

The Bond Lending Channel of Monetary Policy

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Bank of Finland and CEPR:
Monetary Policy Tools and Their Impact on the Macroeconomy

Firms, Credit and Monetary Policy

- Firm financing key for macroeconomy \Rightarrow credit frictions matter
- Monetary policy (MP) can alleviate credit frictions:
 - Monetary easing \Rightarrow relaxes financial constraints
 - Pre-dominant view: (multiform) “bank lending channel”
- Key trend: bond financing growing relative to bank lending

Bond share of corporate debt financing	2000	2016
Global	10%	19%
United States	19%	34%
Western Europe	9%	17%

- **Question:** Does effect of MP depend on bank/bond share?

This Paper

- **Theory ambiguous:** frictions in bank lending vs. market lending
 1. **Bank** lending channel: bond-financed firms *less affected* by MP
 2. **Bond** lending channel: market financing not frictionless!
 - Bonds more **rigid** than relationship lending (Bolton & Scharfstein, 96)
 - ⇒ Higher cost of financial distress ⇒ bond-financed firms *more affected*

- **High-frequency** evidence:
 - Time series of MP shocks + stock price reaction across firms
 - Stock price reactions are special (envelope argument)
 - ⇒ **Reveal** how MP affects constraints

- Main focus is on the **euro area**:
 - Bond markets grew fast, but still smaller than U.S.
 - Pre-crisis 2001-07, conventional MP, large public firms

Main Finding

- Bond-financed firms **more** affected by monetary shocks:
 - Hard to square with (multiform) “bank lending channel”
 - Robust to controlling for drivers of selection into bonds
 - Different from the U.S. (Crouzet, 2019; Ippolito et al., 2018)
 - Complimentary low-frequency evidence of imperfect substitutes:
 - Some credit substitution: more bonds after rate hike
 - But real effects for bond-financed firms (investment falls more)
- ⇒ Large **bond-specific frictions** in euro area:
1. Legal frictions: bankruptcy laws inappropriate for dispersed creditors
 2. Information frictions: small coverage of rating agencies
- Debt structure matters: bond markets not a frictionless “spare tire”

Roadmap

① Mechanism

② Data and Findings

③ Discussion

Roadmap

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③ Discussion

Banks vs. Bonds in Monetary Transmission

- **Bank lending channel** (multiform): $r \uparrow \Rightarrow$ loan supply \downarrow
 - Microfoundations: bank capital/reserves, market power...
 - Floating rate channel (Ippolito et al., 2018)
 - Bond markets typically “spare tire”: frictionless pass-through
- **Bond lending channel**: rigidity of market financing (Bolton and Scharfstein, 1996; Crouzet, 2017; De Fiore and Uhlig, 2015)
 - Dispersed ownership of bonds limits renegotiation
 - *Higher* cost of financial distress for bond-reliant firms

Illustrating the Mechanism

- Firm with cash A borrows to fund I , s.t. financial constraints:
 - High CF R with prob. p_H , low CF χ
 - Can only pledge $\theta \Rightarrow$ debt capacity $= mA$
 - MP affects: 1) discount rate, r , 2) economic activity, $p_H(r)$
- **Debt structure:** bond share $\beta^* \in [0, 1]$ max. debt capacity m
 - Benefit: save loan intermediation costs \Rightarrow banks require $(1 + c)r$
 - Cost: higher cost of financial distress $\Rightarrow \chi(\beta) = \chi_0 - \frac{1}{2} \frac{\chi_1}{1+b_i} \beta^2$
- **Stock price reaction to MP shock:** envelope theorem

$$\frac{d \log V}{dr} = \underbrace{\frac{\partial \log \left(\frac{1}{r} \right)}{\partial r}}_{\text{Direct effect I (discount rate)}} + \underbrace{\frac{\partial \log p'_H(r)}{\partial r}}_{\text{Direct effect II (economy's state)}} + \underbrace{\frac{\partial \log m(\beta^*, r)}{\partial r}}_{\text{Constraint effect}}$$

Illustrating the Mechanism

- Which firms more affected depends on bank vs. bond frictions:

$$\frac{d}{db_i} \left\{ \frac{\partial \log m(\beta_i^*, r)}{\partial r} \right\} = \left[\underbrace{c}_{\substack{\text{Bank lending} \\ \text{channel} > 0}} - \underbrace{\frac{\chi_1}{2} |p'_H(r)| \bar{\beta}}_{\substack{\text{Frictions in bond} \\ \text{financing} > 0}} \right] \bar{\beta}$$

- Estimate term in data...

Roadmap

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② Data and Findings

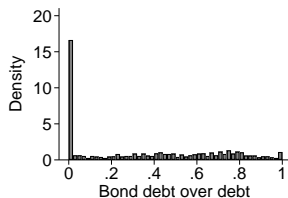
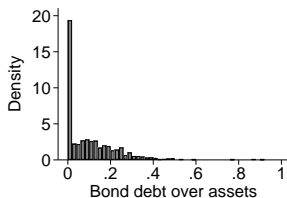
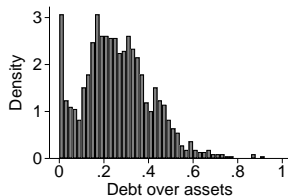
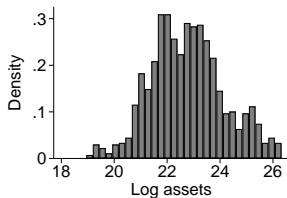
③ Discussion

Data

- Baseline: ECB interest rate policy in 2001-07
 - Full monetary cycle [More](#)
 - Robust bank lending growth during this period [More](#)
- High-frequency identification: MP shock = unexpected change in market interest rates in tight window around announcement
 - Time series from Altavilla et al. (2019)
 - 91 announcement days in euro area
 - Normalization: rate hike \equiv positive MP shock [More](#)
- Firm-level data: large public companies
 - Potential access to bonds, liquid stock price, relevant for macro
 - Constituents of EURO STOXX sectoral indices
 - 80% of EZ total bonds + 85% of market cap [More](#)
 - 290 firms in total, exclude financials/utilities
 - Comparable in size/leverage to S&P500 U.S. firms

Heterogeneity in Debt Financing

- Bank-centric financing in Europe (Langfield and Pagano, 2016)



Debt Structure and Monetary Transmission

- Empirical specification:

$$\Delta \log P_{i,t} = \alpha_i + \nu_{s,t} + \gamma MPS_t \times \text{Bond share}_{i,t-1} + \delta Z_{i,t-1} + \epsilon_{i,t}$$

- Within sector-day: include Sector \times Date FE
 - Other channel of MP often vary at sector-level (consumer demand, prices, etc.)
 - Bond share + leverage vary by sector
- Additional controls:
 - Total debt: include leverage \times MP Shock
 - Equity duration (Weber, 2018; Gormsen and Lazarus, 2019)
 - Robustness: other shocks/time + risk, size, age, CAPM betas... (selection into bond financing)

The Role of Debt Structure: Eurozone

	(1)	(2)	(3)	(4)	(5)	(6)
Δ OIS1M \times Bond debt over assets	-23.40*** (5.254)				-28.78*** (7.148)	-31.98*** (8.331)
Δ OIS1M \times Tercile of bond debt over assets		-1.881*** (0.539)				
Δ OIS1M \times Bond debt over debt			-8.453*** (2.522)			
Δ OIS1M \times Tercile of bond debt over debt				-2.421*** (0.787)		
Δ OIS1M \times Debt over assets			1.210 (4.196)	0.524 (4.244)	7.402 (4.490)	
R^2	0.374	0.373	0.374	0.373	0.374	0.375
Duration control	✓	✓	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓	✓	✓
Firm controls	✓	✓	✓	✓	✓	✓
Sector \times Date FE	✓	✓	✓	✓	✓	✓
Lev. Quintile Interaction						✓
Observations	12717	12717	12717	12717	12717	12717

- Eurozone: bond-financed firms **more** affected by rate hikes
- Economic magnitude: for 25bps \uparrow in rate, moving from 25th pctile to 75th of bond debt/assets \Rightarrow 99 bps lower stock return Robustness

Roadmap

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Discussion

- Bond-financed firms robustly **more** affected by monetary shocks:
 - Hard to square with (multiform) “bank lending channel”
- Still holds in recent sample with higher bond share [More](#)
- Effect driven by firms in the tail of the risk distribution [More](#)
- Different from the U.S. (Crouzet, 2019; Ippolito et al., 2018) [U.S.](#)
- Complimentary low-frequency evidence:
 - Credit substitution: bonds \uparrow after rate hike [More](#)
 - Imperfect substitutes: differential investment response [More](#)

Implications

- Evidence of large **bond-specific frictions** in euro area
- Stylized facts support this interpretation:

1. Information frictions:

- Low presence of rating agencies:
In 2004, 11% of large firms rated vs. 92% in U.S.
- Only 50% to 70% rated in our sample of largest firms
- Stronger effect of rating downgrades in EZ

[More](#)[More](#)

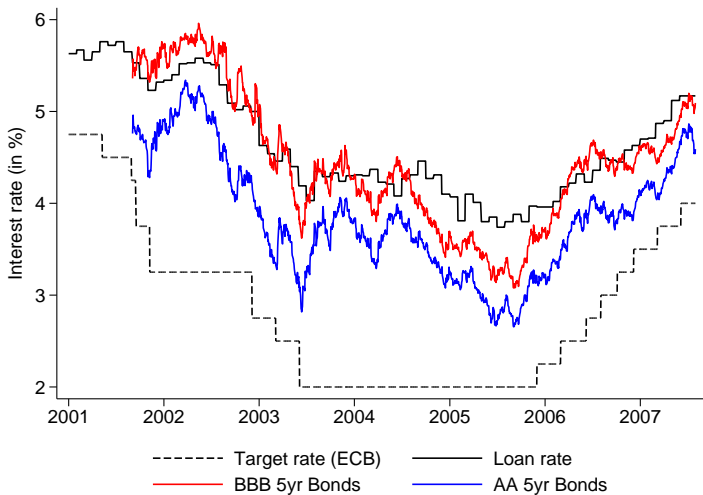
2. Legal frictions more acute in EZ

⇒ Mitigating frictions in bond financing should be a priority:

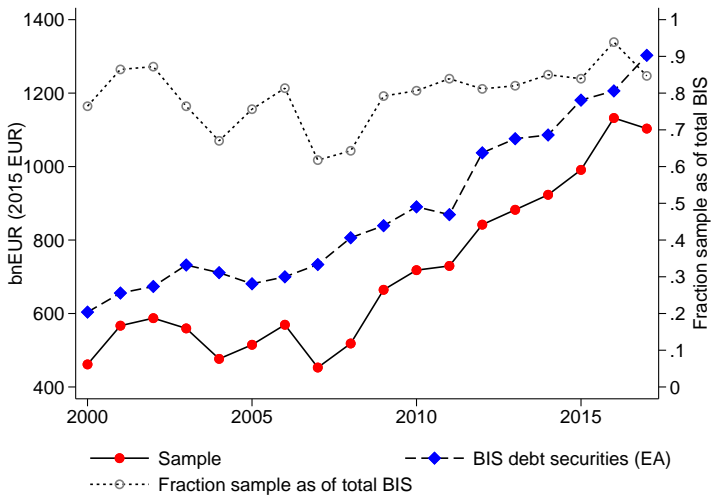
- EZ bond markets in turmoil, wave of rating downgrades
- Fear of “second wave” of bankruptcy ⇒ impair recovery
- Central banks are supporting corporate bond markets
(ECB: via CSPP + Fed: buying bonds for first time)

Extra slides

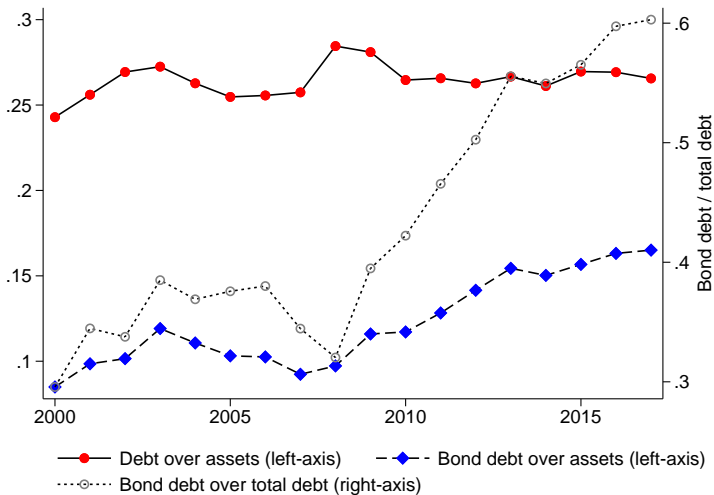
Monetary Cycle in the Eurozone



Sample Coverage Debt Securities



Sample Capital Structure



MP Shocks

	N	Mean	SD	Min	Max
Δ OIS1M	91	0.076	4.80	-35.00	8.65
Δ OIS3M	91	-0.119	4.01	-30.00	5.50
Δ OIS1M Corsettietal	91	-0.046	5.53	-39.25	15.00
Δ OIS3M JK	91	-0.003	4.33	-30.50	9.50
Δ FFR	52	-0.079	4.71	-20.00	12.50

Robustness

- Effect beyond credit risk: credit ratings, distance to default [More](#)

- Robust to:
 - Using other MP shocks [More](#)
 - Excluding “information” shocks [More](#)
 - Add interactions for size, age [More](#)
 - Add interactions for tangibility, profitability, cash, equity vol [More](#)
 - CAPM abnormal return [More](#)

[Back](#)

Monetary Policy Shocks and Distance-to-Default

	(1)	(2)	(3)	(4)
Δ OIS1M \times Bond debt over assets	-21.22*** (5.123)	-20.68*** (5.084)		
Δ OIS1M \times Tercile of bond debt over assets			-1.534*** (0.510)	-1.516*** (0.562)
Δ OIS1M \times Default probability (KMV)	6.309*** (1.139)		6.409*** (0.634)	
Quartile Default=1 \times Δ OIS1M		0.451 (1.672)		1.062 (1.493)
Quartile Default=2 \times Δ OIS1M		-2.037 (1.449)		-2.022 (1.324)
Quartile Default=3 \times Δ OIS1M		-0.602 (2.067)		-0.372 (2.115)
R^2	0.377	0.377	0.376	0.376
Duration control	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓
Firm controls	✓	✓	✓	✓
Sector \times Date FE	✓	✓	✓	✓
Observations	12285	12285	12285	12285

Monetary Policy Shocks and Rating

	(1)	(2)	(3)	(4)
Δ OIS1M \times Bond debt over assets		-21.47*** (7.559)	-25.93*** (9.143)	
Δ OIS1M \times Bond debt over debt				-7.312** (3.238)
Δ OIS1M \times Debt over assets			6.627 (4.433)	1.540 (4.031)
High Yield \times Δ OIS1M	-7.974 (8.313)	-4.569 (7.450)	-4.413 (7.455)	-5.295 (7.268)
IG below AA \times Δ OIS1M	-3.115*** (1.085)	-0.322 (1.891)	-0.485 (1.749)	-0.908 (1.757)
IG AA and above \times Δ OIS1M	-5.313*** (1.732)	-4.222** (1.620)	-3.770** (1.528)	-2.790* (1.458)
R^2	0.373	0.374	0.374	0.374
Duration control	✓	✓		
Firm FE	✓	✓	✓	✓
Firm controls	✓	✓	✓	✓
Sector \times Date FE	✓	✓	✓	✓
Observations	12717	12717	12717	12717

Monetary Policy Shocks and Other Firm Characteristics

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Δ OIS1M \times Bond debt over assets	-25.92*** (8.549)	-26.33*** (8.587)	-21.12*** (6.719)	-31.87*** (8.338)	-31.78*** (8.111)	-31.62*** (8.137)	-32.00*** (7.864)	-32.18*** (9.024)
Δ OIS1M \times Age	0.0373** (0.0149)							
Δ OIS1M \times Log assets		-1.002** (0.425)						
Δ OIS1M \times Log Enterprise Value			-1.917*** (0.426)					
Δ OIS1M \times Fixed assets over assets				-4.163 (4.691)				
Δ OIS1M \times Cash over assets					-8.248 (13.70)			
Δ OIS1M \times Earnings over interest expenses						-0.0476*** (0.0146)		
Δ OIS1M \times Equity std.							-4.669 (147.1)	
Δ OIS1M \times Operating profitability								9.782 (13.30)
R^2	0.392	0.375	0.376	0.375	0.375	0.375	0.375	0.375
Duration control	✓	✓	✓	✓	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓	✓	✓	✓	✓
Firm controls	✓	✓	✓	✓	✓	✓	✓	✓
Sector \times Date FE	✓	✓	✓	✓	✓	✓	✓	✓
Lev. Quintile Interaction	✓	✓	✓	✓	✓	✓	✓	✓
Observations	9652	12717	12717	12717	12717	12717	12717	12717

Alternative MP Shock

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Δ OIS1M \times Bond debt over assets	-23.40*** (5.254)							
Δ OIS1M \times Bond debt over debt		-8.453*** (2.522)						
Δ OIS3M \times Bond debt over assets			-25.14*** (7.139)					
Δ OIS3M \times Bond debt over debt				-9.131*** (3.059)				
Δ OIS1M Corsettietal \times Bond debt over assets					-19.57*** (5.541)			
Δ OIS1M Corsettietal \times Bond debt over debt						-6.249** (2.834)		
Δ OIS3M JK \times Bond debt over assets							-21.88*** (7.780)	
Δ OIS3M JK \times Bond debt over debt								-6.777* (3.514)
R^2	0.374	0.374	0.373	0.373	0.373	0.373	0.373	0.373
Duration control	✓	✓	✓	✓	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓	✓	✓	✓	✓
Firm controls	✓	✓	✓	✓	✓	✓	✓	✓
Sector \times Date FE	✓	✓	✓	✓	✓	✓	✓	✓
Observations	12717	12717	12717	12717	12717	12717	12717	12717

Abnormal Return Debt Structure

	(1)	(2)	(3)	(4)	(5)
Δ OIS1M \times Bond debt over assets	-20.91*** (4.564)				-20.85*** (6.637)
Δ OIS1M \times Tercile of bond debt over assets		-1.851*** (0.440)			
Δ OIS1M \times Bond debt over debt			-6.658*** (2.211)		
Δ OIS1M \times Tercile of bond debt over debt				-2.136*** (0.738)	
Δ OIS1M \times Debt over assets			-4.182 (2.990)	-4.261 (2.845)	-0.0368 (3.577)
R^2	0.241	0.240	0.241	0.241	0.241
Duration control	✓	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓	✓
Firm controls	✓	✓	✓	✓	✓
Sector \times Date FE	✓	✓	✓	✓	✓
Lev. Quintile Interaction					
Observations	12717	12717	12717	12717	12717

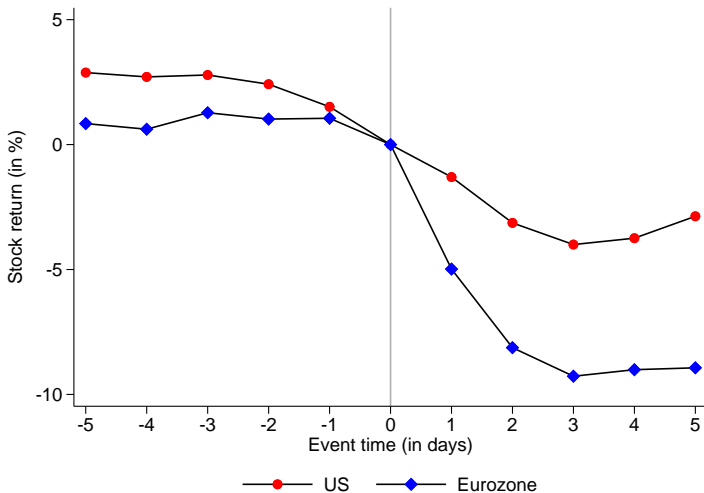
Excluding Information Shocks

	(1)	(2)	(3)	(4)	(5)
Δ OIS3M JK \times Bond debt over assets	-24.88*** (7.564)				-33.62*** (8.477)
Δ OIS3M JK \times Tercile of bond debt over assets		-1.902** (0.804)			
Δ OIS3M JK \times Bond debt over debt			-9.726*** (2.788)		
Δ OIS3M JK \times Tercile of bond debt over debt				-2.810*** (0.774)	
Δ OIS3M JK \times Debt over assets			4.971 (4.754)	4.261 (4.820)	12.29** (4.866)
R^2	0.402	0.401	0.403	0.402	0.403
Duration control	✓	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓	✓
Firm controls	✓	✓	✓	✓	✓
Sector \times Date FE	✓	✓	✓	✓	✓
Observations	7185	7185	7185	7185	7185

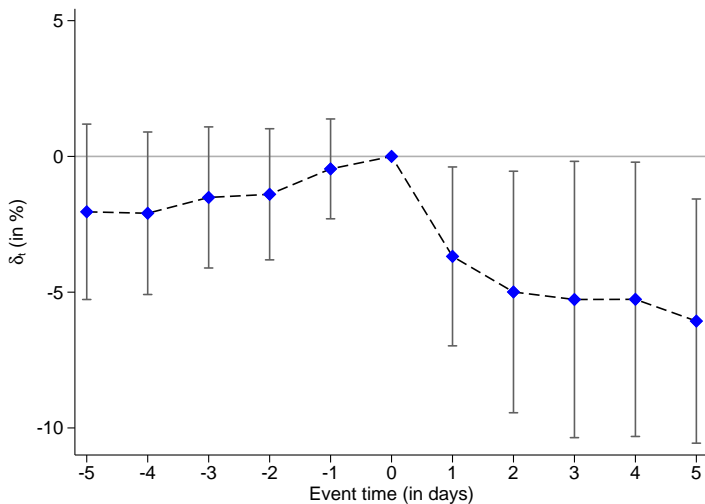
Treatment Effect Heterogeneity

	(1)	(2)
Bond debt over assets $\times \Delta$ OIS1M	-0.487 (8.211)	-11.30 (10.32)
2. Tercile Dist.-to-default \times Bond debt over assets $\times \Delta$ OIS1M	-1.146 (8.998)	
3. Tercile Dist.-to-default \times Bond debt over assets $\times \Delta$ OIS1M	-42.23*** (14.42)	
2. Tercile Equity Vol. \times Bond debt over assets $\times \Delta$ OIS1M		-11.94 (11.07)
3. Tercile Equity Vol. \times Bond debt over assets $\times \Delta$ OIS1M		-24.59* (13.52)
R^2	0.378	0.374
Duration control	✓	✓
Firm FE	✓	✓
Firm controls	✓	✓
Sector \times Date FE	✓	✓
Observations	12285	12717

Event Study Rating Downgrade



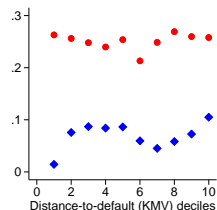
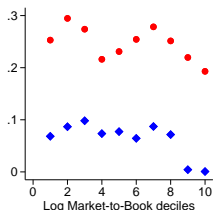
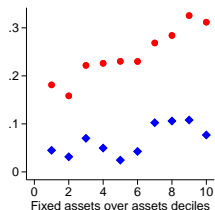
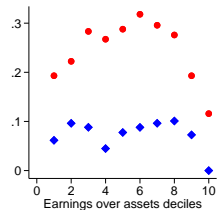
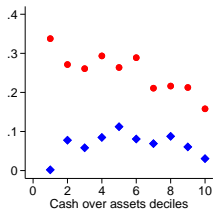
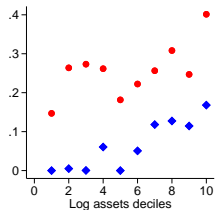
Event Study Rating Downgrade Diff-in-Diff



Summary Statistics Euroarea

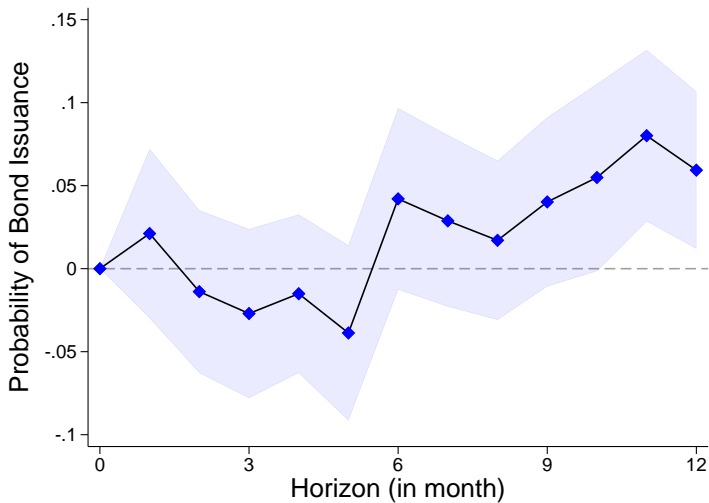
	Mean	p25	p50	p75	count
Assets (in bn)	22.008	3.052	7.960	19.308	13,046
Cash over assets	0.061	0.021	0.039	0.072	13,046
Earnings over assets	0.133	0.090	0.127	0.178	13,046
Fixed assets over assets	0.257	0.107	0.231	0.379	13,046
Equity duration proxy	7.978	0.000	6.780	11.990	13,046
Market-to-Book	3.142	1.309	2.087	3.446	13,046
Debt over earnings	2.378	0.976	1.967	3.069	13,046
Earnings over interest expenses	20.291	5.287	8.922	15.216	13,046
Debt over assets	0.260	0.156	0.249	0.353	13,046
Debt due within year over debt	0.342	0.156	0.282	0.476	12,979
Bond debt over assets	0.104	0.000	0.070	0.170	13,046
Bond debt over debt	0.357	0.000	0.328	0.666	13,046

Eurozone Cross Section

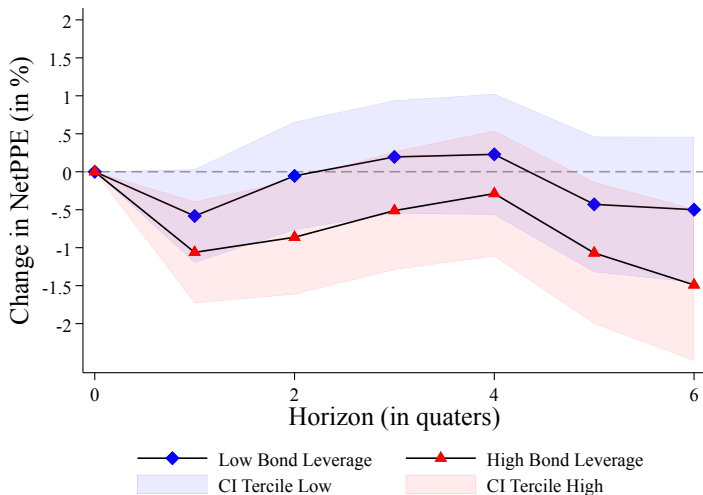


● Debt over assets ◆ Bond debt over assets

Credit Substitution



Investment Response



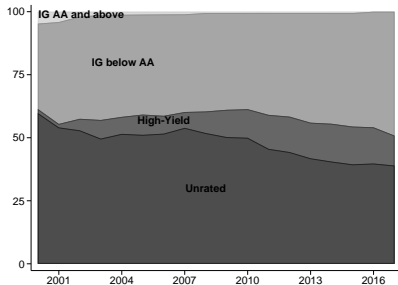
Post-Crisis Sample 2013-2018

	(1)	(2)	(3)	(4)	(5)	(6)
Δ OIS1M \times Bond debt over assets	-60.98*** (11.40)				-65.24*** (16.54)	-53.84*** (16.67)
Δ OIS1M \times Tercile of bond debt over assets		-10.04*** (1.315)				
Δ OIS1M \times Bond debt over debt			-16.15*** (5.340)			
Δ OIS1M \times Tercile of bond debt over debt				-5.631*** (1.984)		
Δ OIS1M \times Debt over assets			-19.73 (13.75)	-24.13* (13.17)	5.843 (17.83)	
R^2	0.410	0.410	0.410	0.410	0.410	0.411
Duration control	✓	✓	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓	✓	✓
Firm controls	✓	✓	✓	✓	✓	✓
Sector \times Date FE	✓	✓	✓	✓	✓	✓
Lev. Quintile Interaction						✓
Observations	9520	9520	9520	9520	9520	9520

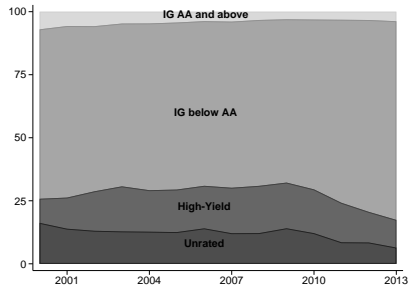
Comparison with the United States

	(1)	(2)	(3)	(4)	(5)	(6)
Δ FFR \times Bond debt over assets	-4.209*				-1.390	-1.895
	(2.454)				(3.899)	(3.310)
Δ FFR \times Tercile of bond debt over assets		-0.555				
		(0.503)				
Δ FFR \times Bond debt over debt			-1.194			
			(1.049)			
Δ FFR \times Tercile of bond debt over debt				-0.437		
				(0.444)		
Δ FFR \times Debt over assets			-4.575*	-4.849*	-4.121	
			(2.404)	(2.424)	(3.939)	
R^2	0.388	0.388	0.389	0.388	0.388	0.389
Duration control	✓	✓	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓	✓	✓
Firm controls	✓	✓	✓	✓	✓	✓
Sector \times Date FE	✓	✓	✓	✓	✓	✓
Lev. Quintile Interaction						✓
Observations	12998	12998	12998	12998	12998	12998

Sample Rating Coverage

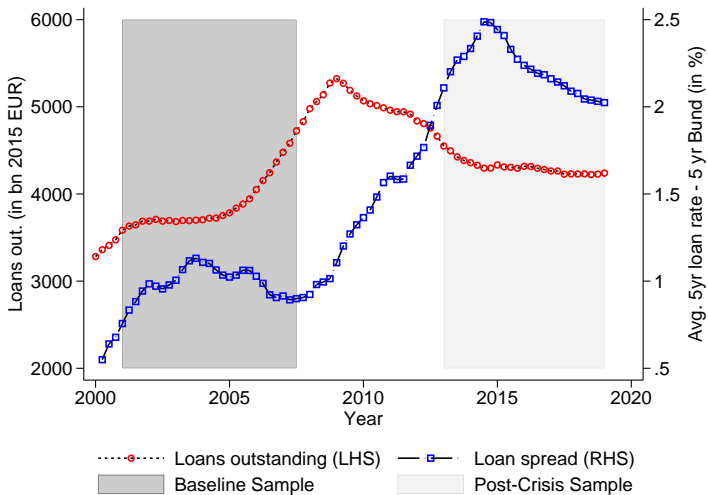


(a) EZ Sample



(b) U.S. Sample

Lending Market



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