



BANK FOR INTERNATIONAL SETTLEMENTS

Searching for Yield Abroad: Risk-Taking through Foreign Investment in US Bonds

Presentation at the Conference:

The Real Effects of Financial Crises: Past, Present, Future

Jointly organised by the House of Finance, the Research Center SAFE and the Institute for Banking and Financial History (IBF)

By Stijn Claessens

(joint with John Ammer, Alexandra Tabova, Caleb Wroblewski, FRB)

The views in this presentation are solely the responsibility of the authors and should not be interpreted as reflecting the views of the BIS or the Board of Governors of the Federal Reserve System or any other person associated with the FRS.



Topic and relevance

- To what extent do investors take on additional risk to compensate for low returns on their other (safe) assets and investment opportunities?
- Current relevance
 - Yields are low and corporate spreads are compressed
 - Some financial institutions are under capitalisation/profitability pressures
- Possible implications
 - Large risk-taking responses (at least for some investors) in a low (for-long)-rate environment could lead to financial stability risks
 - Cross-border spillovers can arise, with possible externalities



Preview of approach and results

- Perform a detailed study of drivers of foreign investment in US corporate bonds over past 14 years. Focus has several advantages, notably:
 - Security-level data: accurately characterise shifts in portfolio composition
 - Empirical identification: use cross-sectional differences in investor-country interest rates; since not closely related to US debt market conditions, largely avoiding simultaneity concerns – rates low and risks vary for other reasons
 - Endogeneity: net shifts in foreign holdings typically not large enough to drive access or financing conditions for US corporate borrowers
- Find statistically/economically significant risk-increasing shifts in the composition of bond holdings, new investments in response to lower safe rates in home country
 - Shifts in US corporate bonds economically significant within foreign portfolios



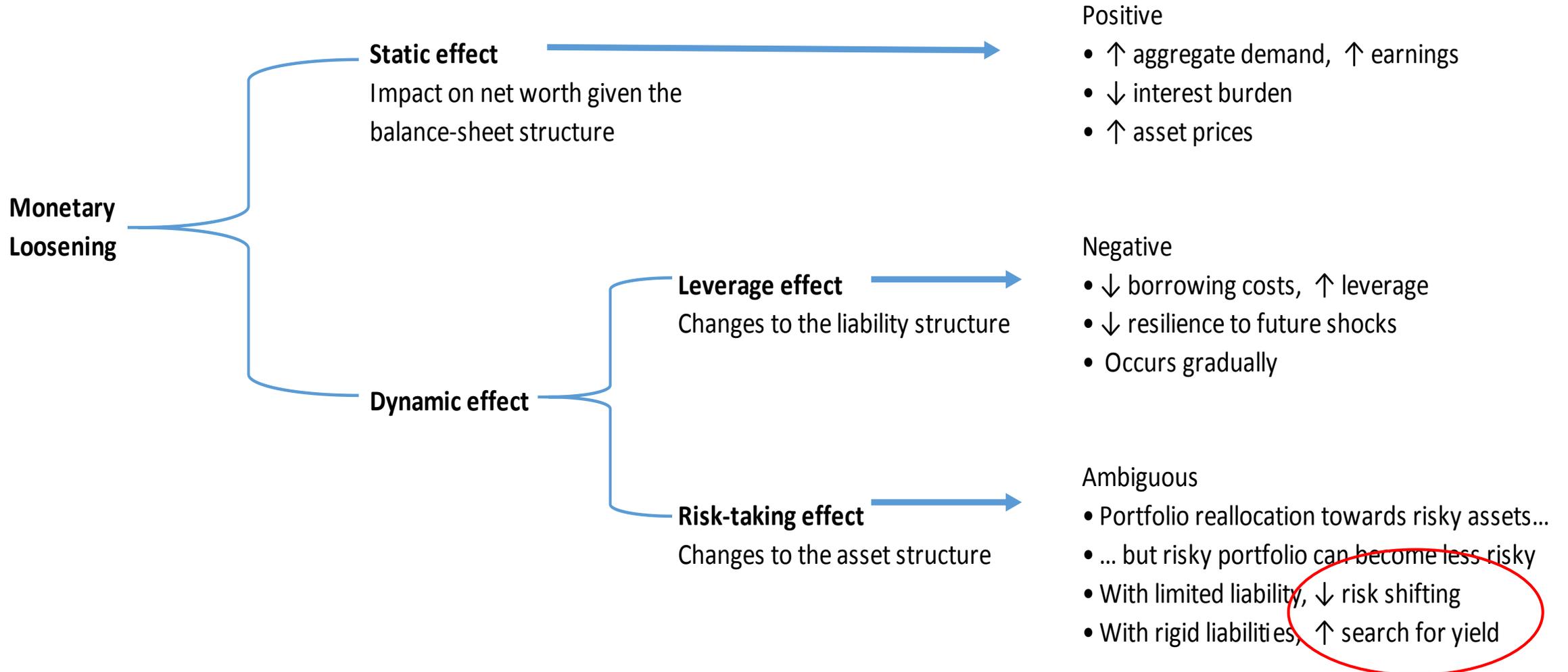
Outline of presentation

- Review analytics on interest rate and risk-taking
- Related empirical literature
- Data used
 - Some stylised facts
- Regression results
- Implications for financial stability, contribution to literature
- Conclusions



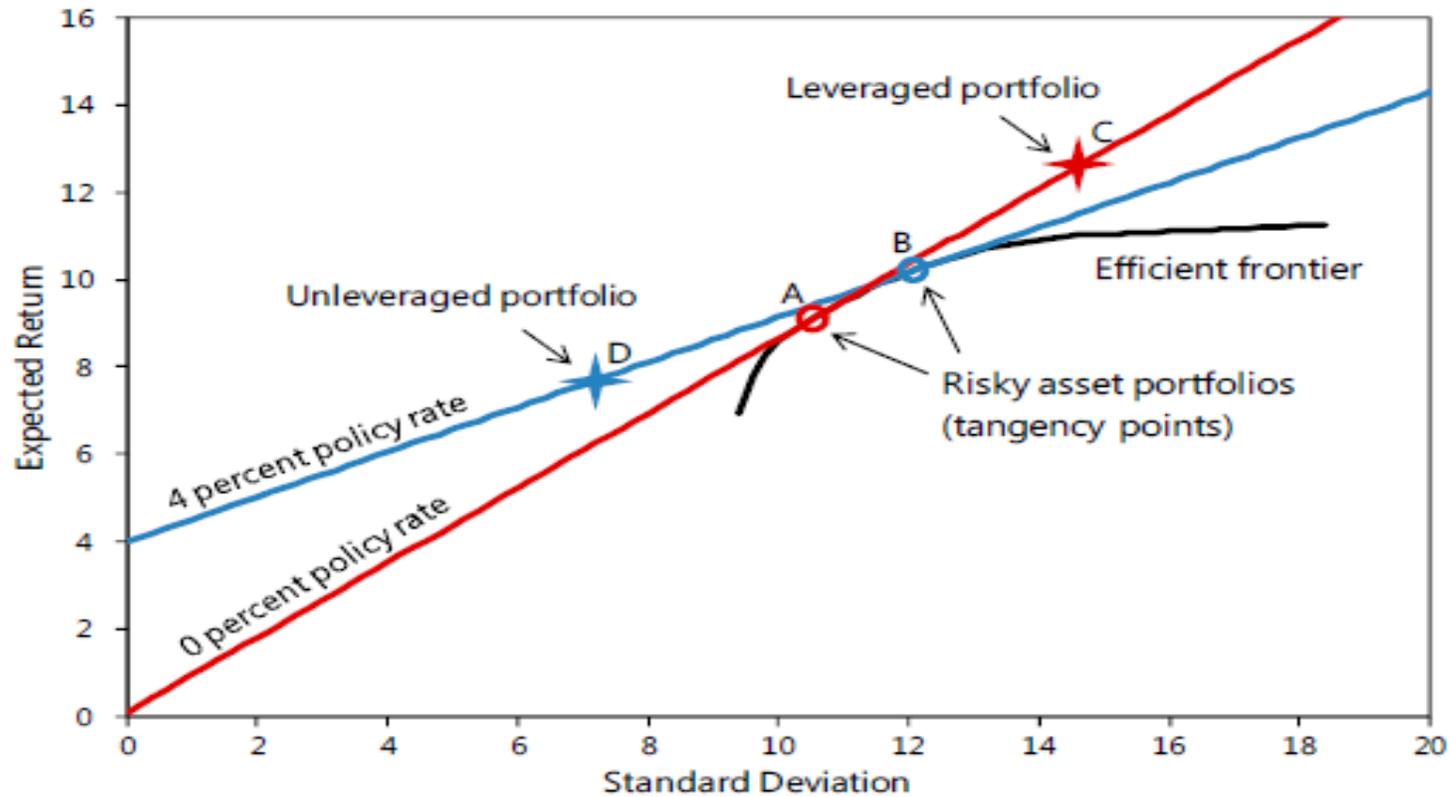
Interest rates can affect financial stability via various channels

The effects of a monetary loosening on financial stability, including through risk-taking



Theoretical example: asset allocation and leverage in a simple CAPM framework with average returns over the past decade. A decline in rate induces moving from point D to C: less risky assets, but higher leverage

Figure 2: Mutual funds' leverage and asset allocation



What are dynamic effects of low rates on profits, capital?

- Low interest rates can put pressure on profitability, capital positions
 - **Banks:** pressure on profitability through lower net interest margins
 - **Life Insurers:**
 - often have minimum return guarantee for policyholders; exposed to rate declines when assets mature before liabilities (“duration mismatches”)
 - **Pension Funds:**
 - defined benefit guarantees can entail a de facto minimum required long-term rate of return that can also involve duration mismatches
 - **(US) Money Market Mutual Funds:** need enough yield to cover fund expenses, especially those that need to avoid “breaking the buck”
- Over time, low profitability and capitalisation can increase “rational” incentives for search-for-yield, and search-for-duration to make up profits, restore capital, etc.



What are (dynamic) effects of low interest rates on incentives, rational and otherwise, for search-for-yield?

- *Theoretically*, in simple (“rational”) models, can go **either** way
 - With limited liability, and thus moral hazard: lower rate, larger profits on **new** investment, larger capital, larger franchise value → less risk taking
 - With rigid liabilities → search for yield, ie, lower rates, more risk taking
- *Behavioural* and other mechanisms can lead investors to “reach-for-yield”. Eg:
 - When returns defined in “reference points” or “hurdle rates”
 - With loss aversion or relative performance ranking
 - When distinguishing income from capital gains, “yield-oriented” investors may accept lower term premium when yield curve is steeper
- *Empirically*: low interest rates → more risk taking. Emerging consensus:
 - Prolonged periods of easy money lead to trouble (but short term more complex)



Related empirical literature on low interest rate, risks and risk-taking

- Lower **bank** profits: Borio, Gambacorta, Hofmann '15; Claessens, Coleman, Donnelly 2017
- Riskier **bank** loans: Ioannidou, Ongena, Peydro 2009; Maddaloni, Peydro 2011; Jimenez et al 2014; Altunbas, Gambacorta, Marques-Ibanez 2014, Kandrak, Schlusche 2016; Aramonte, Lee, Stebunovs 2015; Morais, Peydro, Ruiz 2017; Dell'Ariccia et al, 2017
- Risk-taking by **mutual funds**: Di Maggio, Kacperczyk 2017 (US MMF)
- Duration risk-taking in bonds: Domanski, Shin, Sushko 2017 (German **ins. companies**)
- Risk-taking in broad asset allocation: Ammer, Tabova, Wroblewski 2016 (**international flows** with aggregate balance sheets); Hau, Lai 2016 (**MMF**, equity funds)
- Interest rate differentials and aggregate **capital flows**: Calvo et al 1993, many others
- Capital/solvency requirements and risk-taking (regulatory arbitrage): Becker, Ivashina 2015 (US **insurance companies**); Efung 2016 (German **banks**: ABS)
- Performance benchmarks, risk-taking: Choi, Kronlund 2017 (**corporate bond funds**)



What we do

- Investors' portfolios: risk-taking in low interest rate environment
 - Foreign holdings of US corporate bonds: instrument-level data 2003–2016
- Identification: heterogeneity of changes in investor-country sovereign yields
 - Morais, Peydro, and Ruiz (2017) also use home interest rates to identify an international risk-taking channel, but running through internal markets of banks
- Main focus of our *diff-in-diff* regressions:
 - The more the safe interest rate at home **declines**, do (more) investors **change** their holdings **relative** to outstanding (and other investors) **towards** US bonds with:
 - **higher** yields (ie, taking **more** credit **and** interest rate risks)?
 - **higher** yield spreads (ie, taking **more** credit risk)?
 - **longer** duration (ie, taking **more** interest rate risk)?
- Do effects appear in purchases of newly issued securities and in portfolio rebalancing?

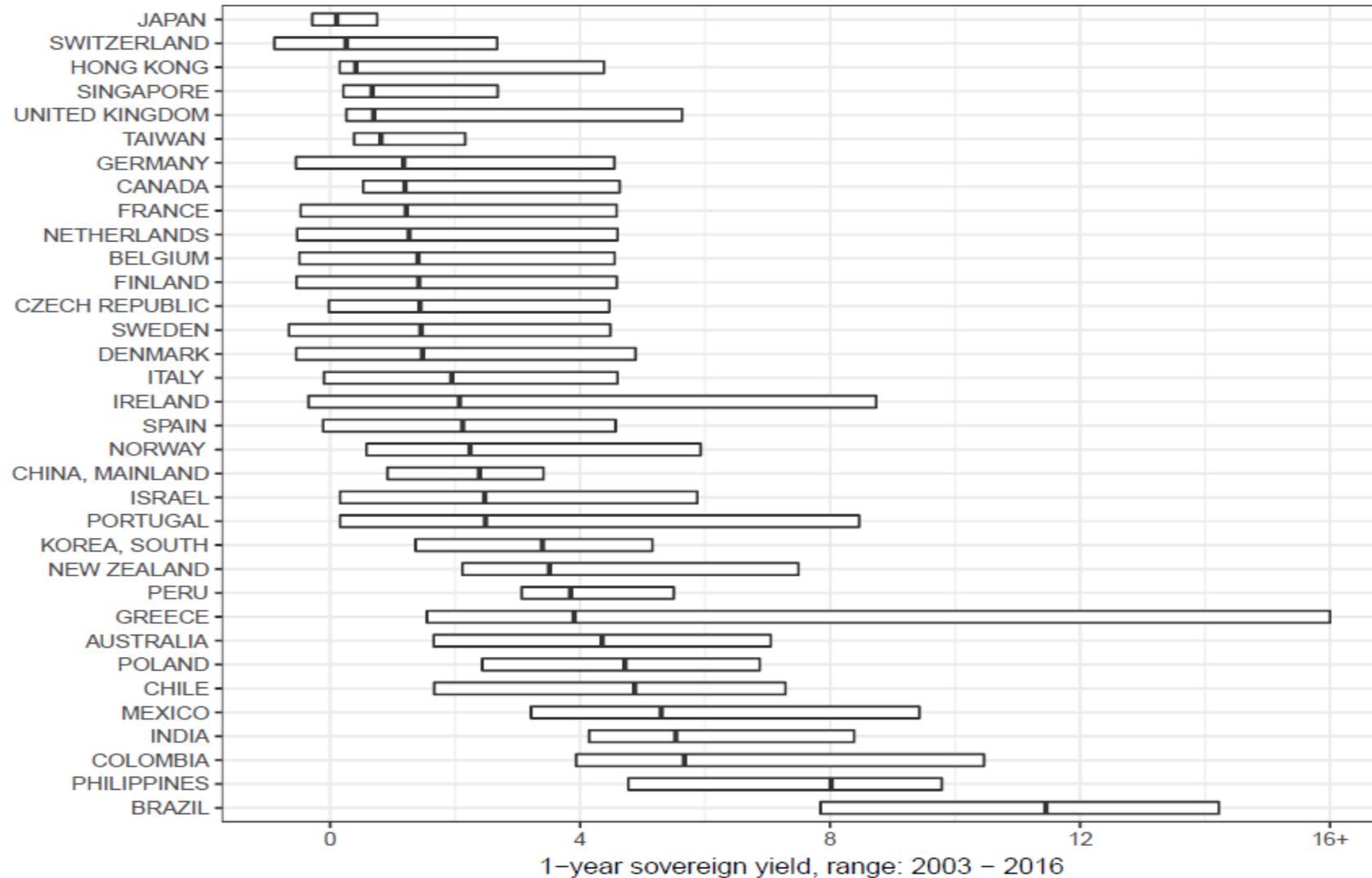


Sovereign yields by country (2003–2016)

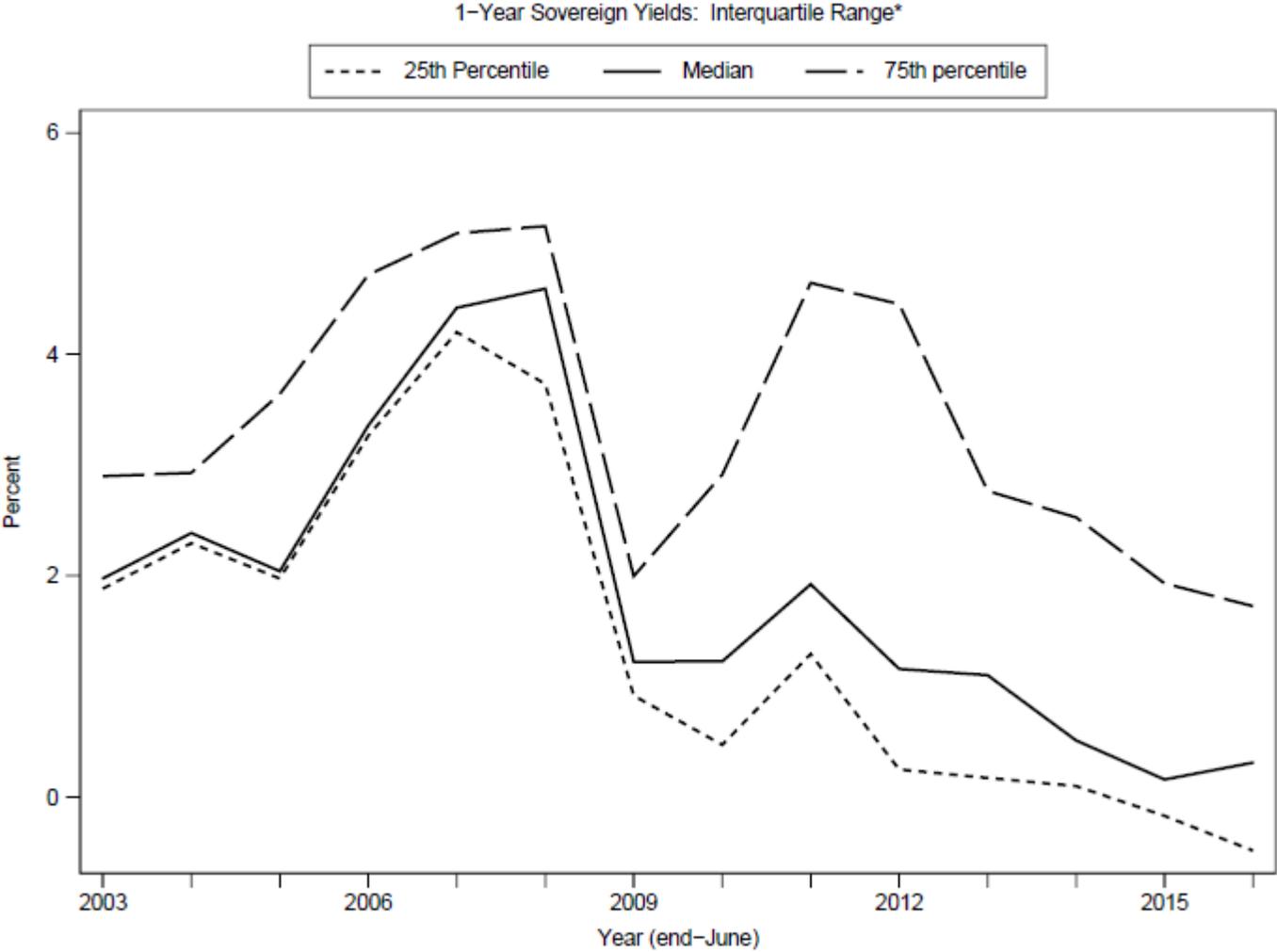
- Local currency sovereign yields, collected for different maturities (3-month, **1-year**, 5-year and 10-year) from Bloomberg
 - Since securities holdings data are reported as of end-June of each year and we expect investors to adjust their positions continuously over the course of the year, we construct and use in regressions reporting year-end sovereign yields, calculated as the average of daily yields for each month of June
 - Then take first difference, ie, annual changes in sovereign yields (most regression results maintained when we study sovereign rates in levels)



Sovereign yields by country (2003–2016)



Sovereign yields over time: general decline, but large variations



Portfolio holdings: data description

- **Holdings data:** Treasury International Capital (TIC):
 - Annual data: 2003–2016 (mid-year collected)
 - Security-level data
 - Focus on corporate bonds
 - Data do not distinguish among private investor types
 - Sample of 310,000 individual corporate bond holdings over entire period
 - 15,000 unique bonds
 - Dollar value \$268 billion (2003), rising to \$1.7 trillion (2016)
- Exclude floating rate, convertible, and non-USD bonds. Keep 72% of overall sample
- Use changes in the stock of holdings, but also differentiate purchases of newly-issued bonds vs purchases and sales in the secondary market



Bond characteristics: description of other data sources

- Extract CUSIP and ISIN from TIC data, merge with various security-level data
 - Bond liquidity (TRACE), credit ratings (BofA/ML, Moodys, S&P)
 - Bond issuance and amount outstanding (BofA/ML, ThomsonOne)
 - Ultimate parent of issuer and coupon type (ThomsonOne)
- Calculate bond yield-to-maturity, duration, yield spread over nearest duration Treasury (BofA/ML US Government indices)
- Three “risk” measures
 - Yield, which combines yield spread and duration
 - Spread, which reflects credit risk compensation
 - Duration, which reflects interest rate risks



US share in foreign countries' bond portfolios

	U.S. bonds % of Fgn portf.	U.S. corp bonds % of Outst.
AFE	21.5	11.2
EME	42.8	0.2
Canada	68.3	0.8
Germany	10.4	0.5
Japan	43.7	0.8
Mexico	94.2	0.03

Calculations for Tables based on CPIS, BIS, TIC (2015)



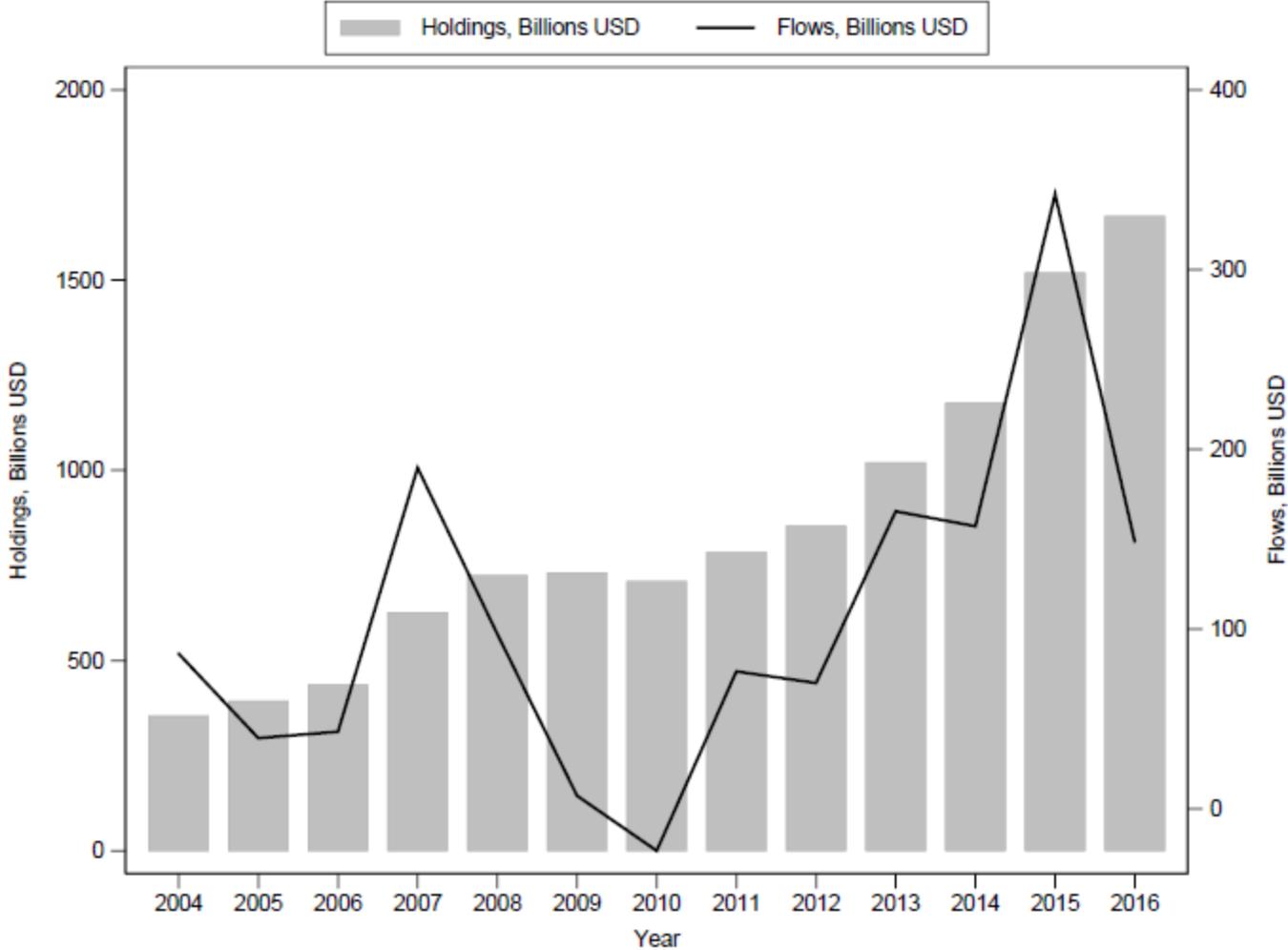
Foreign holdings of US corporate bonds as % of outstanding are small

	Mean	95th p.	99th p.
H/Outstanding (%)	3.4	11.4	25.0

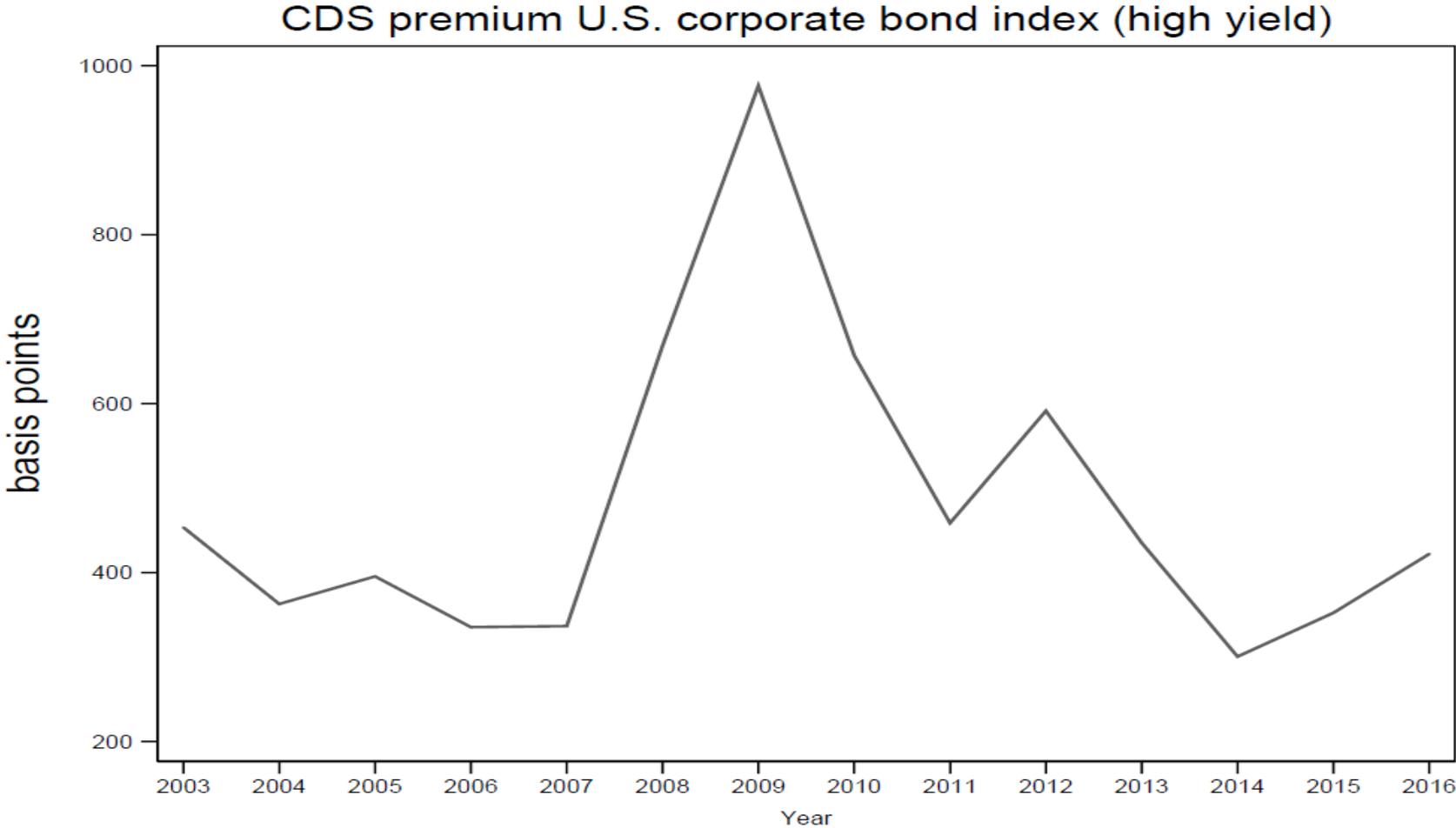
Calculations for Tables based on CPIS, BIS, TIC (2015)



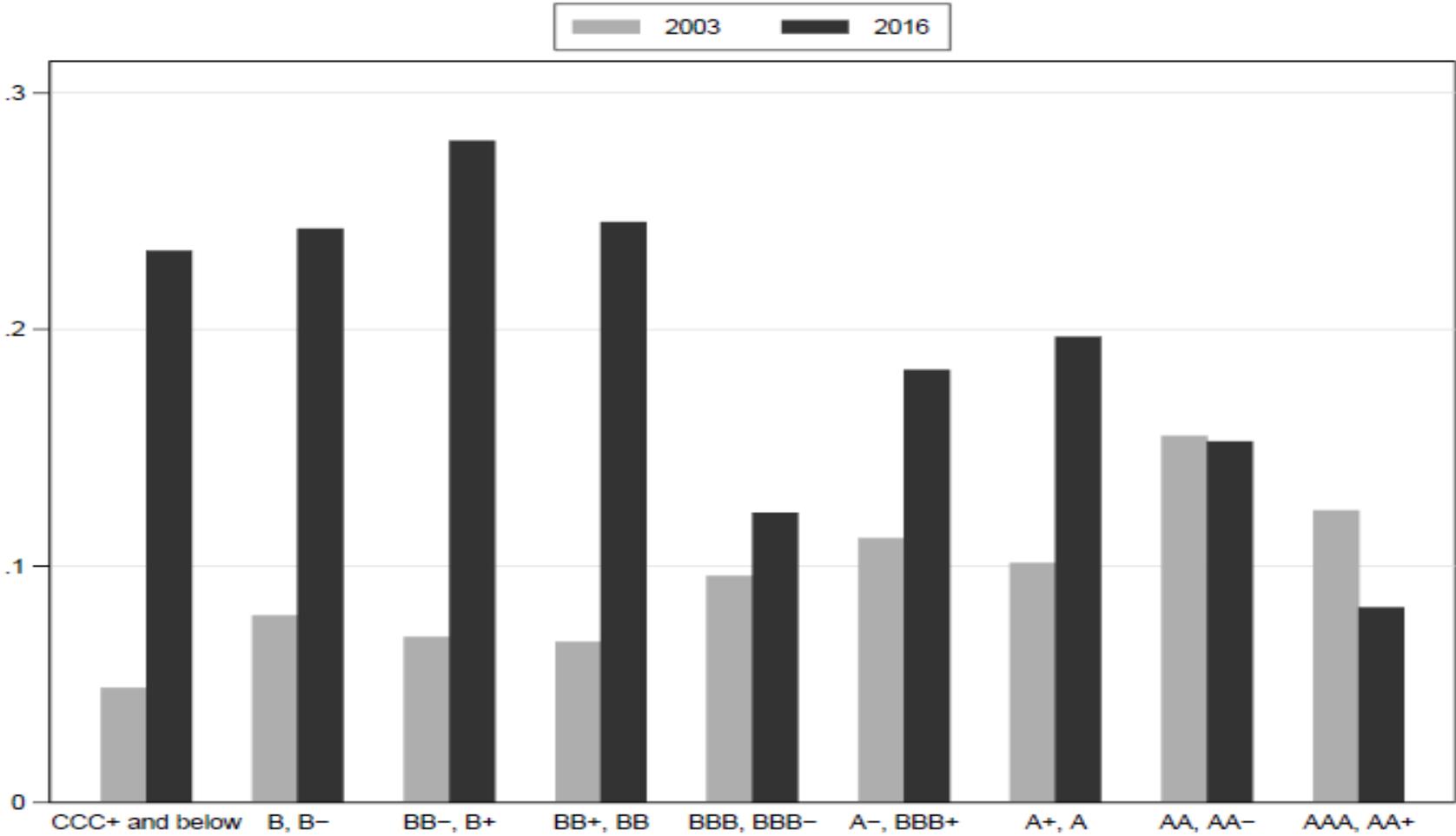
Foreign holdings and net purchases of US corporate bonds (2003–2016)



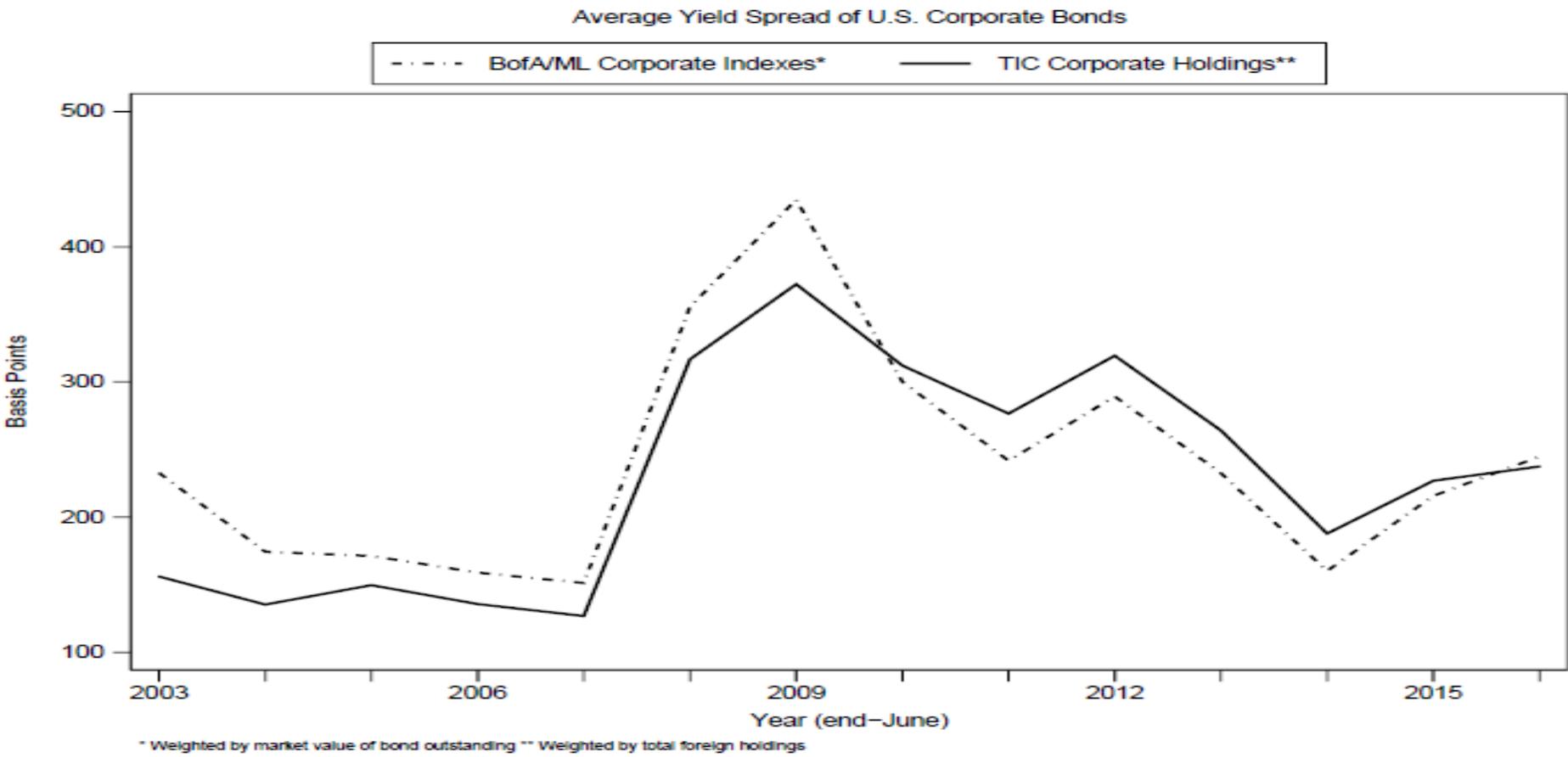
Global financial crisis saw a large increase in CDS spreads, flight to safety



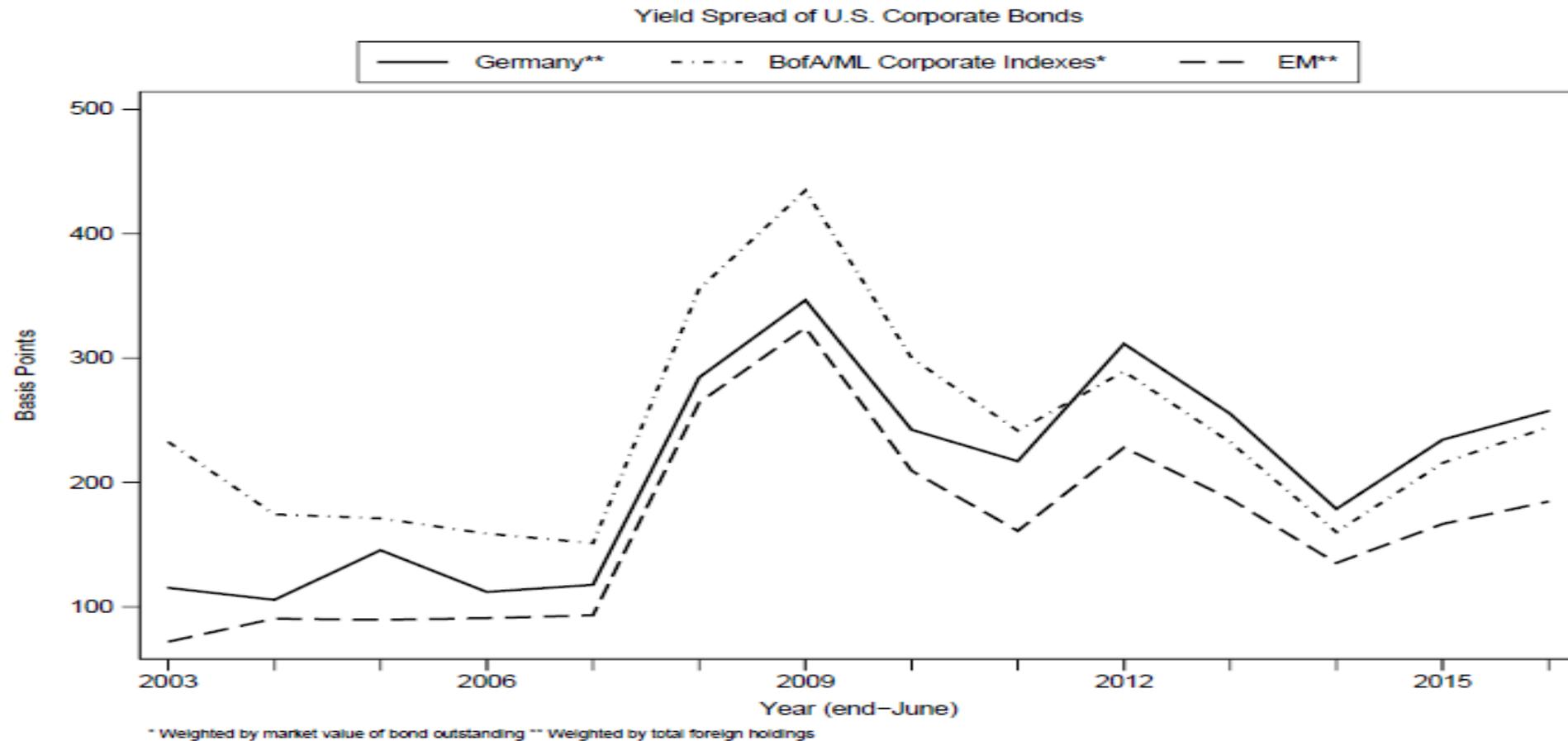
Share of newly-issued US corporate bonds held by foreign investors shows increase in riskiness: higher investments in lower rating bins



Av. corp. yield spread in sample vs BofA/ML benchmark.
During GFC saw large increases in spreads. Importantly: foreign holdings
weighted spread moves above market value weighted spread



Average yield spread increases more than market for select countries, eg, Germany, but for not others, eg, EMs



Empirical setup “ Δ in Δ ”: portfolio adjustments to Δ sovereign yield

$$\Delta H_{ij,t}/Out_{i,t} = f [\text{Bond Risk}_{i,t} * \Delta \text{Sovereign yield}_{j,t}, \text{Control}_{ij,t}]$$

- **$\Delta H_{ij,t}/Out_{i,t}$**
 - $\Delta H_{ij,t}/Out_{i,t}$: change in holdings of bond i by country j over period t scaled by bond i outstanding amount at time t
- **Bond Risk $_{i,t}$**
 - Any compensation for risk captured in bond yields (or yield spread)
 - Also distinguish credit risk (yield spread) from interest rate risk (duration)
- **Bond Risk $_{i,t}$ * Δ Sov yield $_{j,t}$**
 - Search for yield if coefficient Bond Risk $_{i,t}$ * Δ Sov yield $_{j,t}$ < 0 \rightarrow then foreign investors allocate more assets to riskier categories if home interest rate declines
 - Home interest rates: proxy of investment opportunities and funding costs



Empirical setup: regression specification

$$\Delta H_{i,j,t}/\text{Outstanding}_{i,t} = \kappa + \alpha \text{Risk}_{i,t} + \beta \text{Risk}_{i,t} \Delta \text{Sov}_{j,t} + \\ + \gamma \Delta \text{CDS}_t^{\text{US}} \text{Risk}_{i,t} + \theta \text{Liquidity}_{i,t} + c_{j,t} + \epsilon_{i,j,t}$$

- $\Delta H_{i,j,t}/\text{Out}_{i,t}$: change in holdings relative to bond i outstanding amount
- $\text{Risk}_{i,t}$: yield (or yield spread and duration)
- $\text{SOV}_{j,t}$: home sovereign yield
- CDS_t^{US} : general market price of US corporate credit risk
- $\text{Liquidity}_{i,t}$: bond trading volume as a ratio to bond outstanding
- $c_{j,t}$: country*time fixed-effects to absorb all home country conditions
 - Allow country fixed effect to vary by newly issued or seasoned
 - Also use time-varying variables; bilateral trade, financial linkages, exchange rate
- In some specifications, also issuer fixed-effects. And error: $\epsilon_{i,j,t}$.



Foreign countries' holdings of US bonds (TIC) greatly vary (share of GDP)

	U.S. corp bonds % of GDP
Canada	10.0
Germany	3.1
Japan	3.9
Mexico	0.5
Belgium	78
Ireland	112
Luxembourg	894

Calculations based on BIS, TIC (2015)

- SOV for Belgium, Ireland, Luxembourg (to account for their depository nature):
 - mean (NL, FR, IT, ES)
 - robustness: exclude from sample; or include with own sovereign rate (if available)



Baseline sample (all countries 2003–2016). Dependent variable: $\Delta H_{ij,t} / Out_{i,t}$

	Bond yield		Spread and duration	
	(1)	(2)	(3)	(4)
Bond yield	0.046*** (0.003)	0.054*** (0.003)		
D.Sov × Bond yield	-0.024*** (0.003)	-0.029*** (0.003)		
D.CDS (US) × Bond yield	-0.032*** (0.001)	-0.033*** (0.002)		
Traded share		0.024*** (0.005)		0.019*** (0.006)
Bond spread			0.057*** (0.003)	0.067*** (0.004)
Duration			-0.004*** (0.001)	-0.006*** (0.001)
D.Sov × Bond spread			-0.026*** (0.003)	-0.031*** (0.003)
D.Sov × Duration			-0.003* (0.002)	-0.005*** (0.002)
D.CDS (US) × Bond spread			-0.034*** (0.002)	-0.036*** (0.002)
Observations	310620	257045	310620	257045
R-sq	0.23	0.26	0.23	0.26
Time-Country FE	Yes	Yes	Yes	Yes



Control variables: US, bond-specific, and investor country

- Important to control for overall riskiness of corporate sector
 - $\Delta\text{CDS} \times \text{Bond Yield}$ negative: less “inflows” as corporate risks overall increase
- Liquidity important, more so for secondary market, less so for primary
- Bond yield positive; Duration negative
 - Interpretations less obvious, w/ interactions and also time, country fixed effects



Secondary market regression results: changes in portfolio holdings

	Bond yield		Spread and duration	
	(1)	(2)	(3)	(4)
Bond yield	0.021*** (0.003)	0.020*** (0.003)		
D.Sov × Bond yield	-0.017*** (0.003)	-0.022*** (0.003)		
D.CDS (US) × Bond yield	-0.029*** (0.002)	-0.030*** (0.002)		
Traded share		0.017*** (0.005)		0.019*** (0.006)
Bond spread			0.021*** (0.003)	0.018*** (0.004)
Duration			0.009*** (0.001)	0.011*** (0.001)
D.Sov × Bond spread			-0.018*** (0.003)	-0.024*** (0.003)
D.Sov × Duration			-0.001 (0.002)	-0.003 (0.002)
D.CDS (US) × Bond spread			-0.031*** (0.002)	-0.031*** (0.002)
Observations	257571	203996	257571	203996
R-sq	0.03	0.03	0.03	0.03
Time-Country FE	Yes	Yes	Yes	Yes



Primary market regression results: purchases of newly issued bonds

	Bond yield	Spread and duration
	(1)	(2)
Bond yield	0.187*** (0.009)	
D.Sov × Bond yield	-0.034*** (0.008)	
D.CDS (US) × Bond yield	-0.049*** (0.005)	
Bond spread		0.213*** (0.009)
Duration		-0.082*** (0.006)
D.Sov × Bond spread		-0.042*** (0.008)
D.Sov × Duration		0.012* (0.006)
D.CDS (US) × Bond spread		-0.049*** (0.005)
Observations	53044	53044
R-sq	0.23	0.24
Time-Country FE	Yes	Yes



Regression results for splits by IG, Non-IG, grades, type of firms

	IG	Non-IG	BBB	BBB Non-Fin.	Non-Fin.	Fin.
	(1)	(2)	(3)	(4)	(5)	(6)
Bond spread	-0.051*** (0.008)	-0.032*** (0.008)	-0.038*** (0.012)	-0.045*** (0.016)	0.067*** (0.004)	0.072*** (0.010)
Duration	0.006*** (0.002)	0.008 (0.007)	-0.001 (0.003)	-0.006** (0.003)	-0.007*** (0.002)	-0.007** (0.003)
D.Sov × Bond spread	-0.048*** (0.005)	-0.005 (0.006)	-0.044*** (0.008)	-0.058*** (0.010)	-0.027*** (0.003)	-0.034*** (0.006)
D.Sov × Duration	-0.004*** (0.002)	-0.004 (0.007)	-0.006** (0.003)	-0.005 (0.003)	-0.001 (0.002)	-0.012*** (0.003)
D.CDS (US) × Bond spread	-0.019*** (0.004)	-0.022*** (0.004)	-0.033*** (0.006)	-0.040*** (0.009)	-0.031*** (0.002)	-0.050*** (0.004)
Traded share	0.022*** (0.005)	0.056*** (0.019)	0.019** (0.008)	0.023*** (0.008)	0.021*** (0.006)	0.008 (0.013)
Observations	185078	71076	81526	67092	185753	70401
R-sq	0.23	0.35	0.23	0.23	0.27	0.27
Time-Country FE	Yes	Yes	Yes	Yes	Yes	Yes



Regression results for subperiods

	2003-2007		2008-2012		2013-2016	
	(1)	(2)	(3)	(4)	(5)	(6)
Bond spread	0.095*** (0.013)	0.109*** (0.015)	0.102*** (0.005)	0.116*** (0.005)	-0.022*** (0.005)	-0.023*** (0.006)
Duration	-0.013*** (0.005)	-0.008 (0.005)	-0.002 (0.002)	-0.002 (0.003)	0.017*** (0.002)	0.018*** (0.002)
D.Sov × Bond spread	-0.133*** (0.018)	-0.167*** (0.022)	0.004 (0.003)	0.003 (0.003)	-0.145*** (0.013)	-0.173*** (0.016)
D.Sov × Duration	-0.019*** (0.006)	-0.037*** (0.006)	-0.001 (0.002)	-0.002 (0.002)	0.070*** (0.005)	0.078*** (0.006)
D.CDS (US) × Bond spread	-0.100*** (0.025)	-0.115*** (0.031)	-0.026*** (0.002)	-0.026*** (0.002)	-0.066*** (0.004)	-0.075*** (0.005)
Traded share		-0.018 (0.015)		-0.004 (0.010)		0.034*** (0.007)
Observations	56034	43455	118358	97452	136228	116138
R-sq	0.15	0.18	0.21	0.23	0.32	0.34
Time-Country FE	Yes	Yes	Yes	Yes	Yes	Yes



Regression results for periods with low or high interest rate

	Bond yield			Spread and duration		
	(1) Full Sample	(2) Low	(3) High	(4) Full Sample	(5) Low	(6) High
Bond yield	0.054*** (0.003)	-0.015*** (0.005)	0.117*** (0.005)			
D.Sov × Bond yield	-0.029*** (0.003)	-0.059*** (0.007)	-0.024*** (0.003)			
D.CDS (US) × Bond yield	-0.033*** (0.002)	-0.028*** (0.003)	-0.042*** (0.002)			
Traded share	0.024*** (0.005)	0.018*** (0.006)	0.015* (0.009)	0.019*** (0.006)	0.022*** (0.006)	0.004 (0.009)
Bond spread				0.067*** (0.004)	-0.026*** (0.006)	0.143*** (0.005)
Duration				-0.006*** (0.001)	0.015*** (0.002)	-0.025*** (0.002)
D.Sov × Bond spread				-0.031*** (0.003)	-0.073*** (0.008)	-0.024*** (0.003)
D.Sov × Duration				-0.005*** (0.002)	0.018*** (0.004)	-0.006*** (0.002)
D.CDS (US) × Bond spread				-0.036*** (0.002)	-0.032*** (0.003)	-0.046*** (0.002)
Observations	257045	128190	128855	257045	128190	128855
R-sq	0.26	0.32	0.23	0.26	0.33	0.23
Time-Country FE	Yes	Yes	Yes	Yes	Yes	Yes



Regression results for periods with low or high interest rate (II)

	Median		25th percentile		10th percentile	
	(1) Low	(2) High	(3) Low	(4) High	(5) Low	(6) High
Bond spread	0.061*** (0.004)	0.002 (0.013)	-0.023*** (0.005)	0.154*** (0.006)	-0.061*** (0.008)	0.102*** (0.004)
Duration	0.005*** (0.002)	-0.041*** (0.004)	0.015*** (0.002)	-0.029*** (0.003)	0.012*** (0.003)	-0.009*** (0.002)
D.Sov × Bond spread	-0.037*** (0.004)	-0.007 (0.005)	-0.083*** (0.006)	-0.017*** (0.003)	-0.135*** (0.017)	-0.023*** (0.003)
D.Sov × Duration	0.008*** (0.002)	-0.017*** (0.004)	0.016*** (0.003)	-0.006*** (0.002)	0.031*** (0.006)	-0.006*** (0.002)
D.CDS (US) × Bond spread	-0.043*** (0.002)	-0.005 (0.005)	-0.044*** (0.003)	-0.048*** (0.003)	-0.037*** (0.007)	-0.036*** (0.002)
Traded share	0.026*** (0.006)	-0.019 (0.015)	0.029*** (0.006)	-0.010 (0.010)	0.033*** (0.008)	0.009 (0.007)
Observations	212290	44755	147948	109097	68747	188298
R-sq	0.29	0.16	0.32	0.21	0.34	0.25
Time-Country FE	Yes	Yes	Yes	Yes	Yes	Yes



Regression results also obtain when using alternative country variables

	Bank CDS		MSCI returns	
	(1)	(2)	(3)	(4)
Bond yield	0.016*** (0.004)		0.025*** (0.004)	
D.Sov × Bond yield	-0.016*** (0.003)		-0.019*** (0.003)	
CDS.bank × Bond yield	-0.004*** (0.001)			
D.CDS (US) × Bond yield	-0.016*** (0.002)		-0.018*** (0.002)	
Traded share	0.015** (0.006)	0.014** (0.006)	0.017*** (0.006)	0.017*** (0.006)
Bond spread		0.012*** (0.004)		0.020*** (0.004)
Duration		0.012*** (0.002)		0.018*** (0.002)
D.Sov × Bond spread		-0.016*** (0.003)		-0.017*** (0.003)
D.Sov × Duration		-0.004** (0.002)		-0.007*** (0.002)
CDS.bank × Bond spread		0.002 (0.002)		
CDS.bank × Duration		-0.010*** (0.001)		
D.CDS (US) × Bond spread		-0.015*** (0.002)		-0.015*** (0.002)
ExpEarnGr × Bond yield			-0.077*** (0.011)	
ExpEarnGr × Bond spread				-0.035*** (0.011)
ExpEarnGr × Duration				-0.089*** (0.006)
Observations	208186	208186	217863	217863
R-sq	0.22	0.22	0.22	0.22



Regression results also obtain with longer (5 year) sovereign yield

	Bond yield		Spread and duration	
	(1)	(2)	(3)	(4)
Bond yield	0.047*** (0.003)	0.054*** (0.003)		
D.Sov5y × Bond yield	-0.021*** (0.004)	-0.028*** (0.004)		
D.CDS (US) × Bond yield	-0.028*** (0.001)	-0.028*** (0.002)		
Traded share		0.023*** (0.005)		0.017*** (0.006)
Bond spread			0.057*** (0.003)	0.067*** (0.004)
Duration			-0.005*** (0.001)	-0.007*** (0.002)
D.Sov5y × Bond spread			-0.022*** (0.004)	-0.030*** (0.004)
D.Sov5y × Duration			-0.004** (0.002)	-0.006*** (0.002)
D.CDS (US) × Bond spread			-0.030*** (0.002)	-0.031*** (0.002)
Observations	310620	257045	310620	257045
R-sq	0.23	0.26	0.23	0.26
Time-Country FE	Yes	Yes	Yes	Yes



Economic significance: effects on yield, spread, duration differentials

- Scenario: sovereign rate declines by some 215 bp (DE - JP)
- Compare the differential between predicted and actual portfolio in terms of yield, spread and duration/rating
- Results for the full sample:
 - Yield differential: 15 bp
 - Yield spread differential: 10 bp
 - Duration differential: 0.1 years
 - Worse credit rating: .1 notch
- Results for the non-crises sample:
 - Yield differential: 33 bp
 - Yield spread differential: 27 bp
 - Worse credit rating: almost .5 notch



Robustness and additional results: summary

- Results hold for both primary and secondary market trading:
 - Primary market: purchases of newly issued securities
 - Secondary market: trading of seasoned bonds
- Results robust to:
 - Excluding Belgium, Luxembourg, and Ireland from the sample
 - Including Belgium and Ireland with their own sovereign yield (Lux NA)
 - Dependent variable scaled by local bond market cap
- Results are stronger for investment grade bonds
 - Some evidence of search for yield within rating categories (example BBB)
 - Results hold for both financial and non-financial bonds
- Results are stronger for subperiods
 - Pre GFC stronger, less so after GFC, least during GFC



Contribution: risk-taking by institutional investors internationally

- Changes in local interest rates affect investors' portfolio composition through changes in cross-border portfolio investment into US
 - Adds to literature on risk-taking related to level of interest rates as largely focuses on bank lending or mutual fund flows
 - Granular security-level data allows for studying the portfolio effects and for controlling for bond characteristics
- Overcome many identification challenges plaguing other studies
 - Single country studies in literature have challenges in identifying relationship between interest rates and risk-taking
 - Use cross-section of countries with variety of changes in home interest rates ...
 - ... yet each representing very small fraction of investment in the US



Implications for financial stability

- Could reflect more general risk taking patterns, then suggest financial stability risks
- Though identified shifts are not large relative to total home-country assets, they are economically significant within the US corporate bond component of some of these countries' foreign investments, and
 - They can be larger for some investor classes (eg with stronger incentives or fewer constraints) within a given country
 - Extrapolating from the part of their behaviour observed, one could conjecture that investors have made risk-increasing investment elsewhere that could pose financial stability risks for these countries, particularly if low-rates persist
- Study could be complemented using domestically reported data (eg, European Central Bank Securities Holdings Statistics) on risk-taking related to interest rates



Conclusion

- Unique security-level data on foreign countries' holdings of US corporate bonds
- Explore the variety of changes in countries' home interest rates
 - Provides less concern about reverse causality or omitted variables biasing results
- Evidence of a "search-for-yield" as changes in interest rates affect risk-taking
 - Shift to riskier US bonds in response to lower home interest rates
 - The larger the decline in home interest rates, the larger the shift towards higher yielding bonds as well as towards longer duration in portfolio
- Extrapolating the (small) part of behaviour observed, can conjecture that:
 - Investors likely made risk-increasing shifts elsewhere too that could pose financial stability risks, particularly if low-interest rate environment persists



Robustness and Extra Slides



Regression results alternative sovereign rate for BEL, LUX, and IRL

	Bond yield		Spread and duration	
	(1)	(2)	(3)	(4)
Bond yield	0.046*** (0.003)	0.053*** (0.003)		
D.Sov1y × Bond yield	-0.023*** (0.003)	-0.029*** (0.003)		
D.CDS (US) × Bond yield	-0.033*** (0.001)	-0.034*** (0.002)		
Traded share		0.022*** (0.006)		0.016*** (0.006)
Bond spread			0.058*** (0.003)	0.069*** (0.004)
Duration			-0.008*** (0.001)	-0.010*** (0.002)
D.Sov1y × Bond spread			-0.023*** (0.003)	-0.028*** (0.003)
D.Sov1y × Duration			-0.007*** (0.002)	-0.009*** (0.002)
D.CDS (US) × Bond spread			-0.034*** (0.002)	-0.036*** (0.002)
Observations	302095	249732	302095	249732
R-sq	0.23	0.26	0.24	0.26
Time-Country FE	Yes	Yes	Yes	Yes



Regression results excluding BEL, LUX, and IRL

	Bond yield		Spread and duration	
	(1)	(2)	(3)	(4)
Bond yield	0.069*** (0.003)	0.083*** (0.004)		
D.Sov \times Bond yield	-0.026*** (0.003)	-0.032*** (0.003)		
D.CDS (US) \times Bond yield	-0.034*** (0.002)	-0.037*** (0.002)		
Traded share		0.010 (0.006)		0.006 (0.006)
Bond spread			0.076*** (0.004)	0.093*** (0.004)
Duration			0.004*** (0.001)	0.004** (0.002)
D.Sov \times Bond spread			-0.027*** (0.003)	-0.033*** (0.003)
D.Sov \times Duration			-0.005*** (0.002)	-0.007*** (0.002)
D.CDS (US) \times Bond spread			-0.035*** (0.002)	-0.039*** (0.002)
Observations	248665	205530	248665	205530
R-sq	0.24	0.28	0.24	0.28
Time-Country FE	Yes	Yes	Yes	Yes



Regression results including Rating Fixed Effects

	Bond yield		Spread and duration	
	(1)	(2)	(3)	(4)
Bond yield	-0.016*** (0.004)	-0.014*** (0.004)		
D.Sov × Bond yield	-0.031*** (0.003)	-0.036*** (0.003)		
D.CDS (US) × Bond yield	-0.033*** (0.001)	-0.034*** (0.002)		
Traded share		0.017*** (0.006)		0.019*** (0.006)
Bond spread			-0.022*** (0.006)	-0.017** (0.007)
Duration			0.005*** (0.001)	0.004** (0.002)
D.Sov × Bond spread			-0.033*** (0.003)	-0.038*** (0.003)
D.Sov × Duration			-0.001 (0.002)	-0.004** (0.002)
D.CDS (US) × Bond spread			-0.033*** (0.002)	-0.034*** (0.002)
Observations	308573	256154	308573	256154
R-sq	0.24	0.27	0.24	0.27
Time-Country FE	Yes	Yes	Yes	Yes
Rating FE	Yes	Yes	Yes	Yes



Regression results for weighting by outstanding amounts

	Bond yield		Spread and duration	
	(1)	(2)	(3)	(4)
Bond yield	0.042*** (0.002)	0.047*** (0.003)		
D.Sov × Bond yield	-0.020*** (0.002)	-0.024*** (0.003)		
D.CDS (US) × Bond yield	-0.025*** (0.001)	-0.026*** (0.001)		
Traded share		0.044*** (0.004)		0.042*** (0.004)
Bond spread			0.056*** (0.003)	0.064*** (0.003)
Duration			-0.004*** (0.001)	-0.006*** (0.001)
D.Sov × Bond spread			-0.022*** (0.002)	-0.026*** (0.003)
D.Sov × Duration			-0.002 (0.001)	-0.003** (0.002)
D.CDS (US) × Bond spread			-0.029*** (0.001)	-0.030*** (0.002)
Observations	310620	257045	310620	257045
R-sq	0.25	0.28	0.25	0.28
Time-Country FE	Yes	Yes	Yes	Yes



Regression results Primary Market Robustness to Error Cluster

	Bond yield	Spread and duration
	(1)	(2)
Bond yield	0.188*** (0.019)	
D.Sov × Bond yield	-0.044*** (0.011)	
D.CDS (US) × Bond yield	-0.065*** (0.007)	
Bond spread		0.242*** (0.020)
Duration		-0.077*** (0.009)
D.Sov × Bond spread		-0.056*** (0.011)
D.Sov × Duration		0.012 (0.007)
D.CDS (US) × Bond spread		-0.066*** (0.007)
Observations	40643	40643
R-sq	0.22	0.23
Time-Country FE	Yes	Yes



Use of Control variables: US, bond-specific, and investor country

- Banking links not statistically significant: no sign of information asymmetries, or of substitution or complements
- Some signs of currency effects as change in bilateral exchange rate (\$/LC) positive
 - Could be risk taking channel of currency (appreciation)
- Trading links positively affect changes: perhaps information asymmetries, closeness
 - Split by exports vs imports shows no consistent differences



Baseline regression results. Dependent variable: $\Delta H_{ij,t} / Out_{i,t}$ **Controls**

	Yield			Yield spr and dur		
	(1)	(2)	(3)	(4)	(5)	(6)
Sov1y	0.048*** (0.008)	0.044*** (0.009)	0.038*** (0.010)	0.046*** (0.008)	0.043*** (0.009)	0.037*** (0.010)
D.Sov1y	0.019 (0.017)	0.031 (0.020)	0.026 (0.020)	0.027 (0.018)	0.046** (0.019)	0.037* (0.020)
Bond yld	0.003 (0.003)	-0.007* (0.004)	-0.008** (0.004)			
D.Sov1y × Bond yld	-0.017*** (0.002)	-0.017*** (0.003)	-0.018*** (0.003)			
D.CDS (US) × Bond yld	-0.027*** (0.002)	-0.024*** (0.002)	-0.024*** (0.002)	-0.026*** (0.002)	-0.024*** (0.002)	-0.024*** (0.002)
Ln Q traded		-0.037*** (0.005)	-0.039*** (0.006)		-0.037*** (0.005)	-0.039*** (0.006)
Bank link			-0.000 (0.284)			0.064 (0.283)
D.FX			0.657*** (0.086)			0.624*** (0.085)
Trade share			6.429*** (1.421)			6.701*** (1.418)
Bond yspr				0.004 (0.004)	-0.009** (0.004)	-0.008** (0.004)
Dur				-0.001 (0.002)	0.002 (0.002)	-0.001 (0.002)
D.Sov1y × Bond yspr				-0.016*** (0.002)	-0.017*** (0.003)	-0.018*** (0.003)
D.Sov1y × Dur				-0.008*** (0.002)	-0.009*** (0.002)	-0.009*** (0.002)
Observations	315456	241375	234367	315456	241375	234367
R-sq	0.19	0.17	0.17	0.19	0.17	0.17
Time and Cntry FE	Yes	Yes	Yes	Yes	Yes	Yes

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses



Stylised facts: more risk-taking in banks when interest rate is lower (but capital then lower too)

