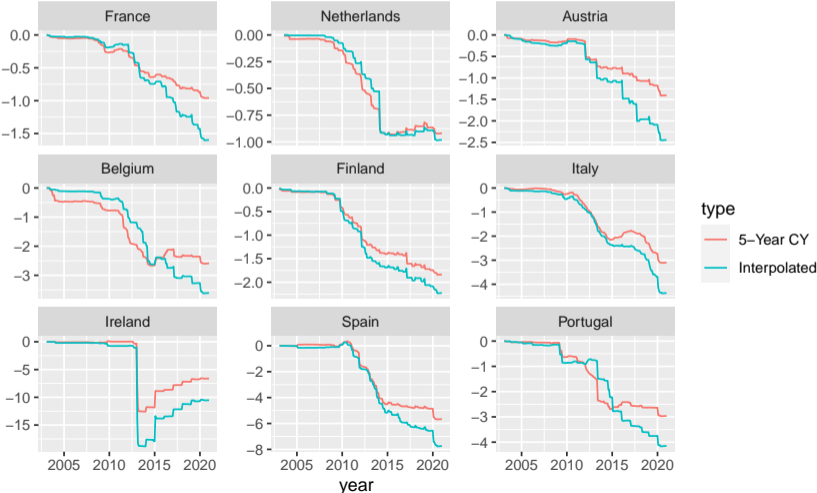
- When country i earns a lower convenience yield than Germany, it raises less revenue for each bond issuance:

$$\mathcal{L}_t^i = \underbrace{I_t^i}_{\text{Issuance Amount}} \cdot \underbrace{h_t}_{\text{Bond Duration}} \cdot \underbrace{(\lambda_t^i - \lambda_t^{DE})}_{\text{Conv Yield Differential}}$$

- This revenue loss gives peripheral countries a funding disadvantage relative to central countries in the Eurozone.

III. Feedback: Fiscal Costs of Convenience Yields

Figure: Cumulative Revenue Loss/GDP Ratio. Revenue losses are compounded at German 5-year yields. In percentage points.



Conclusion

- Theoretical framework relates convenience yields to fiscal conditions. In a currency union, convenience yields play an important role as absorbers of country-specific fiscal shocks.
- Empirically, we show that convenience yields
 - ▶ Explain a large share of the variation in bond yield differentials
 - ▶ Rise when there is good fiscal news
 - ▶ Affect revenues from bond issuance, esp. in peripheral countries
- New consideration in the design of optimal currency area