Global or Regional Safe Assets: Evidence from Bond Substitution Patterns

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Motivation: A Granular Look at International Bond Markets

- International bond markets key to understand:
  - Role of global & regional safe assets in monetary policy transmission
  - International monetary policy spillovers

- New perspective through *demand elasticities* of international bond investors:
  - *Own* elasticities → degree of portfolio rebalancing
  - *Substitution* elasticities → composition of portfolio rebalancing

This Paper: A Novel View of Portfolio Rebalancing

- Granular own- and cross-elasticities of demand by US & EA mutual funds
  - Corp & govt bonds $\sim$ 57% of global debt securities
  - 140 countries, 60 currencies, of all maturities & credit ratings

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  - CB *safe asset* purchases less effective during financial crises
  - Bond market *segmentation* through prism of fund portfolio re-balancing

Literature

1. Safe assets & segmented markets:

Caballero, Farhi and Gourinchas (2008, 2015, 2017); Gourinchas and Rey (2016, 2022); He, Krishnamurthy and Milbradt (2019); Coppola, Krishnamurthy and Xu (2023); Gorton (2017); Dang, Gorton and Holmström (2012);

Vayanos and Vila (2021); Ray (2019); Gourinchas, Ray and Vayanos (2022); Costain, Nuño and Thomas (2022); Kekre, Lenel and Mainardi (2022); Eser, Lemke, Nyholm, Radde and Vladu (2023);

2. Convenience yields & exchange rate dynamics:

Krishnamurthy and Vissing-Jorgensen (2012); Nagel (2016); Jiang, Krishnamurthy and Lustig (2018, 2023); Engel and Wu (2018); Krishnamurthy and Lustig (2019); Engel (2020); Valchev (2020); Mota (2020); Diamond and Van Tassel (2021); Van Binsbergen, Diamond and Grotteria (2022)

3. Characteristics-based asset demand & downward-sloping demand curves:

Koijen and Yogo (2019, 2020); Koijen, Richmond and Yogo (2020b); Bretscher, Schmid, Sen and Sharma (2020); Jiang, Richmond and Zhang (2021); Shen and Zhang (2021); Noh and Oh (2021); Fang, Hardy and Lewis (2022); Gabaix and Koijen (2022); Eren, Schrimpf and Xia (2023);

Shleifer (1986); Harris and Gurel (1986); Chang, Hong and Liskovich (2014); Chen, Noronha and Singal (2004); Petajisto (2011);

Froot and Ramadorai (2005, 2008); Hau and Rey (2004, 2006); Hau, Massa and Peress (2010); Camanho, Hau and Rey (2022); Bippus, Lloyd and Ostry (2023)

4. Portfolio rebalancing after QE programmes (foreign & non-bank investors):

Joyce, Liu and Tonks (2014); Bergant, Fidora and Schmitz (2018); Koijen, Koulischer, Nguyen and Yogo (2020a); Tabova and Warnock (2021); Faia, Salomao and Veghazy (2022); Holm-Hadulla and Leombroni (2023); Zhou (2023); Du et al. (2024); Faia, Lewis and Zhou (2024)

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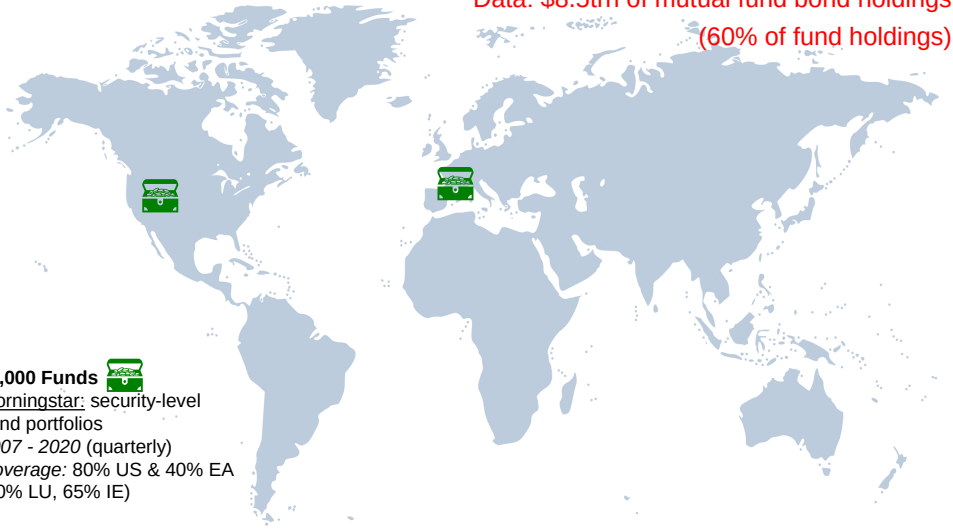
Outline

Data: $8.5trn of mutual fund bond holdings
(60% of fund holdings)



~11,000 Funds
- Morningstar: security-level bond portfolios
- *2007 - 2020* (quarterly)
- *Coverage:* 80% US & 40% EA (70% LU, 65% IE)

▸ Holdings over time,$bn ▸ Holdings over time,%

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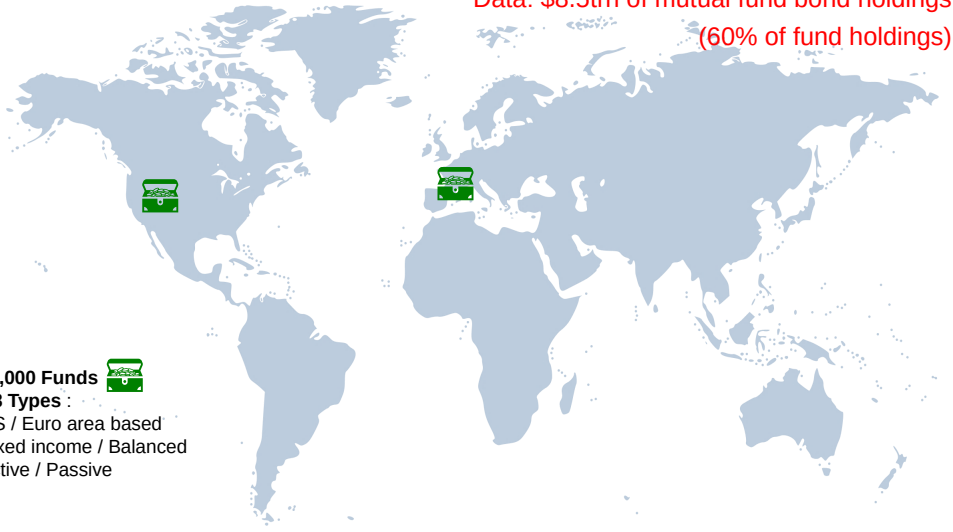

~11,000 Funds
⇒ 8 Types :
- US / Euro area based
- Fixed income / Balanced
- Active / Passive

▸ Fund types tree ▸ Funds summary over time

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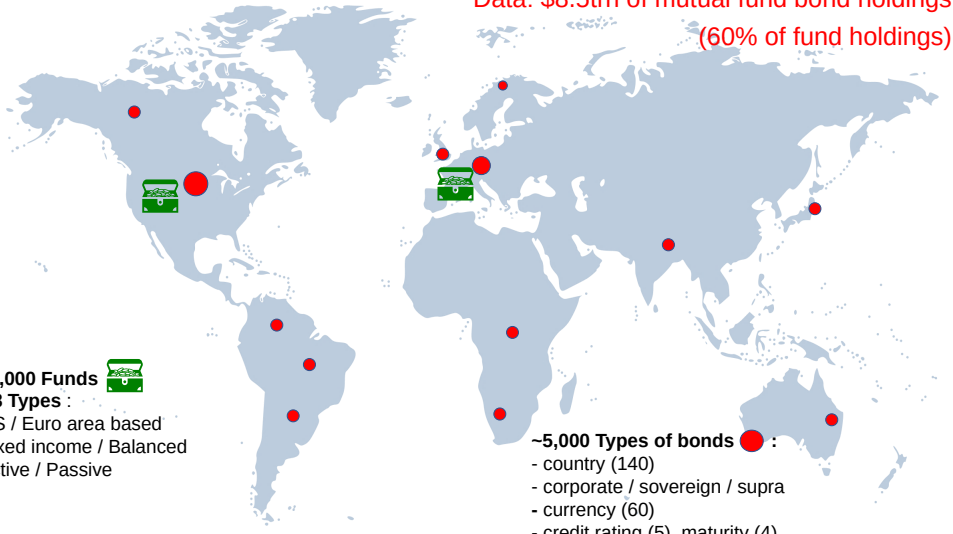

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- credit rating (5), maturity (4)

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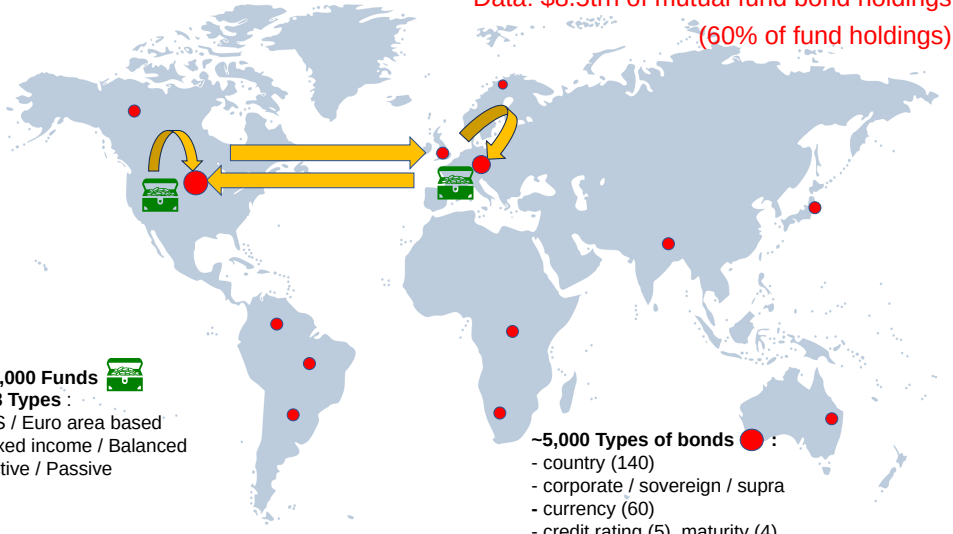

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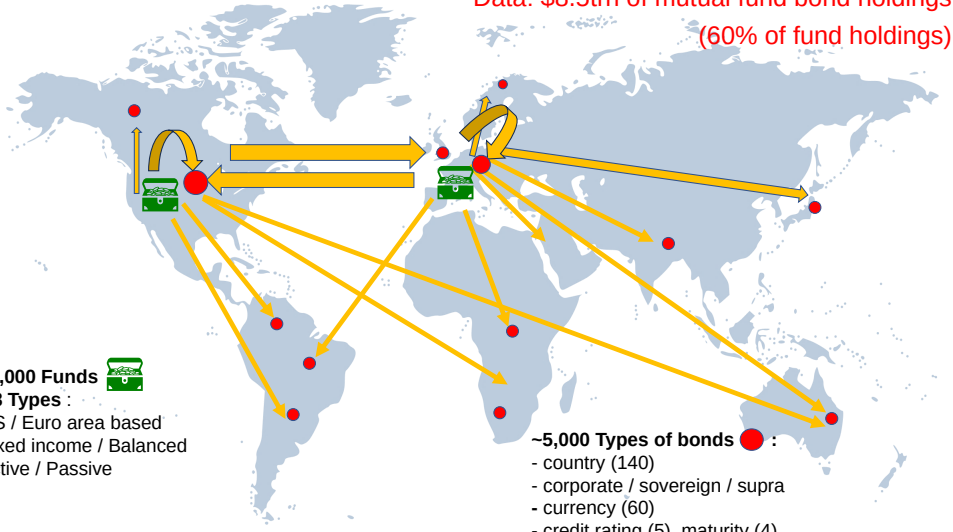

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Bond buckets Bond data Bonds included

Outline

Characteristics-based bond demand

Panel Logit demand:

$$\log\left(\frac{w_{i,t}(n)}{w_{i,t}(0)}\right) = \alpha_{T(i)} per^{h}_{\chi(i),t}(n) + \mathbf{x}^1_t(n)'\beta^1_{T(i)} + \mathbf{x}^2(n)'\beta^2_{T(i)} + \mathbf{b}_i(n)'\theta_{T(i)} + \zeta_{i,t} + \varepsilon_{i,t}(n)$$

$w_{i,t}(n)$, $w_{i,t}(0)$: weight of bond n / outside asset in fund i portfolio at the end of quarter t

▸ ICAPM ▸ From ICAPM to Characteristics-based ▸ Characteristics-based demand functions

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Predicted excess bond returns $per^{h}_{\chi(i),t}(n)$:

$$rx_{\chi(i),t+h}(n)(\equiv r_{\chi(i),t+h}(n) - r^{h}_{\chi(i),t})$$
$$= A^{h}_{\chi(i)}\, y_t(n) + B^{h}_{i}\, rer_{\chi(i),t}(n) + \sum_{f=1}^{3} C^{h}_{\chi(i),f}\, uspc_{f,t} + \sum_{f=1}^{3} D^{h}_{\chi(i),f}\, depc_{f,t} + F^{h}_{\chi(i),n} + E_{\chi(i),n,t+h}$$

▸ Regression output ▸ Time-varying bond risk

Rich bond & fund controls

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Granular characteristics:

- $\mathbf{x}^1_t(n)$: Maturity, Amount Outstanding
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} Risk & Market Segments

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  (Home & Home Currency biases , Fund Investment Area , Government / Corporate bond mandate)

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- $\zeta_{i,t} = -\log(\rho_{i,t}) + \xi_{i,t}$: investor-time FEs capture risk aversion and other bond portfolio demand shocks

} Risk aversion

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} Risk aversion

- $\varepsilon_{i,t}(n)$: unobserved variation in investor demand across bonds, at time t

Bond demand elasticities

Aggregate fund sector elasticity: % change in weight of bond j in aggregated fund sector portfolio in response to 1ppt change in predicted excess return of bond k

$\rightarrow$ holdings-weighted average of individual elasticities:

$$\eta_t(jk) \equiv \frac{\partial \log(w_t(j)) * 100}{\partial per_t(k)} = \begin{cases} \sum_i \frac{AUM_{i,t} w_{i,t}(j)}{\sum_i (AUM_{i,t} w_{i,t}(j))} \widehat{\alpha}_{T(i)} \, (1 - w_{i,t}(j)) * 100 & \text{if } j = k, \\ -\sum_i \frac{AUM_{i,t} w_{i,t}(j)}{\sum_i (AUM_{i,t} w_{i,t}(j))} \widehat{\alpha}_{T(i)} \, w_{i,t}(k) * 100 & \text{otherwise.} \end{cases}$$

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$\rightarrow$ Own demand elasticities vary across bonds and over time due to investor base

$\rightarrow$ Substitution driven by funds who hold both bond j and k at time t: closest substitutes are those that experience greatest spillovers from safe asset return changes

▸ Definitions ▸ Weights, Summary ▸ Own, Summary ▸ Cross, Summary

Identification challenge

➢ **Need instrument:** uncorrelated with investor-specific *residual relative bond demand*

$$\mathbb{E}_t\left[\varepsilon_{i,t}(n)\, Z_t(n) \;\middle|\; \mathbf{x}_t^1(n),\, \mathbf{x}^2(n),\, \mathbf{b}_i(n),\, \zeta_{i,t}\right] = 0$$

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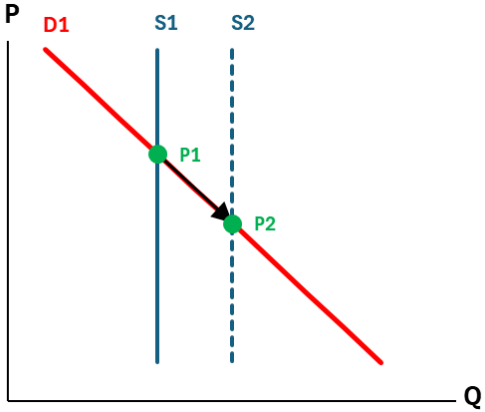

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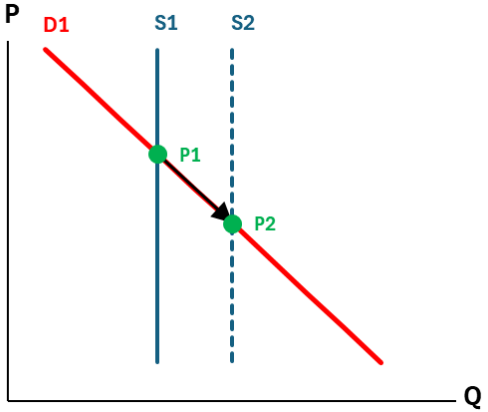

✗ Broad and long panel of bond holdings
→ bond-specific exogenous supply shocks not feasible

✗ No market clearing (fund sector holdings of bonds only)
→ Koijen and Yogo (2019, 2020) instruments not feasible

High-frequency Monetary Policy Shocks by Fed & ECB

➢ **Monetary policy shocks** that vary with bond maturity, country, currency:

$$Z_t(n) = [FEDiv_t(n),\ ECBiv_t(n)]'$$

✓ Fed & ECB surprises to the entire yield curve (Gürkaynak et al., 2022; Altavilla et al., 2019)
✓ Cleaned from central bank information effects (Jarociński and Karadi, 2018)
✓ Heterogeneous international spillovers by country & currency conditional on yield curve segment (Miranda-Agrippino and Nenova, 2022)

▸ Monetary policy instruments ▸ IV correlations ▸ First stage specification ▸ F-stats $ ▸ F-stats € ▸ First stage Fed coefs ▸ First stage ECB coefs
▸ OLS *vs* 2SLS illustration ▸ OLS *vs* 2SLS scatter ▸ OLS *vs* 2SLS table ▸ Threat risk

Stock-take: Methodological advances

1. Flexible functional form allows flexible substitution estimates
   - Compared to Nested Logit in global demand system of Koijen and Yogo (2020)

2. Precision from more granular data:
   - Fund-level holdings and characteristics ⇒ fund-specific & time-varying risk aversion + heterogeneous mandates / preferred habitats
   - Security-level bond holdings and characteristics ⇒ market segmentation along many dimensions possible (country, currency, rating, maturity, issuer type...)

3. Broader scope than previous demand estimation : 57% of global debt securities outstanding

4. New instruments for bond returns in a demand setting without market clearing

Outline

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Safe assets have low demand elasticities

Own demand elasticity: $\eta_t(jj) \equiv \frac{\partial \log(w_t(j)) * 100}{\partial per_t(j)} = \sum_i \frac{AUM_{i,t} w_{i,t}(j)}{\sum_i (AUM_{i,t} w_{i,t}(j))} \widehat{\alpha}_{T(i)} (1 - w_{i,t}(j)) * 100$

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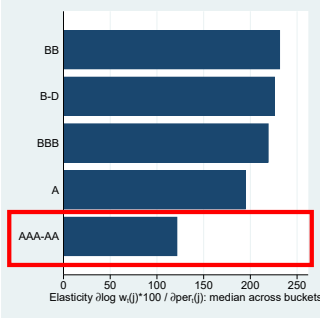
Credit rating



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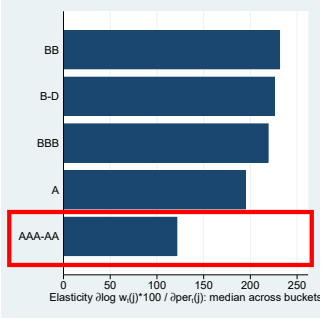
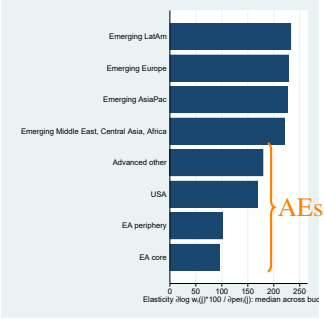


Issuer region



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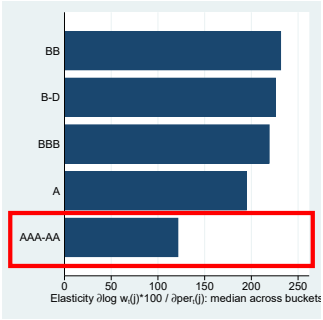

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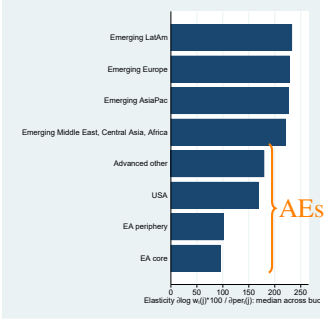
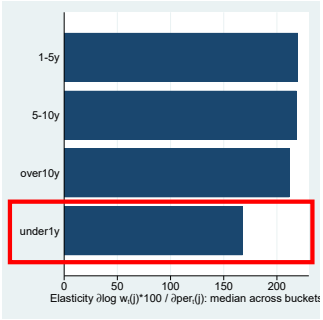


Bond maturity



Note: Medians across sovereign bond buckets. Time averages of bucket-level elasticities of the total fund sector.

▸ Corporate ▸ All bonds ▸ Bond currencies ▸ Asset types ▸ By fund residence

Spillovers from US T-bill returns ↑: Funds de-risk

Cross-elasticity: $\eta_t(jk) \equiv \frac{\partial \log(w_t(j))}{\partial per_t(k)} * 100 = \sum_i \frac{AUM_{i,t} w_{i,t}(j)}{\sum_i (AUM_{i,t} w_{i,t}(j))} \left(- \widehat{\alpha}_{T(i)} \, w_{i,t}(k) * 100 \right)$

Spillovers from US T-bill returns ↑: Funds de-risk

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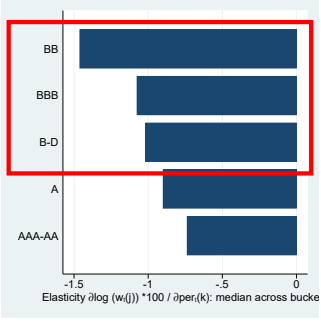
Credit rating



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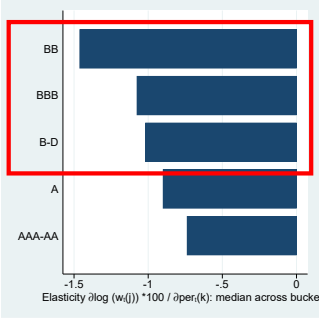
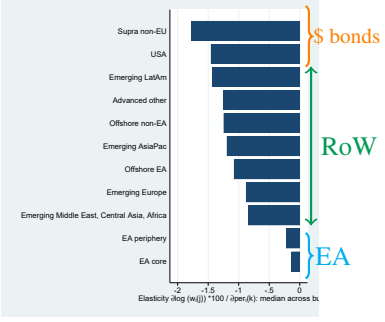


Issuer region



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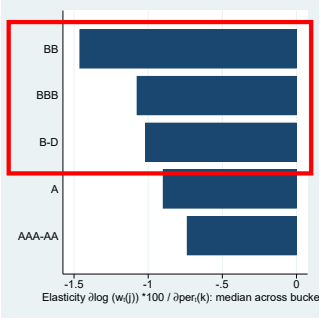

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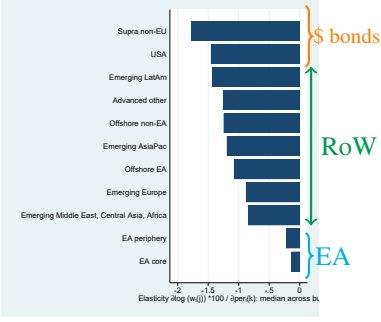
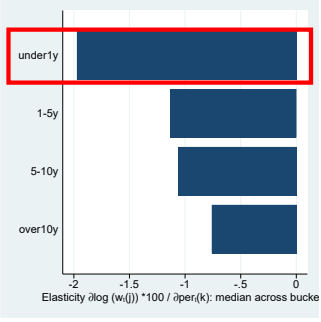


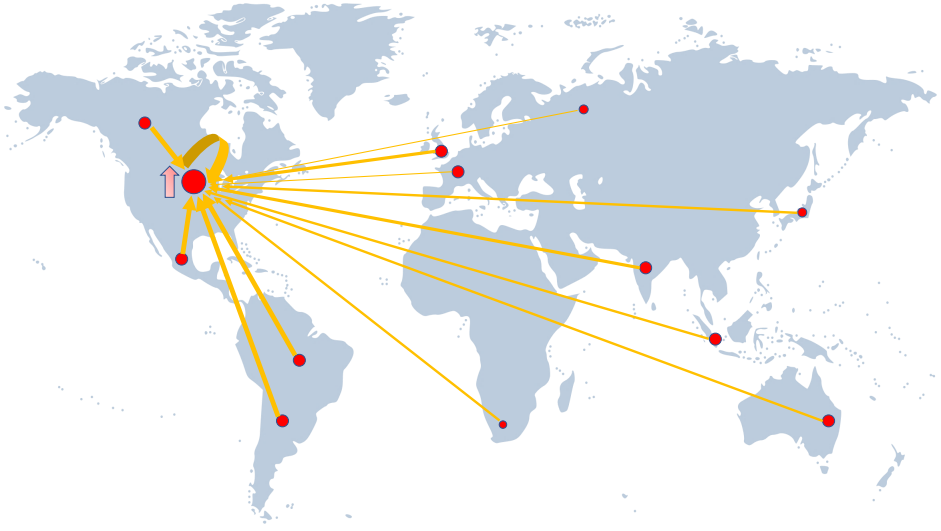
Bond maturity



Note: Medians across all bond buckets. Time averages of bucket-level elasticities of the total fund sector.

▸ Sovereign ▸ Corporate ▸ US funds ▸ EA funds ▸ US 1-5y ▸ US 5-10y ▸ US 10y+

US monetary policy triggers global rebalancing



Spillovers from DE T-bill returns ↑: Funds sell other EA safe short bonds

Cross-elasticity: $\eta_t(jk) \equiv \frac{\partial \log(w_t(j))}{\partial per_t(k)} * 100 = \sum_i \frac{AUM_{i,t} w_{i,t}(j)}{\sum_i (AUM_{i,t} w_{i,t}(j))} \left(- \widehat{\alpha}_{T(i)} \, w_{i,t}(k) * 100 \right)$

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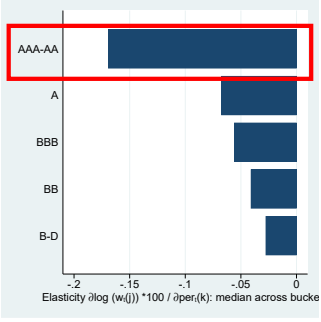

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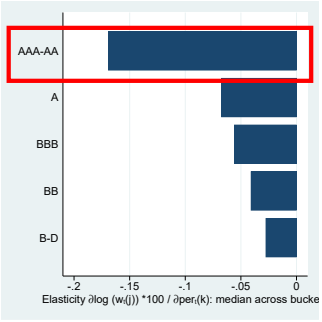
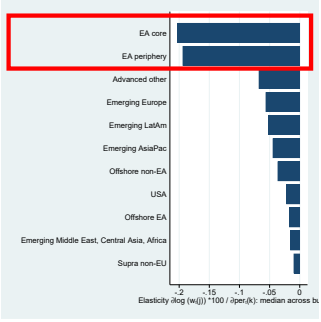


Issuer region



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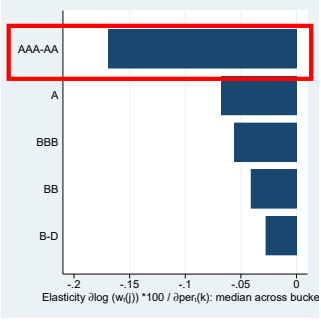

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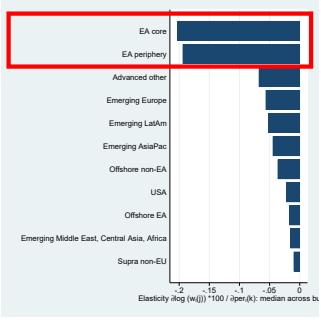

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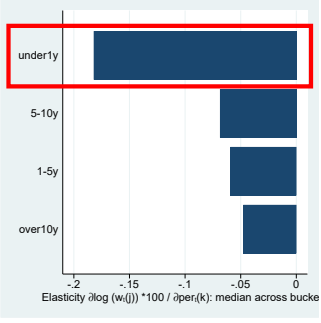


Note: Medians across all bond buckets. Time averages of bucket-level elasticities of the total fund sector.

▸ Sovereign ▸ Corporate ▸ US funds ▸ EA funds ▸ DE 1-5y ▸ DE 5-10y ▸ DE 10y+ ▸ Top substituters' portfolios

EA monetary policy triggers regional rebalancing

Rebalancing from safe assets: US *vs* EA

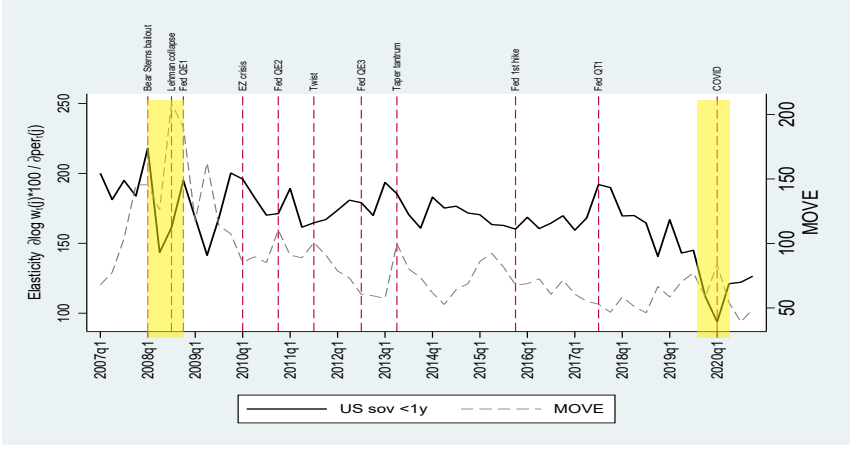
US: Global transmission with risky assets affected disproportionately

EA: Regional transmission via rebalancing in European sovereign debt market

$\Rightarrow$ Effects of monetary policy are asymmetric along segmented bond markets

Outline

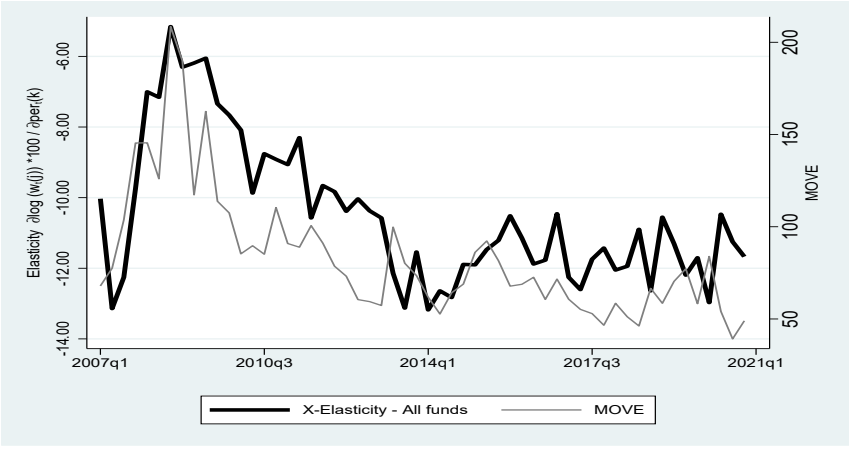
Flight to safety #1: US T-bills elasticity ↓ when market stress ↑



Black line: Funds' demand elasticity for US Treasuries with maturity under 1 year to changes *w.r.t.* 1ppt change in its predicted excess returns.

▸ Correlation table ▸ Time variation in elasticities

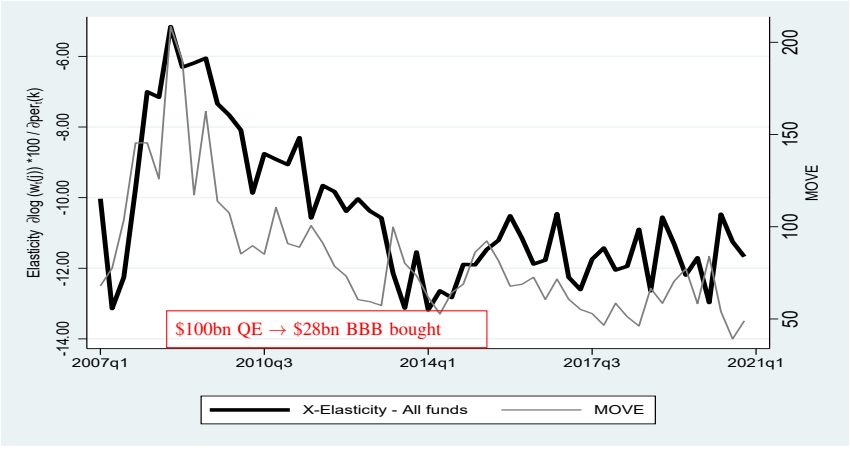
Flight to safety #2: *Relative* safety of Treasuries *vs* US BBB corp. bonds



Black line: Substitution elasticity of BBB-rated US corporate bonds with maturity of over 10 years *w.r.t.* 1ppt change in predicted excess returns on US Treasury with maturity over 10 years.

▸ Back of envelope

Flight to safety #2: *Relative* safety of Treasuries *vs* US BBB corp. bonds



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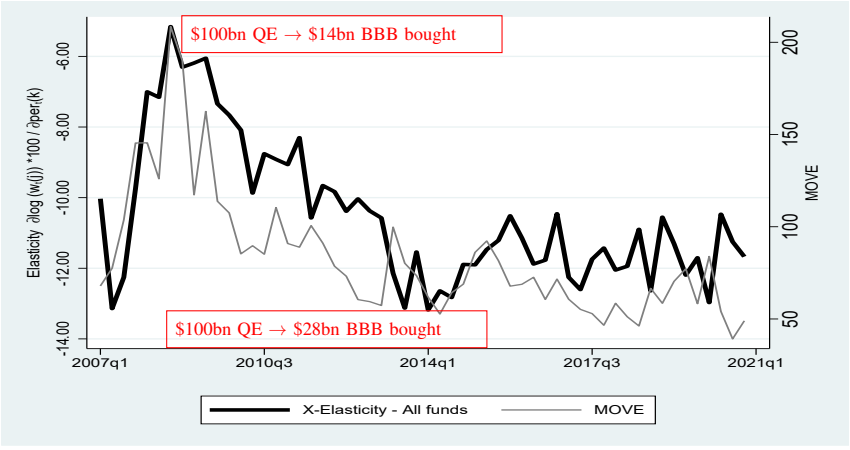

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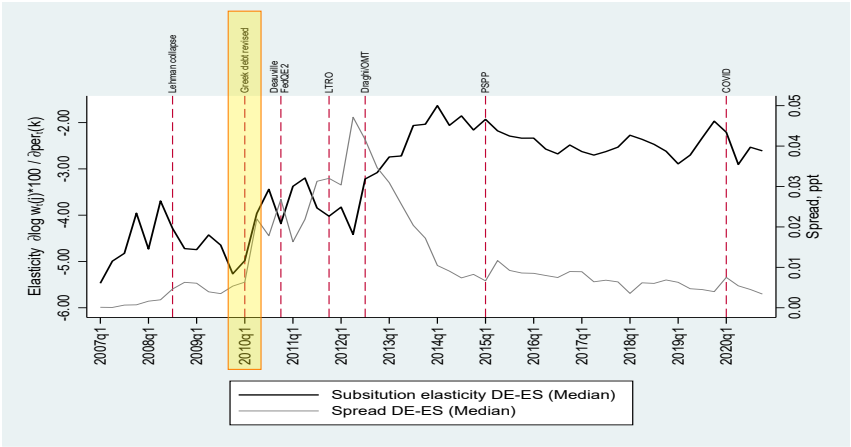
▸ Back of envelope

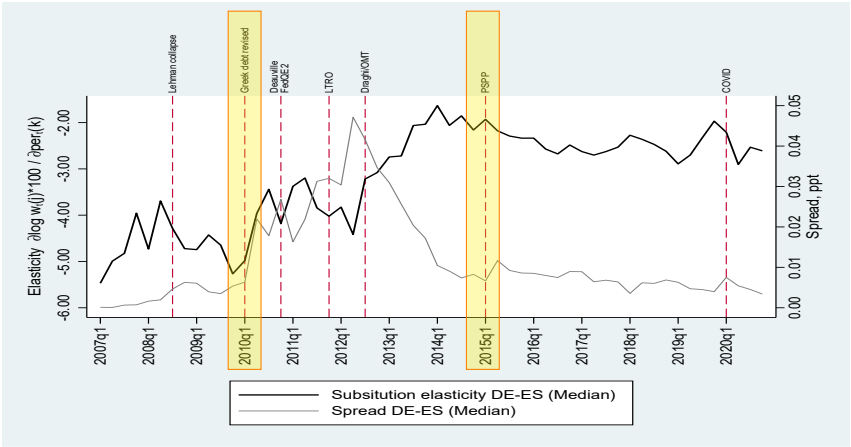
Flight to safety #3: *Relative* safety of German Bund *vs* Spain



Black line: Substitution elasticity of Spanish sovereign bonds *w.r.t.* 1ppt change in predicted excess returns on German sovereign bonds. Median of substitutions within all four maturity buckets (under 1y, 1-5y, 5-10y, over 10y).

- Italy
- France
- Belgium
- Netherlands

Flight to safety #3: *Relative* safety of German Bund *vs* Spain



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▸ Italy ▸ France ▸ Belgium ▸ Netherlands

Forms of flight to safety: US *vs* EA

US: Monetary policy transmission to risky assets is impaired during crisis

EA: European sovereign debt market integration deteriorates

$\Rightarrow$ Calibration & composition of central bank policies should be state-contingent

Outline

Lessons for theory & policy

1. Market segmentation in international bond portfolios
   - → Global *vs* regional safe assets
   - → Demand elasticities to calibrate preferred-habitat models

2. Flight to safety affects monetary policy transmission
   - → US Treasuries *vs* risky corporate bonds
   - → EA sovereign debt market

3. New way to track bond market fragmentation
   - → At time of geopolitical shifts

Lessons for theory & policy

1. Market segmentation in international bond portfolios
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Thank you!

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