

# 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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  - Financial crises make QE less effective

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  - Different Fed / ECB spillovers via *global* (US Treasuries) / *regional* safe assets (German Bunds)
  - Financial crises make QE less effective
  - Characterize segmentation & calibrate demand elasticities in preferred habitat models

# 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)

## 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); Fang, Hardy and Lewis (2022); Holm-Hadulla and Leombroni (2023); Du, Forbes and Luzzetti (2024)



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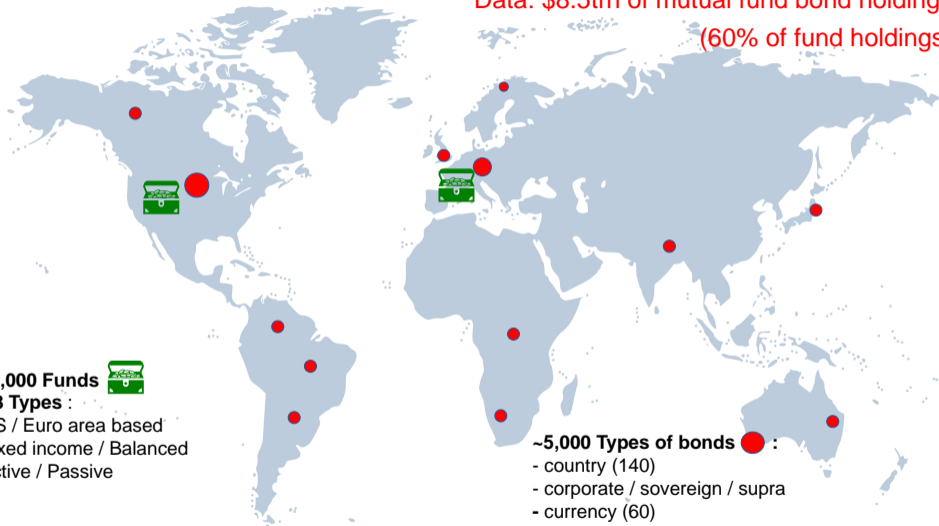
# Outline

- 1 Dataset
- 2 Bond demand specification
- 3 Safe assets, imperfect substitutes & monetary policy
  - Safety relative to other bonds
  - Safety amid heightened risk
- 4 Conclusions





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



~11,000 Funds



⇒ 8 Types :


- US / Euro area based
- Fixed income / Balanced
- Active / Passive

~5,000 Types of bonds ● :

- country (140)
- corporate / sovereign / supra
- currency (60)
- credit rating (5), maturity (4)



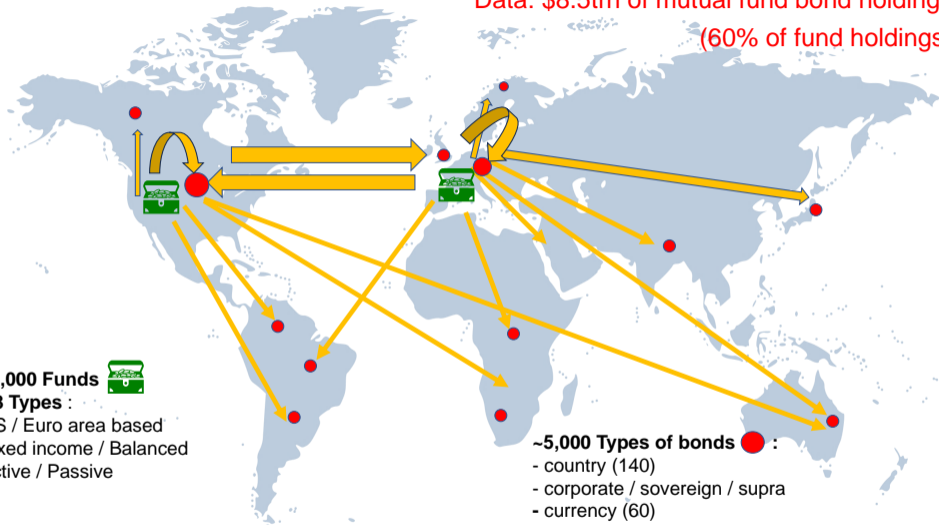
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# Flexible empirical model of bond demand

- Build on literature estimating downward-sloping demand for financial assets using IO techniques ([Kojen and Yogo, 2019, 2020](#))
- + Simple, yet general specification to capture multitude of institutional details & fit observed holdings
- + Flexible substitution patterns to assess market segmentation

# Characteristics-based bond demand

## Panel Logit demand:

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

$w_{i,t}(n)$ ,  $w_{i,t}(0)$  : 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 $\text{per}_{\chi(i),t}^h(n)$ :

$$\begin{aligned} rx_{\chi(i),t+h}(n) & (\equiv r_{\chi(i),t+h}(n) - r_{\chi(i),t}^h) \\ & = A_{\chi(i)}^h y_t(n) + B_i^h rer_{\chi(i),t}(n) + \sum_{f=1}^3 C_{\chi(i),f}^h uspc_{f,t} + \sum_{f=1}^3 D_{\chi(i),f}^h depc_{f,t} + F_{\chi(i),n}^h + E_{\chi(i),n,t+h} \end{aligned}$$

- ▶ Regression output
- ▶ Time-varying bond risk

# Rich bond & fund controls

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## Granular characteristics:

- $\mathbf{x}_t^1(n)$ : Maturity, Amount Outstanding
  - $\mathbf{x}^2(n)$ : Rating Bucket, Seniority, Country of risk, Currency of denomination
- } Risk & Market Segments

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

# Fit of fund bond holdings above 70%

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**R<sup>2</sup> : 71% (US fixed income active) – 94% (EA fixed income passive)**

- ▶ 2SLS  $\alpha_{T(i)}$
- ▶ Full 2SLS output
- ▶ Sensitivity by AUM
- ▶ Sensitivity to *per* 12-month





# Bond demand elasticities

**Individual fund elasticity:** % change in fund  $i$  portfolio weight of bond  $j$  in response to 1ppt change in predicted excess return of bond  $k$ :

$$\eta_{i,t}(jk) \equiv \frac{\partial \log(w_{i,t}(j)) * 100}{\partial per_{i,t}(k)} = \begin{cases} \hat{\alpha}_{T(i)} (1 - w_{i,t}(j)) * 100 & \text{if } j = k, \\ -\hat{\alpha}_{T(i)} w_{i,t}(k) * 100 & \text{otherwise.} \end{cases}$$

$i$ : fund;  $t$ : quarter;  $j, k$ : bonds.

**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  $k$

→ holdings-weighted average of individual elasticities:

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→ Own demand elasticities vary across bonds and over time due to investor base



# Identification

- **Instrument exogeneity:** uncorrelated with investor-specific *residual relative bond demand*

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

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- ✗ Broad and long panel of bond holdings → bond-specific exogenous supply or demand shocks not feasible
- ✗ No market clearing (fund sector holdings of bonds only) → [Kojien and Yogo \(2019, 2020\)](#) instruments not feasible

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

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

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- ✓ 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
- ▶ Demand-Supply basic
- ▶ Demand-Supply OLS vs IV
- ▶ First stage F-stats
- ▶ First stage Fed coeffs
- ▶ First stage ECB coeffs



# 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  $\Rightarrow$  fund-specific & time-varying risk aversion + heterogeneous mandates / preferred habitats
  - Security-level bond holdings and characteristics  $\Rightarrow$  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

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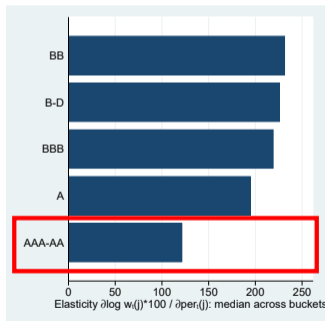
# Safe assets have low demand elasticities

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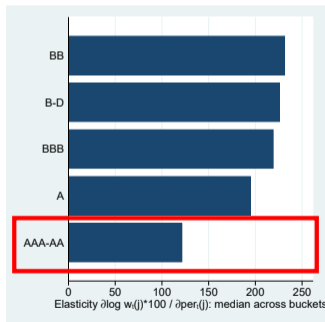
*Credit rating*



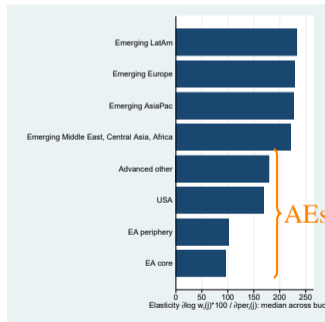
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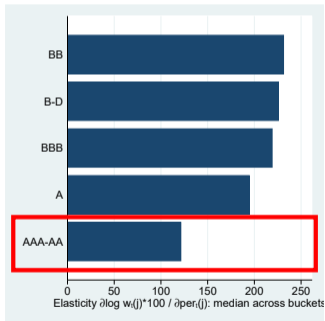
*Issuer region*



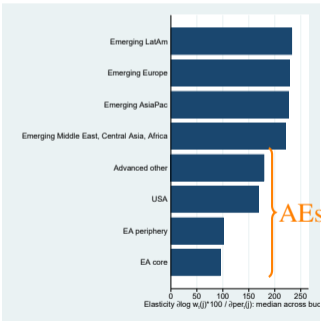
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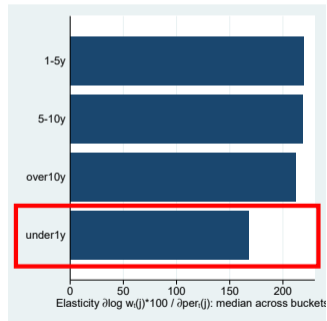
*Credit rating*



*Issuer region*



*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

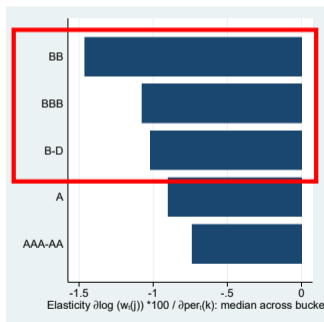
**Cross-elasticity:**  $\eta_t(jk) \equiv \frac{\partial \log(w_t(j))}{\partial \text{per}_t(k)} * 100 = \sum_i \frac{AUM_{i,t} w_{i,t}(j)}{\sum_i (AUM_{i,t} w_{i,t}(j))} (-\hat{\alpha}_{T(i)} w_{i,t}(k) * 100)$



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**Cross-elasticity:**  $\eta_t(jk) \equiv \frac{\partial \log(w_t(j))}{\partial \text{per}_t(k)} * 100 = \sum_i \frac{AUM_{i,t} w_{i,t}(j)}{\sum_i (AUM_{i,t} w_{i,t}(j))} (-\hat{\alpha}_{T(i)} w_{i,t}(k) * 100)$

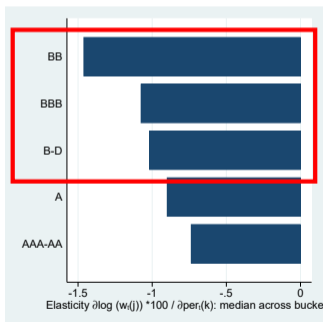
*Credit rating*



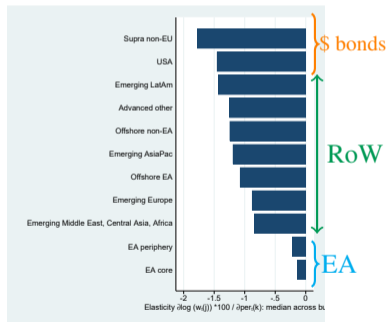
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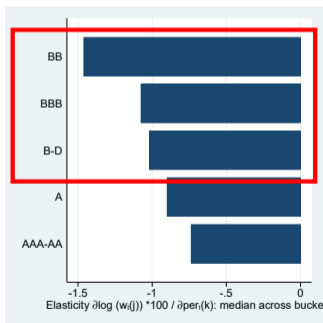
*Issuer region*



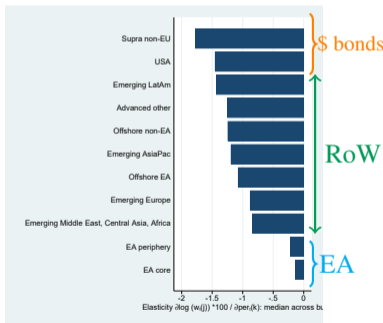
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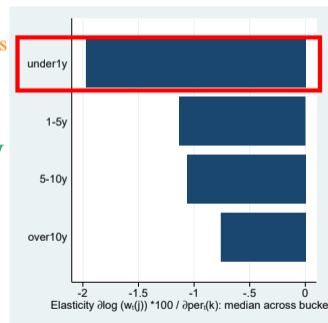
*Credit rating*



*Issuer region*

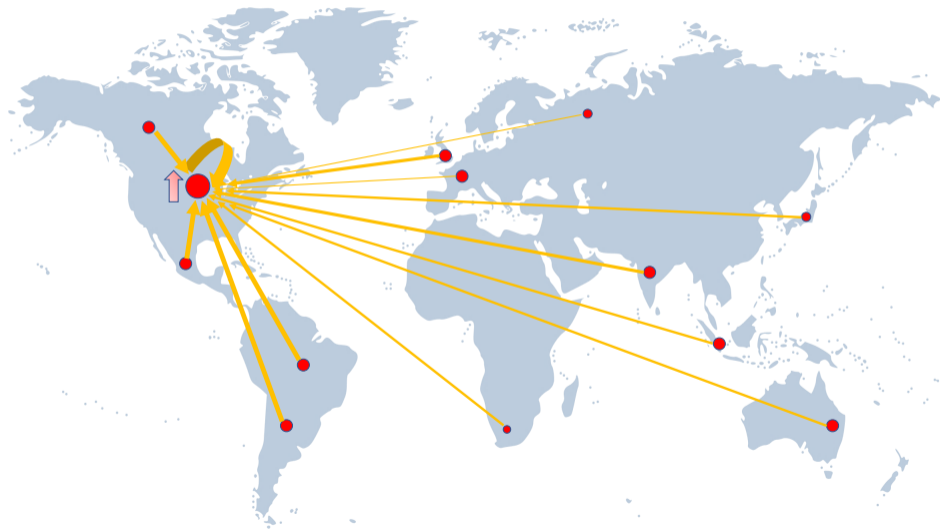


*Bond maturity*



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

# US monetary policy triggers global rebalancing



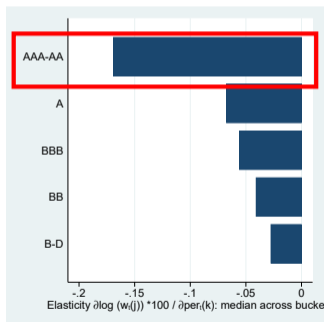
# Spillovers from DE T-bill returns ↑: Funds sell other EA safe short bonds

**Cross-elasticity:**  $\eta_t(jk) \equiv \frac{\partial \log(w_t(j))}{\partial \text{per}_t(k)} * 100 = \sum_i \frac{AUM_{i,t} w_{i,t}(j)}{\sum_i (AUM_{i,t} w_{i,t}(j))} (-\hat{\alpha}_{T(i)} w_{i,t}(k) * 100)$

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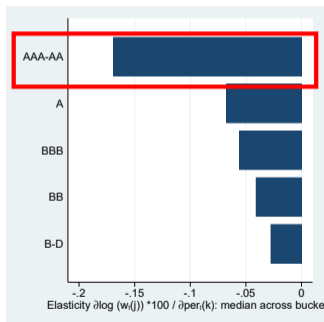
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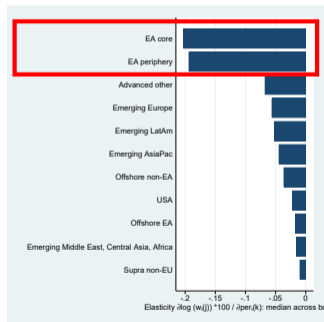
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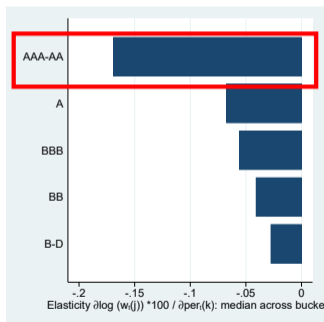
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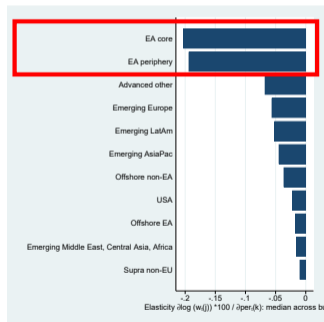
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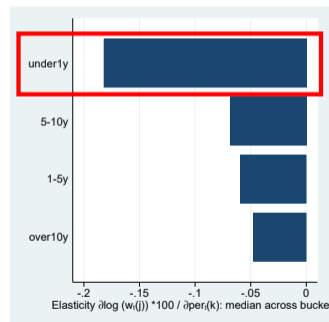
*Credit rating*



*Issuer region*



*Bond maturity*



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



# EA monetary policy triggers regional rebalancing

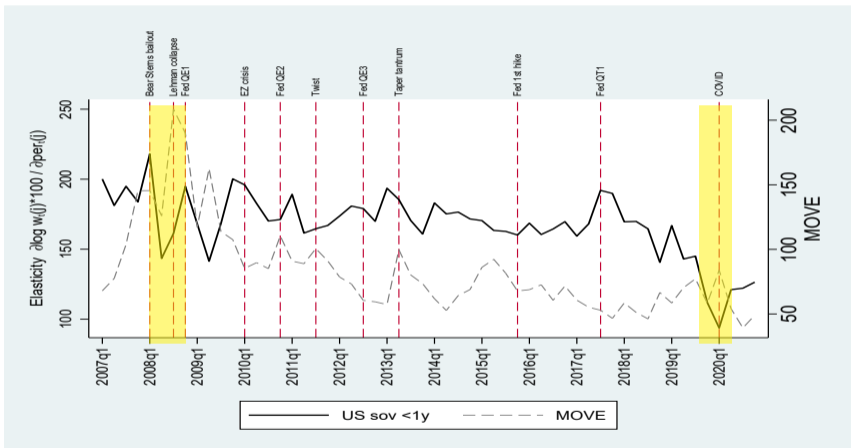


# Outline

- 1 Dataset
- 2 Bond demand specification
- 3 Safe assets, imperfect substitutes & monetary policy**
  - Safety relative to other bonds
  - Safety amid heightened risk**
- 4 Conclusions

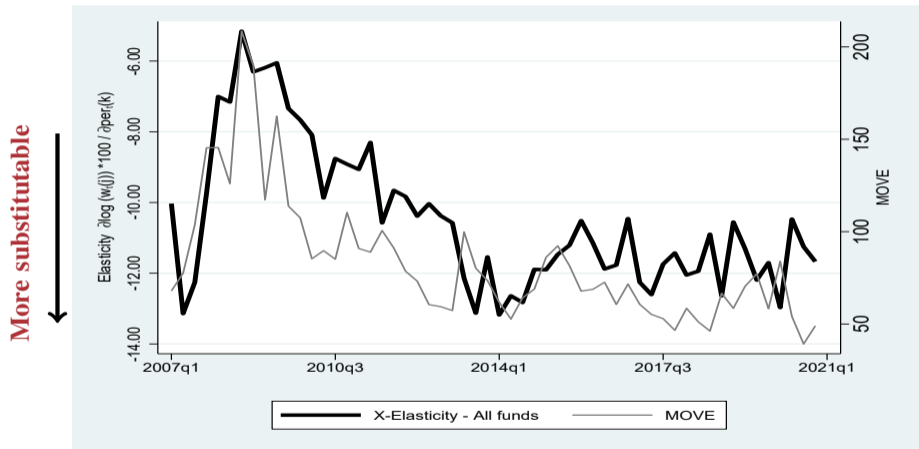
# Flight to safety #1: US T-bills elasticity ↓ when market stress ↑

More elastic



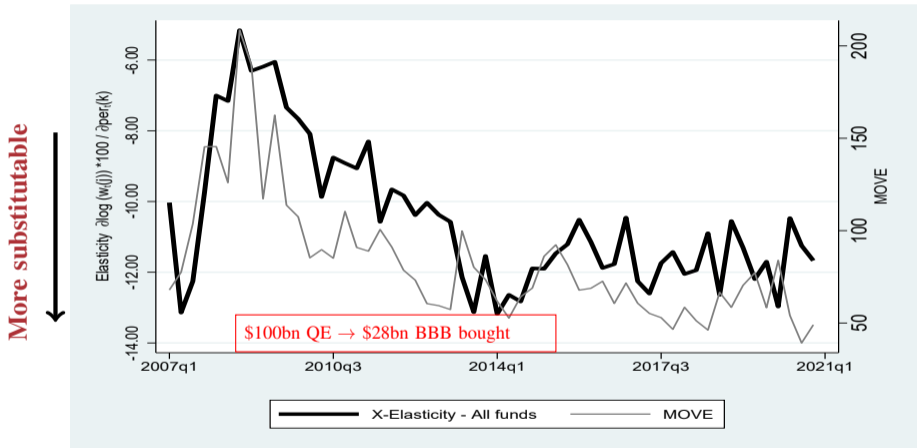
*Black line:* Funds' demand elasticity for US Treasuries with maturity under 1 year to changes *w.r.t.* 1ppt change in its predicted excess returns.

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



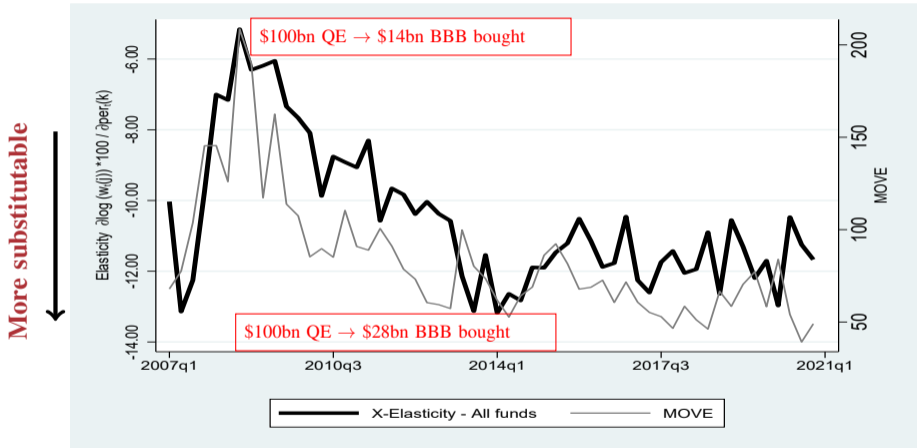
*Black line:* Substitution elasticity of BBB-rated US corporate bonds with maturity of over 10 years w.r.t. 1ppt change in predicted excess returns on US Treasury with maturity over 10 years.

# 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.

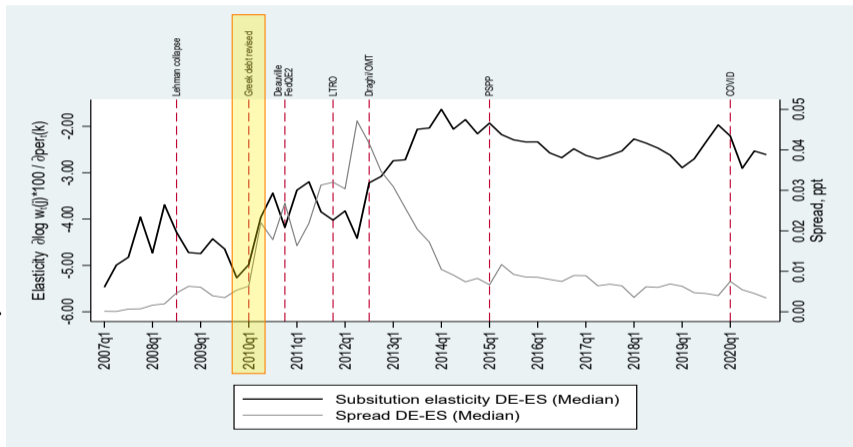
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Black line: Substitution elasticity of BBB-rated US corporate bonds with maturity of over 10 years w.r.t. 1ppt change in predicted excess returns on US Treasury with maturity over 10 years.

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

More substitutable

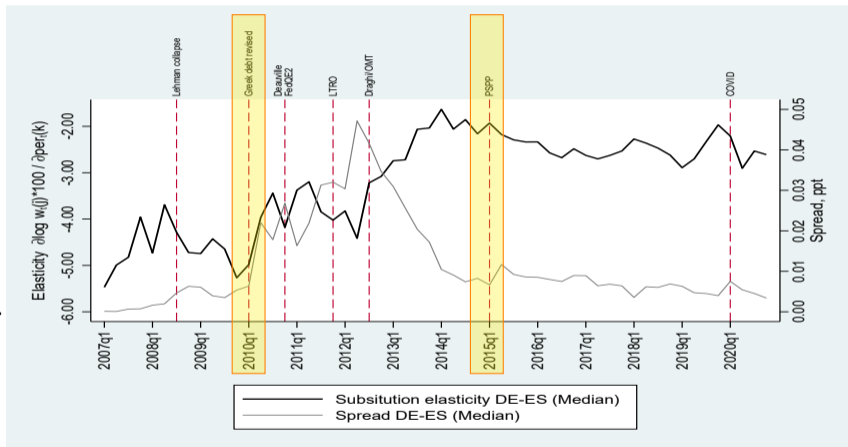


*Black line:* Substitution elasticity of Spanish sovereign bonds *w.r.t.* 1ppt change in predicted excess returns on German sovereign bonds.  
Median of substitutions within all four maturity buckets (under 1y, 1-5y, 5-10y, over 10y).

► Italy    ► France    ► Belgium    ► Netherlands

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

More substitutable



*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



# 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

⇒ Calibration & composition of central bank policies should be **state-contingent**

# Outline

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- 4 Conclusions

# 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

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# Thank you!

# References I

- Albuquerque, Rui A, José-Miguel Cardoso-Costa, and José Afonso Faias**, “Price elasticity of demand and risk-bearing capacity in sovereign bond auctions,” Available at SSRN 4051070, 2022.
- Allen, Jason, Jakub Kastl, and Milena Wittwer**, “Estimating demand systems for Treasuries,” Technical Report, Working paper 2020.
- Altavilla, Carlo, Luca Brugnolini, Refet S. Gürkaynak, Roberto Motto, and Giuseppe Ragusa**, “Measuring euro area monetary policy,” *Journal of Monetary Economics*, 2019, 108, 162 – 179. “Central Bank Communications: From Mystery to Transparency” May 23-24, 2019 Annual Research Conference of the National Bank of Ukraine Organized in cooperation with Narodowy Bank Polski.
- Bauer, Michael D, Ben S Bernanke, and Eric Milstein**, “Risk appetite and the risk-taking channel of monetary policy,” *Journal of Economic Perspectives*, 2023, 37 (1), 77–100.
- Bergant, Katharina, Michael Fidora, and Martin Schmitz**, “International capital flows at the security level – evidence from the ECB’s Asset Purchase Programme,” *ECMI Working Paper No 7.*, 2018.
- Binsbergen, Jules H Van, William F Diamond, and Marco Grotteria**, “Risk-free interest rates,” *Journal of Financial Economics*, 2022, 143 (1), 1–29.
- Bretscher, Lorenzo, Lukas Schmid, Ishita Sen, and Varun Sharma**, “Institutional corporate bond pricing,” *Swiss Finance Institute Research Paper*, 2020, (21-07).
- Bubeck, Johannes, Maurizio Michael Habib, and Simone Manganeli**, “The portfolio of euro area fund investors and ECB monetary policy announcements,” *Journal of International Money and Finance*, 2018, 89, 103–126.
- Caballero, Ricardo J., Emmanuel Farhi, and Pierre-Olivier Gourinchas**, “An Equilibrium Model of "Global Imbalances" and Low Interest Rates,” *The American Economic Review*, 03 2008, 98 (1), 358–393. Copyright - Copyright American Economic Association Mar 2008; Last updated - 2016-04-30; CODEN - AENRAA; SubjectsTermNotLitGenreText - United States–US.
- Caballero, Ricardo J, Emmanuel Farhi, and Pierre-Olivier Gourinchas**, “Global Imbalances and Currency Wars at the ZLB.,” Technical Report, National Bureau of Economic Research 2015.

## References II

—, —, and —, “The safe assets shortage conundrum,” *Journal of Economic Perspectives*, 2017, 31 (3), 29–46.

**Camanho, Nelson, Harald Hau, and H elene Rey**, “Global portfolio rebalancing and exchange rates,” *The Review of Financial Studies*, 2022, 35 (11), 5228–5274.

**Chang, Yen-Cheng, Harrison Hong, and Inessa Liskovich**, “Regression Discontinuity and the Price Effects of Stock Market Indexing,” *The Review of Financial Studies*, 07 2014, 28 (1), 212–246.

**Chen, Honghui, Gregory Noronha, and Vijay Singal**, “The Price Response to S&P 500 Index Additions and Deletions: Evidence of Asymmetry and a New Explanation,” *The Journal of Finance*, 2004, 59 (4), 1901–1930.

**Coppola, Antonio, Arvind Krishnamurthy, and Chenzi Xu**, “Liquidity, debt denomination, and currency dominance,” Technical Report, National Bureau of Economic Research 2023.

**Costain, James S, Galo Nu no, and Carlos Thomas**, “The term structure of interest rates in a heterogeneous monetary union,” 2022.

**Dang, Tri Vi, Gary Gorton, and Bengt Holmstr om**, “Ignorance, debt and financial crises,” *Yale University and Massachusetts Institute of technology, working paper*, 2012, 17.

**Diamond, William and Peter Van Tassel**, “Risk-free rates and convenience yields around the world,” *Jacobs Levy Equity Management Center for Quantitative Financial Research Paper*, 2021.

**Du, Wenxin, Kristin Forbes, and Matthew N Luzzetti**, “Quantitative Tightening Around the Globe: What Have We Learned?,” Technical Report, National Bureau of Economic Research 2024.

**Engel, Charles**, “Safe U.S. Assets and U.S. Capital Flows,” *Journal of International Money and Finance*, 2020, 102, 102102. Global Safe Assets, International Reserves, and Capital Flow.

— and **Steve Pak Yeung Wu**, “Liquidity and exchange rates: An empirical investigation,” Technical Report, National Bureau of Economic Research 2018.

**Eren, Egemen, Andreas Schrimpf, and Fan Dora Xia**, “The Demand for Government Debt,” *BIS Working Paper No. 1105*, 2023.











## References VI

**Petajisto, Antti**, “The index premium and its hidden cost for index funds,” *Journal of Empirical Finance*, 2011, 18 (2), 271 – 288.

**Ray, Walker**, “Monetary policy and the limits to arbitrage: Insights from a New Keynesian preferred habitat model,” in “2019 Meeting Papers,” Vol. 692 Society for Economic Dynamics 2019.

**Shen, Leslie Sheng and Tony Zhang**, “Risk Sharing and Amplification in the Global Financial Network,” *Available at SSRN 4032741*, 2021.

**Shleifer, Andrei**, “Do Demand Curves for Stocks Slope Down?,” *The Journal of Finance*, 1986, 41 (3), 579–590.

**Tabova, Alexandra M and Francis E Warnock**, “Foreign investors and us treasuries,” Technical Report, National Bureau of Economic Research 2021.

**Valchev, Rosen**, “Bond convenience yields and exchange rate dynamics,” *American Economic Journal: Macroeconomics*, 2020, 12 (2), 124–66.

**Vayanos, Dimitri and Jean-Luc Vila**, “A preferred-habitat model of the term structure of interest rates,” *Econometrica*, 2021, 89 (1), 77–112.

























































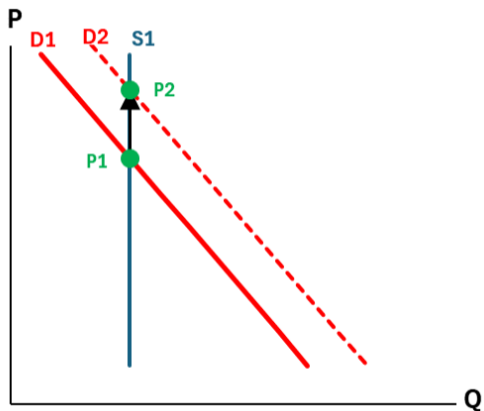






# Stylized identification *in principle*

*Demand curve shifts (OLS)*













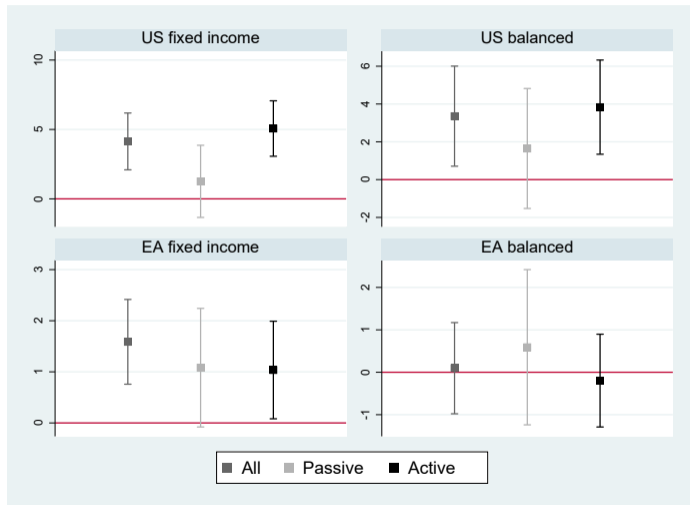


# Demand estimates by fund type

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	US fixed inc.:	Passive	Active	EA fixed inc.:	Passive	Active	US balanced:	Passive	Active	EA balanced:	Passive	Active
per <sub>it</sub> <sup>1</sup>	3.3517*** (0.8911)	2.0661* (1.2166)	3.8106*** (0.8799)	1.7823*** (0.4221)	0.5537 (0.6108)	1.6549*** (0.4829)	2.0080 (1.2432)	1.2114 (1.5947)	2.5316** (1.1180)	1.0679* (0.5918)	1.4376 (1.0476)	0.6656 (0.5906)
Maturity	-0.0089** (0.0045)	-0.0073 (0.0051)	-0.0078 (0.0052)	-0.0022 (0.0016)	-0.0005 (0.0022)	-0.0019 (0.0019)	-0.0065 (0.0049)	-0.0037 (0.0059)	-0.0084* (0.0046)	-0.0081*** (0.0026)	-0.0104*** (0.0036)	-0.0062** (0.0026)
AAA-AA=1	0.2587** (0.1116)	0.6261*** (0.1583)	-0.0054 (0.1323)	0.1181* (0.0626)	0.2677*** (0.0870)	0.0236 (0.1348)	0.2130 (0.1348)	0.3670** (0.1651)	0.0044 (0.1448)	0.2997*** (0.0852)	0.4977*** (0.1424)	0.2278*** (0.0863)
A=1	0.2390** (0.1006)	0.6335*** (0.1641)	0.0325 (0.1198)	0.0390 (0.0579)	0.1681** (0.0803)	0.0013 (0.0760)	0.3286** (0.1290)	0.5546*** (0.1550)	0.0686 (0.1366)	0.1299 (0.0793)	0.3473*** (0.1301)	0.0574 (0.0815)
BBB=1	0.2247* (0.1152)	0.5949*** (0.1717)	0.0846 (0.1297)	0.0545 (0.0544)	0.1820** (0.0758)	0.0273 (0.0714)	0.2735* (0.1427)	0.5038*** (0.1679)	0.0681 (0.1485)	0.1311* (0.0723)	0.3297*** (0.1231)	0.0710 (0.0734)
BB=1	0.1191 (0.0889)	0.2917** (0.1308)	0.0906 (0.1330)	0.0260 (0.0552)	-0.0043 (0.0666)	0.0435 (0.0762)	0.1458 (0.0953)	0.2543*** (0.0949)	0.0839 (0.1359)	0.0731 (0.0653)	0.2008* (0.1046)	0.0327 (0.0627)
Amt. Outstanding	0.3774*** (0.0236)	0.4646*** (0.0294)	0.3293*** (0.0262)	0.3063*** (0.0091)	0.3776*** (0.0142)	0.2613*** (0.0103)	0.4384*** (0.0293)	0.4876*** (0.0306)	0.3468*** (0.0321)	0.2518*** (0.0119)	0.3187*** (0.0180)	0.2239*** (0.0135)
Bond Seniority	-0.0172 (0.0141)	-0.0057 (0.0174)	-0.0063 (0.0148)	-0.0063 (0.0066)	-0.0063 (0.0101)	-0.0022 (0.0064)	0.0126 (0.0215)	0.0472 (0.0328)	0.0029 (0.0164)	-0.0181* (0.0098)	-0.0267* (0.0148)	-0.0155 (0.0102)
Home Bond	0.0000 (.)	0.0000 (.)	0.0000 (.)	0.0651*** (0.0235)	0.0689** (0.0298)	0.0730*** (0.0270)	0.0000 (.)	0.0000 (.)	0.0000 (.)	-0.0021 (0.0401)	-0.0220 (0.0471)	0.0618 (0.0482)
Bond in Fund Investment Area	0.3224*** (0.0612)	0.1459* (0.0820)	0.3249*** (0.0595)	0.2373*** (0.0343)	0.1472*** (0.0359)	0.2658*** (0.0401)	0.1569 (0.1203)	0.0134 (0.1481)	0.3437** (0.1400)	0.1301** (0.0632)	0.0947* (0.0504)	0.1442 (0.1020)
Govt Bond=1 X Govt Fund=1	0.6442*** (0.0854)	0.5432*** (0.1309)	0.6678*** (0.1067)	0.6976*** (0.0420)	0.6342*** (0.0564)	0.6875*** (0.0536)	1.3049*** (0.1462)	1.2810*** (0.1882)	0.9791*** (0.2972)	0.9272*** (0.0838)	0.8639*** (0.1062)	0.9585*** (0.1083)
Govt Bond=1 X Mixed Fund=1	0.2150*** (0.0651)	0.2198*** (0.0730)	0.1904*** (0.0610)	0.2927*** (0.0296)	0.3476*** (0.0367)	0.1992*** (0.0306)	0.3460*** (0.0685)	0.3428*** (0.0833)	0.2319*** (0.0672)	0.3428*** (0.0327)	0.3930*** (0.0453)	0.3205*** (0.0337)
Corp Bond=1 X Corp Fund=1	0.3062*** (0.1138)	-0.1492 (0.0939)	0.3671*** (0.0939)	0.2150*** (0.0394)	0.0384 (0.0455)	0.2552*** (0.0374)	-0.1101 (0.1384)	-0.4955*** (0.1257)	0.1354 (0.1289)	0.0804 (0.0686)	-0.2476*** (0.0557)	0.1435* (0.0757)
Obs	1,933,880	807,205	1,098,618	3,204,199	1,239,624	1,929,587	533,547	326,818	197,813	1,020,864	328,895	686,874
DoF	1,933,701	807,038	1,098,444	3,204,005	1,239,447	1,929,394	533,389	326,670	197,659	1,020,689	328,738	686,699
Adj. Rsq.-Within	0.16	0.26	0.11	0.17	0.28	0.12	0.22	0.27	0.14	0.15	0.24	0.12
Adj. Rsq.	0.82	0.89	0.71	0.91	0.94	0.88	0.81	0.85	0.72	0.80	0.84	0.78
Fund X Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bond country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bond currency FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes



# $\alpha_{T(i)}$ by Active/Passive for 12-month returns











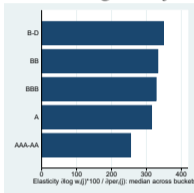




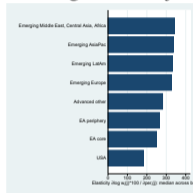


# Sovereign bond elasticities by fund residence

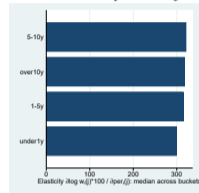
Credit rating, US funds



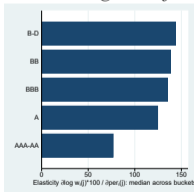
Issuer region, US funds



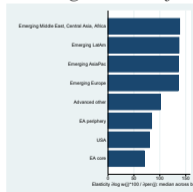
Bond maturity, US funds



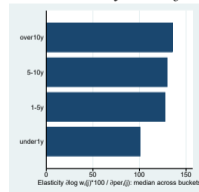
Credit rating, EA funds



Issuer region, EA funds



Bond maturity, EA funds



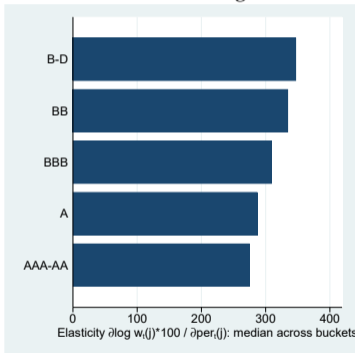
Note: Sovereign bonds. Time averages of bucket-level elasticities of the fund sector aggregated by residence area.

◀ Back

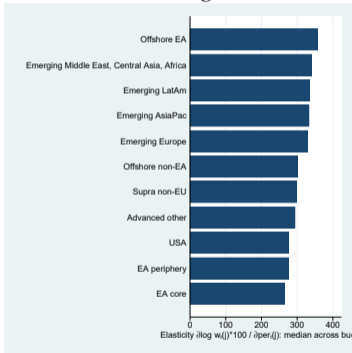


# All bonds elasticities: US funds

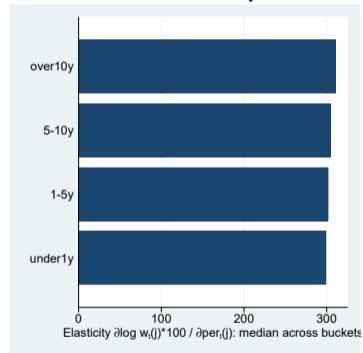
## Credit rating



## Issuer region



## Bond maturity



*Note:* All bonds. Time averages of bucket-level elasticities of the US fund sector.

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# Outline

- 5 Data extra
- 6 Identification extra
- 7 Estimation extra
- 8 Elasticities extra**
  - Own across bonds
  - **Substitution across bonds**
  - Over time







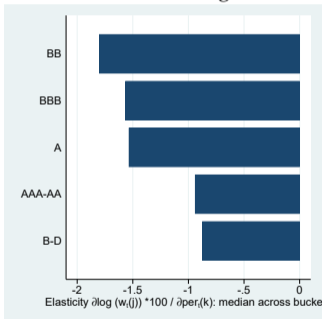




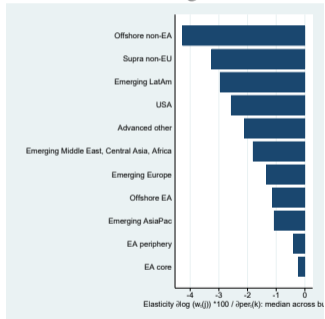


# US sov. >10y returns ↑: Substitutions across all bonds

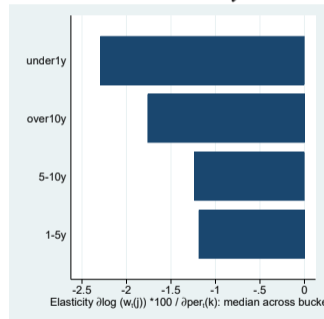
## Credit rating



## Issuer region



## Bond maturity



Note: Time averages of bucket-level elasticities of the total fund sector.

◀ Back





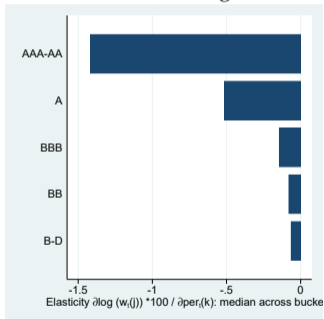




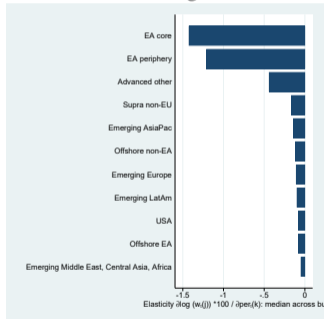


# DE sov. 1-5y returns ↑: Substitutions across all bonds

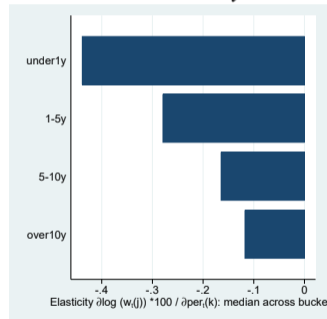
### Credit rating



### Issuer region



### Bond maturity

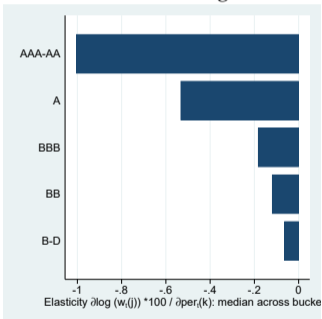


Note: Time averages of bucket-level elasticities of the total fund sector.

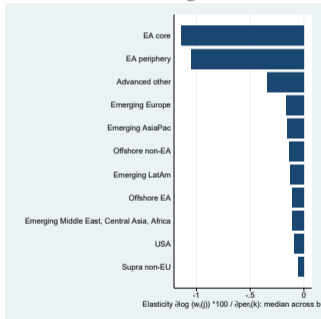
◀ Back

# DE sov. 5-10y returns ↑: Substitutions across all bonds

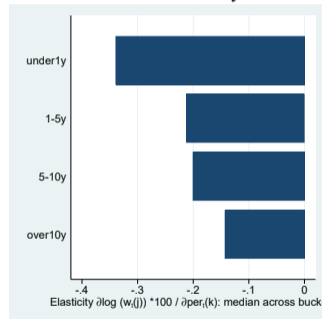
*Credit rating*



*Issuer region*



*Bond maturity*



Note: Time averages of bucket-level elasticities of the total fund sector.

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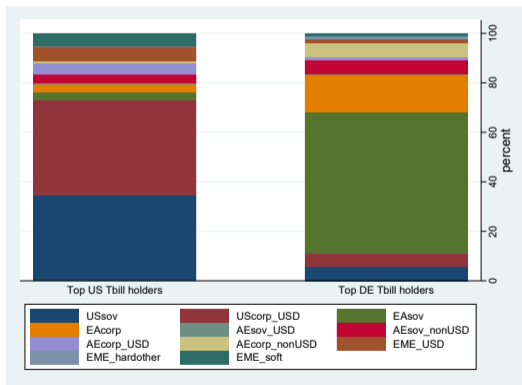






# Portfolios of 'top substituters': US vs German T-bills, at Face Value

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



Note: 'Top substituters' are funds who have a high product of weight in the relevant safe asset (US or German T-bills) and the weight on the rest of their bond portfolio. Plot shows average portfolio holdings of funds above the 75th percentile of this product. Face value calculated by dividing each bond holding by price.



# Outline

- 5 Data extra
- 6 Identification extra
- 7 Estimation extra
- 8 Elasticities extra**
  - Own across bonds
  - Substitution across bonds
  - Over time

# Safe asset demand over time

**Aggregate fund sector elasticity w.r.t. safe asset returns:**

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

Time variation from interaction between two components:

Investor composition (  $\neq$  bond return sensitivities )    ×    Portfolio weight of safe bond  
~86% of time variation





# Flight to safety: Swiss bond elasticity stable when market stress ↑

## Correlations between CH sovereign bond elasticities and risk measures

	CH sov <1y	CH sov 1-5y	CH sov 5-10y	CH sov >10y
<b>Elasticities</b>				
CH sov <1y	1.000			
CH sov 1-5y	-0.035	1.000		
CH sov 5-10y	0.280*	0.306**	1.000	
CH sov >10y	-0.521***	0.638***	0.274**	1.000
<b>Risk</b>				
VIX	-0.076	-0.100	-0.302**	-0.394***
BEX risk aversion	0.101	-0.080	-0.248*	-0.402***
BHL risk aversion	-0.086	-0.100	-0.323**	-0.383***
MOVE	0.331**	-0.457***	-0.194	-0.723***
EBP	-0.033	-0.142	-0.032	-0.443***
CISSEAbond	0.210	-0.187	-0.090	-0.433***

# Flight to safety: Japanese bond elasticity stable when market stress ↑

## Correlations between JP sovereign bond elasticities and risk measures

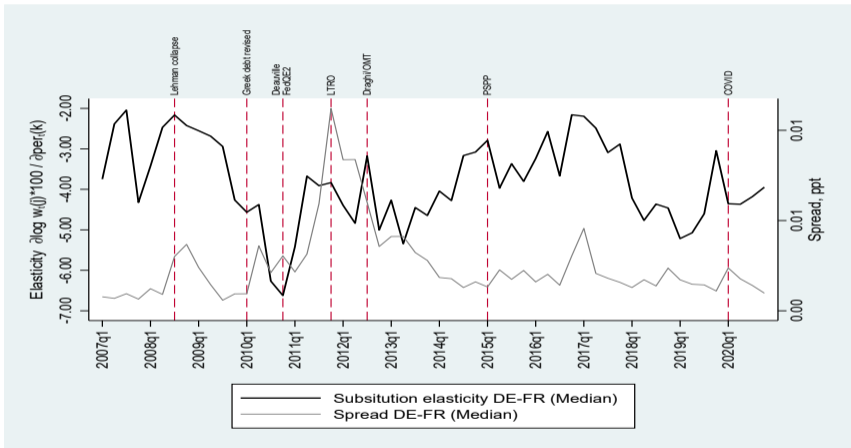
	JP sov <1y	JP sov 1-5y	JP sov 5-10y	JP sov >10y
<b>Elasticities</b>				
JP sov <1y	1.000			
JP sov 1-5y	-0.466***	1.000		
JP sov 5-10y	-0.352***	0.626***	1.000	
JP sov >10y	-0.173	0.617***	0.400***	1.000
<b>Risk</b>				
VIX	-0.286**	0.378***	0.191	0.079
BEX risk aversion	-0.338**	0.398***	0.216	0.029
BHL risk aversion	-0.324**	0.379***	0.215	0.080
MOVE	-0.398***	0.699***	0.289**	0.303**
EBP	-0.265**	0.398***	0.042	0.116
CISSEAbond	-0.142	0.424***	0.238*	-0.013





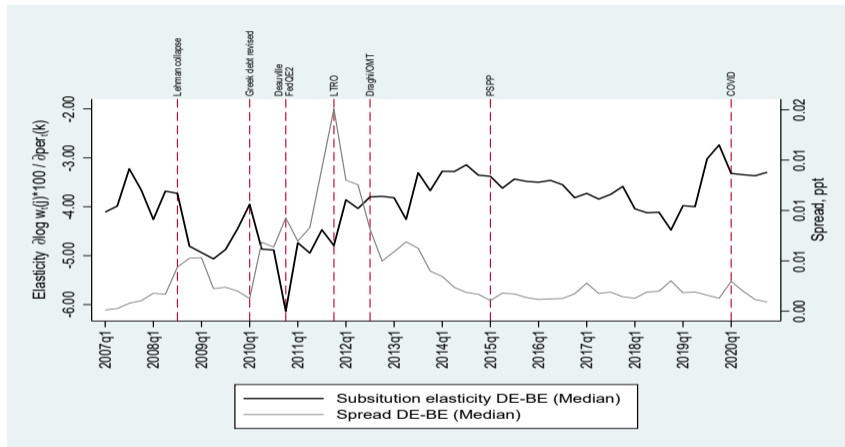
# German sovereign bond relative safety vs EA core

More substitutable



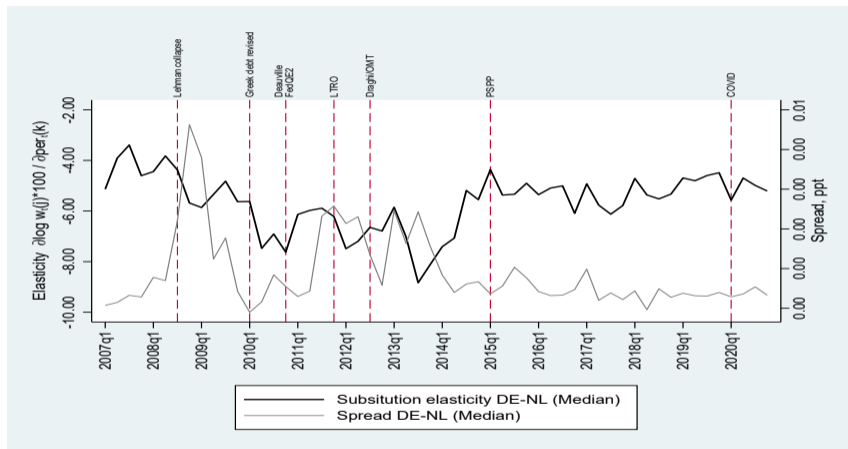
*Black line:* Substitution elasticity of French sovereign bonds *w.r.t.* 1ppt change in predicted excess returns on German sovereign bonds. Median of substitutions within all four maturity buckets (under 1y, 1-5y, 5-10y, over 10y).

# German sovereign bond relative safety vs Belgium



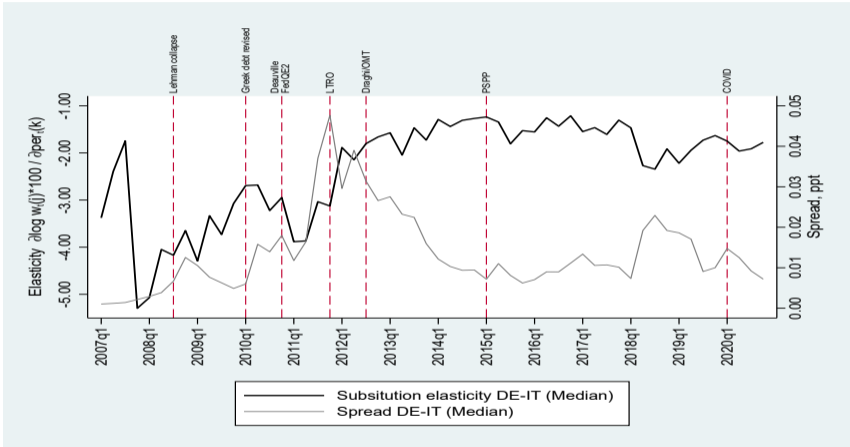
**Black line:** Substitution elasticity of Belgian sovereign bonds *w.r.t.* 1ppt change in predicted excess returns on German sovereign bonds.  
Median of substitutions within all four maturity buckets (under 1y, 1-5y, 5-10y, over 10y).

# German sovereign bond relative safety vs Netherlands



*Black line:* Substitution elasticity of Dutch 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).

# German sovereign bond relative safety vs Italy



*Black line:* Substitution elasticity of Italian 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).