Corporate Loan Spreads and Economic Activity

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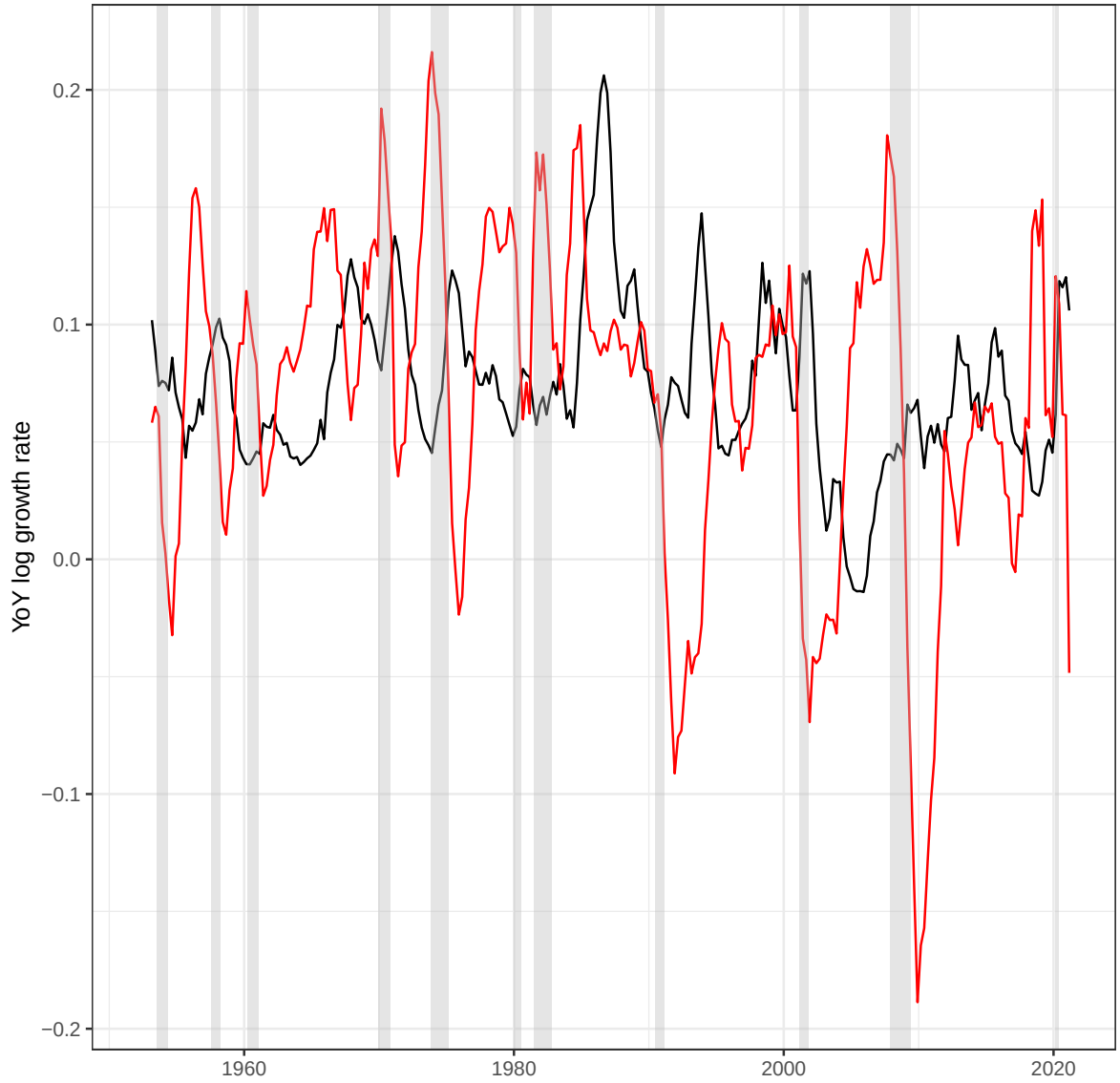
Motivation



Corporate bonds (black), Corporate loans (red)

Motivation

- Credit spreads derived from bond and loan markets encode unique information
  - Bond credit spreads focuses on the least constrained firms, misses firms most sensitive to financial frictions

→ This paper: Novel dataset to exploit the unique information contained within corporate *loan* spreads:
  - Improve economic forecasts
  - Measure financial frictions

Key results

1. Loan spreads improve macro forecasts above and beyond existing measures.
   - Robust to other economic aggregates; different prediction horizons; other controls; other countries; in and out of sample

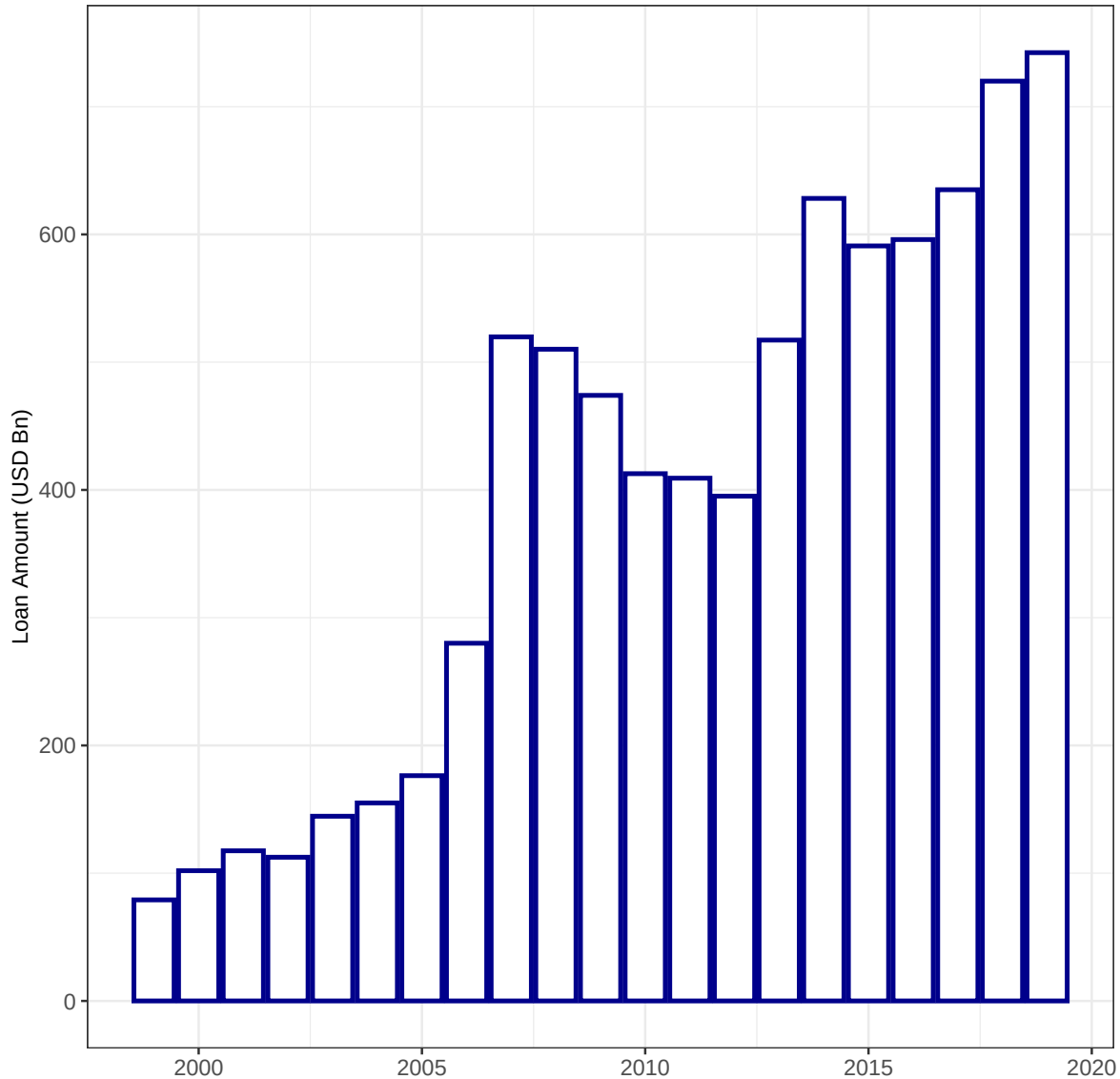
2. Loan spreads capture both borrower and intermediary balance sheet constraints

3. We highlight benefits of exploring lower aggregation levels

Contribution

1. Introduce new credit spread that has economically large predictive power
   - Important for academics and policy makers
2. Add to the debate on what types of frictions matter for the business cycle
   - Relax implicit assumption that the same frictions apply across bond and loan markets. Focusing only on bond market underestimates borrower frictions

Secondary loan market trading volume



▸ Data

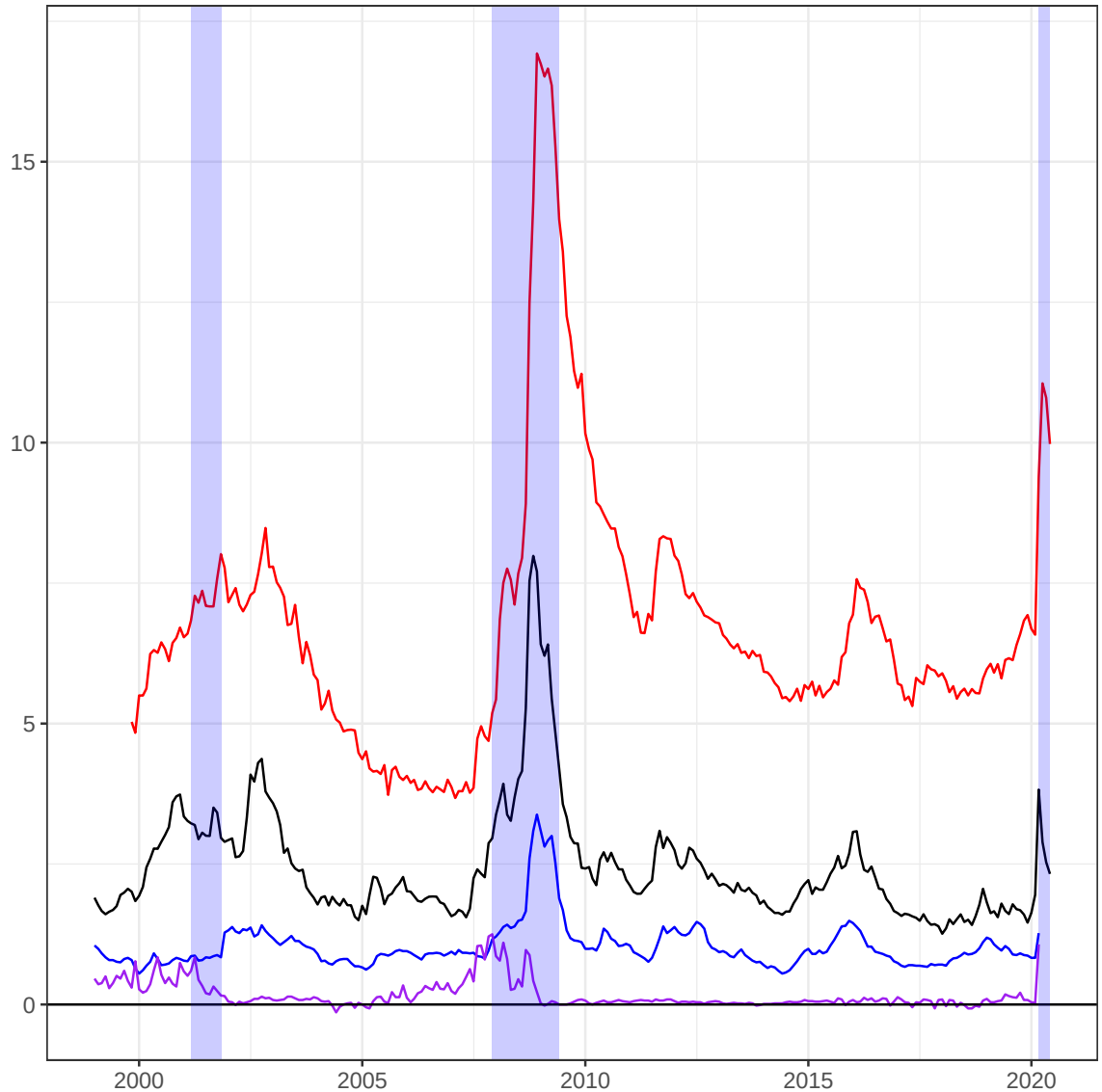
Aggregate loan spread

- "Bottom-up" spread
  - Qrt. cash flows: coupon using 3m forward LIBOR + AISD
    $\rightarrow$ yield-to-maturity $y_{it}[k]$
  - Synthetic risk-free loan w/ same cash-flow profile
    $\rightarrow$ yield-to-maturity $y^f_{it}[k]$
    - DCF using cont. comp. zero-coupon Treasury yields (Gürkaynak, Sack, and Wright, 2007)

$\rightarrow$ Loan spread (for each loan): $S_{it}[k] = y_{it}[k] - y^f_{it}[k]$

$\rightarrow$ Aggregate loan spread: $S^{Loan}_t = \frac{1}{N_t} \sum_i \sum_k S_{it}[k]$

Loan spread (1999-2020)



Loan spread (red), GZ bond spread (black), Baa (blue), CP-Bill (purple)

Forecasting economic developments

$$\Delta y_{t+h} = \alpha + \beta \Delta y_{t-1} + \gamma_1 \Delta S_t + \lambda_2 TS_t + \lambda_3 RFF_t + \epsilon_{t+h},$$

- Δy is the log growth rate of a macro variable (in this talk mainly industrial production. Various other measures in paper)
- S_t is a credit spread or other indicator
- TS_t is the term spread and RFF_t real effective fed fund rate
- Estimated with OLS, Newey-West/H-H s.e., coefficients are standardized

Baseline results

	Industrial Production; Forecast horizon: 3 months							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\Delta S_t^{CP\text{-}Bill}$		0.081						
		(0.919)						
$\Delta S_t^{Baa\text{-}Aaa}$			−0.276					
			(−3.860)					
$\Delta S_t^{HY\text{-}AAA}$				−0.252				
				(−3.520)				
ΔS_t^{Bond}					−0.207			
					(−2.650)			
ΔS_t^{Loan}						−0.405		−0.356
						(−5.600)		(−4.590)
$\Delta S_t^{Bond\ PC}$							−0.253	−0.115
							(−3.540)	(−1.690)
FFR	✓	✓	✓	✓	✓	✓	✓	✓
Term Spread	✓	✓	✓	✓	✓	✓	✓	✓
Adj R^2	0.189	0.192	0.262	0.249	0.228	0.335	0.249	0.343
Inc R^2	-	+0.03	+0.073	+0.060	+0.039	+0.146	+0.06	+0.154
LR Test(χ^2)	-	-	-	-	-	-	-	33.26
Obs	241	241	241	241	241	241	241	241

▸ Hansen Hodrick SE ▸ Alternative variables ▸ Europe ▸ Robustness ▸ OOS ▸ LP

Mechanism I: Intermediary balance sheets

- Loan market borrowers may have limited funding alternatives and hence are particularly sensitive to shocks to the balance sheets of financial intermediaries
- Reduced capacity and/or willingness of intermediaries to provide credit to the economy which is reflected in credit spreads
  - A deterioration in the health of intermediaries (e.g. Holmström and Tirole, 1997)
  - Frictions in raising new capital (e.g. He and Krishnamurthy, 2013; Gertler and Kiyotaki, 2010)
  - Fluctuations in collateral value (e.g. Kiyotaki and Moore, 1997)

Credit conditions and bank health I

	(1)	(2)	(3)	(4)
Panel A. FSLOSS				
$\Delta S_t^{CP-Bill}$	-0.015			
	(-0.108)			
ΔS_t^{Loan}		0.439		0.464
		(3.758)		(4.904)
$\Delta S_t^{Bond\ PC}$			0.310	-0.034
			(2.218)	(-0.239)
Adjusted R^2	-0.012	0.182	0.085	0.172
Observations	81	81	81	81
Panel B. Unsued Commitments				
$\Delta S_t^{CP-Bill}$	-0.057			
	(-0.284)			
ΔS_t^{Loan}		-0.343		-0.309
		(-2.443)		(-1.712)
$\Delta S_t^{Bond\ PC}$			-0.288	-0.043
			(-1.638)	(-0.167)
Adjusted R^2	-0.010	0.106	0.071	0.095
Observations	81	81	81	81

▸ Europe

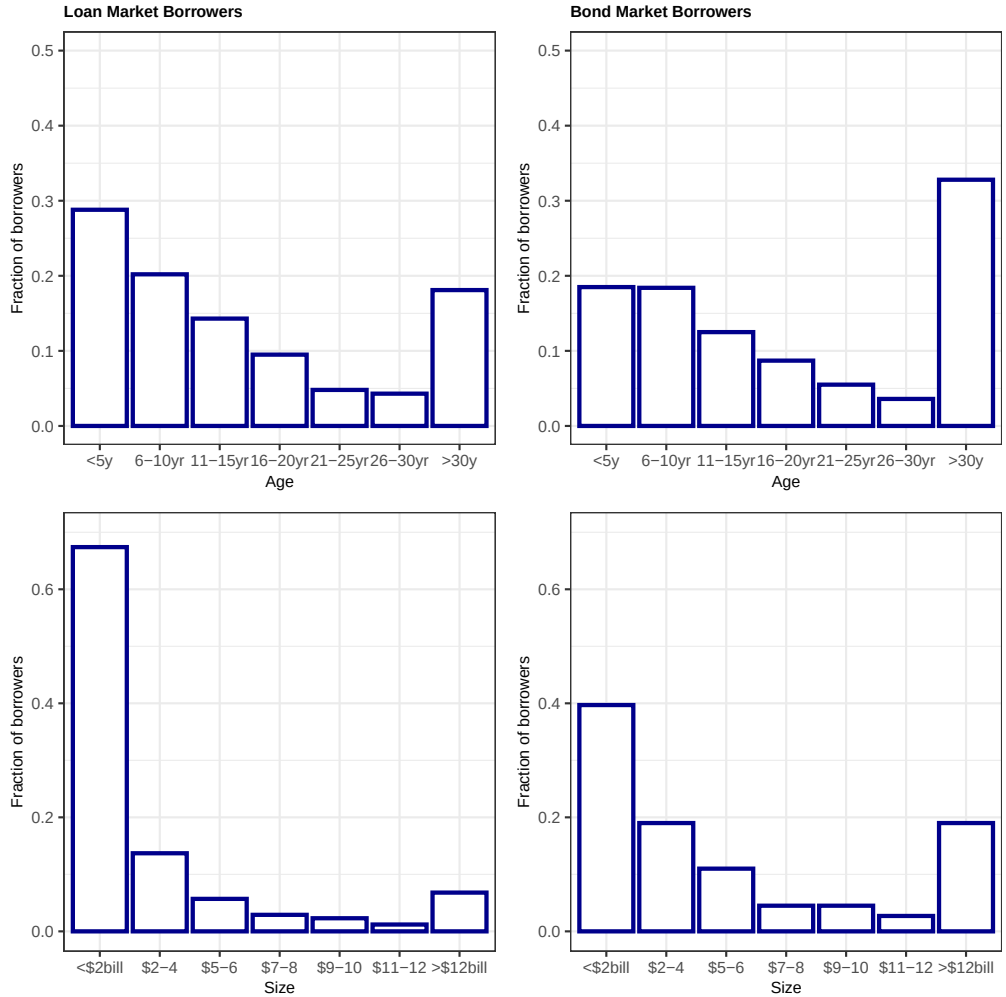
Credit spread decomposition

	Loan Spread$_{ibt}$	Industrial Production$_t$ (3-month)
$\Delta\hat{S}_t^{Loan}$		-0.373
		(-5.009)
ΔELP_t		-0.265
		(-4.682)
$\overline{DD}_{bt}$	-0.429	
	(-36.620)	
$\overline{DD}_{bt}^2$	0.027	
	(28.190)	
σDD_{bt}	-0.023	
	(-3.501)	
$Ln(AISD)$	0.670	
	(30.710)	
$Ln(Age)$	0.066	
	(29.680)	
$Ln(Amount)$	-0.055	
	(-8.896)	
$Secured(0/1)$	-0.011	
	(-0.441)	
$Covenants(0/1)$	0.009	
	(0.750)	
$Senior(0/1)$	0.115	
	(1.111)	
Loan type fixed effects	Yes	
Industry fixed effects	Yes	
Rating fixed effects	Yes	
Adjusted R^2	0.465	0.355
Observations	288,072	241
Incremental R^2		$+0.166$
Contribution from $\Delta\hat{S}_t^{Loan}$		0.676

Mechanisms II: Borrower balance sheets

- Loan market borrowers may be particularly sensitive to financial frictions that emanate from their own balance sheet
- Wedge between the cost of external funds and the opportunity cost of internal funds, labelled the "external finance premium" (e.g. Bernanke and Gertler, 1989)
- A deterioration in the health of borrower balance sheets is further amplified via a "financial accelerator" effect (e.g. Bernanke, Gertler, and Gilchrist, 1999), which is subsequently reflected in the borrower's cost of credit

Borrower Size and Age



- Loan borrowers younger (29% <= 5yrs) and smaller (67% <= \$2bill)
- Loan spread capturing borrower balance sheet frictions

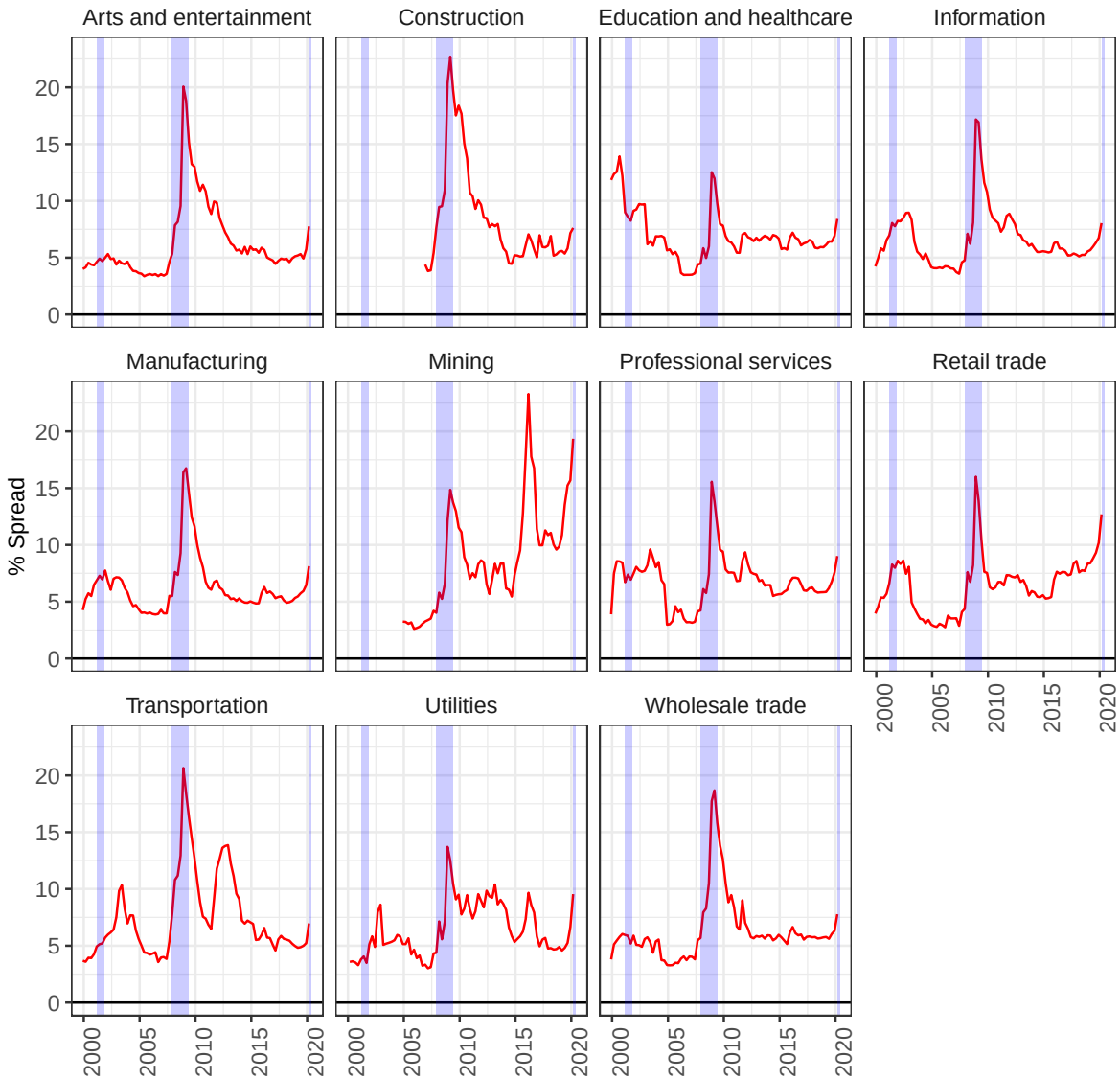
Size and age double-sort

	Industrial production; Forecast horizon: 3 months		
	(1)	(2)	(3)
ΔS_t^{Loan}[Young + Small Firms]	−0.375		
	(−4.115)		
ΔS_t^{Loan}[Old + Large Firms]		−0.266	
		(−3.463)	
ΔS_t^{Loan}[Private]			−0.415
			(−5.340)
Term Spread	✓	✓	✓
FFR	✓	✓	✓
Adjusted R^2	0.320	0.254	0.341
Incremental R^2	+ 0.131	+0.064	+0.152
Observations	241	241	241

- Consistent with smaller, private firms being more sensitive to changes in economic conditions (e.g., Begenau and Salomao (2019); Pflueger, Siriwardane, and Sunderam (2020))
- Non-overlapping sample (small & young) explains largest part of incremental predictive power

▸ Ratings distribution ▸ Ratings split

INDUSTRY LOAN SPREADS



Industry forecasting results

	Industry employment; Forecast horizon: 3 months			
	(1)	(2)	(3)	(4)
S_{bt}^{Loan}	−0.130	−0.171	−0.292	
	(−3.491)	(−3.534)	(−4.609)	
S_{t}^{Loan}	−0.239			
	(−3.818)			
S_{bt}^{Loan} × Top 3 EFD				−0.519
				(−5.408)
S_{bt}^{Loan} × Middle 4 EFD				−0.269
				(−2.754)
S_{bt}^{Loan} × Bottom 4 EFD				−0.139
				(−1.606)
Year × quarter fixed effects	No	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes
Adjusted R^2	0.452	0.558	0.590	0.606
Incremental R^2	+ 0.086	+0.192	+0.224	+0.240
Observations	803	803	803	803

- Industries with firms that are more dependent on external finance (Rajan and Zingales (1998)) account for most of the predictive power of the loan spread.

▸ Alternative Weighting

Conclusion

- Introduce a novel measure of credit spreads using secondary loan market prices
- Loan spreads contain information about the future business cycle above and beyond existing credit spread indicators
- Differential predictive power is (in part) driven by compositional differences btw loan and bond markets (borrower and bank frictions)

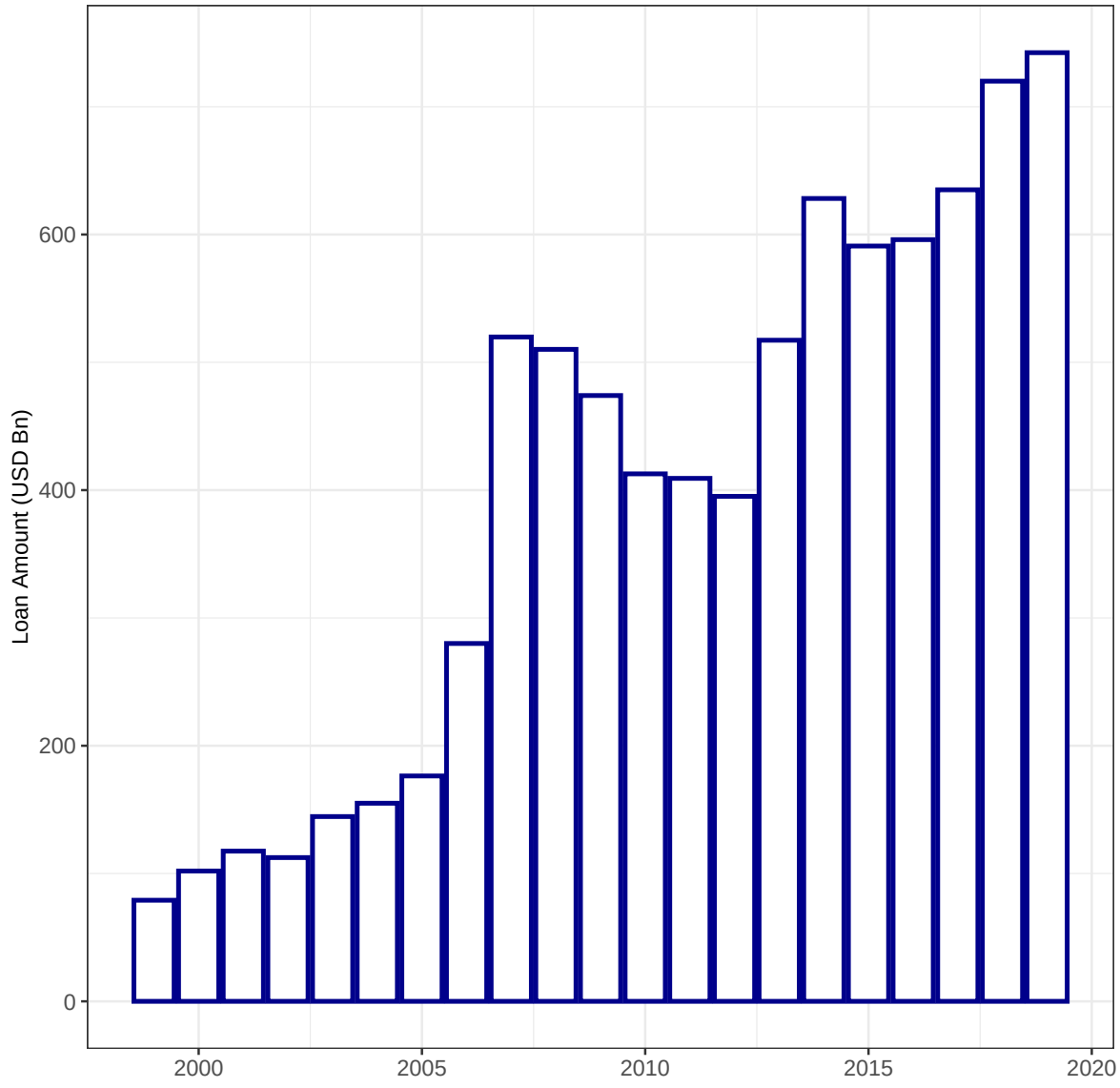
Thanks!

Data

- Daily secondary market prices (mid quotes) of loans from the Loan Syndication and Trading Association (LSTA)
  - 1999 to Q1 2020 period, U.S. non-financial firms, TL, >300,000 loan-month observations ($\sim$ 1,200 loans outstanding per month)
- LPC Dealscan matched to LSTA using LIN
  - Loan amount/spread $->$ cash flows + contract terms
- Bond information
  - Gilchrist and Zakrajšek (2012), TRACE, and Mergent FISD
- Macro variables: FRED, BEA, BLS

▸ Loan Market - Liquidity ▸ Back

SECONDARY LOAN MARKET TRADING VOLUME



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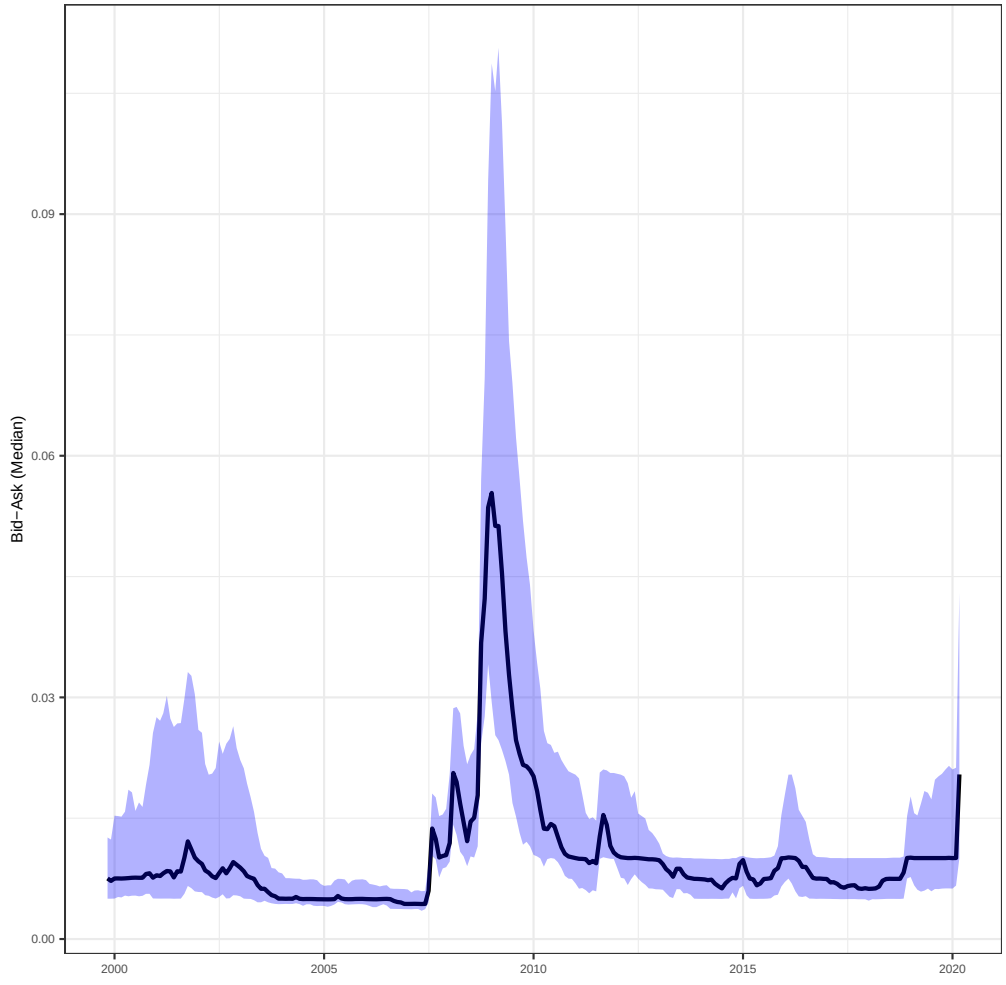
Secondary loan market liquidity



- Pre-GFC bid-ask-spread: 68bps (vs. 34bps in the bond market)
- Secondary loan market is highly liquid.

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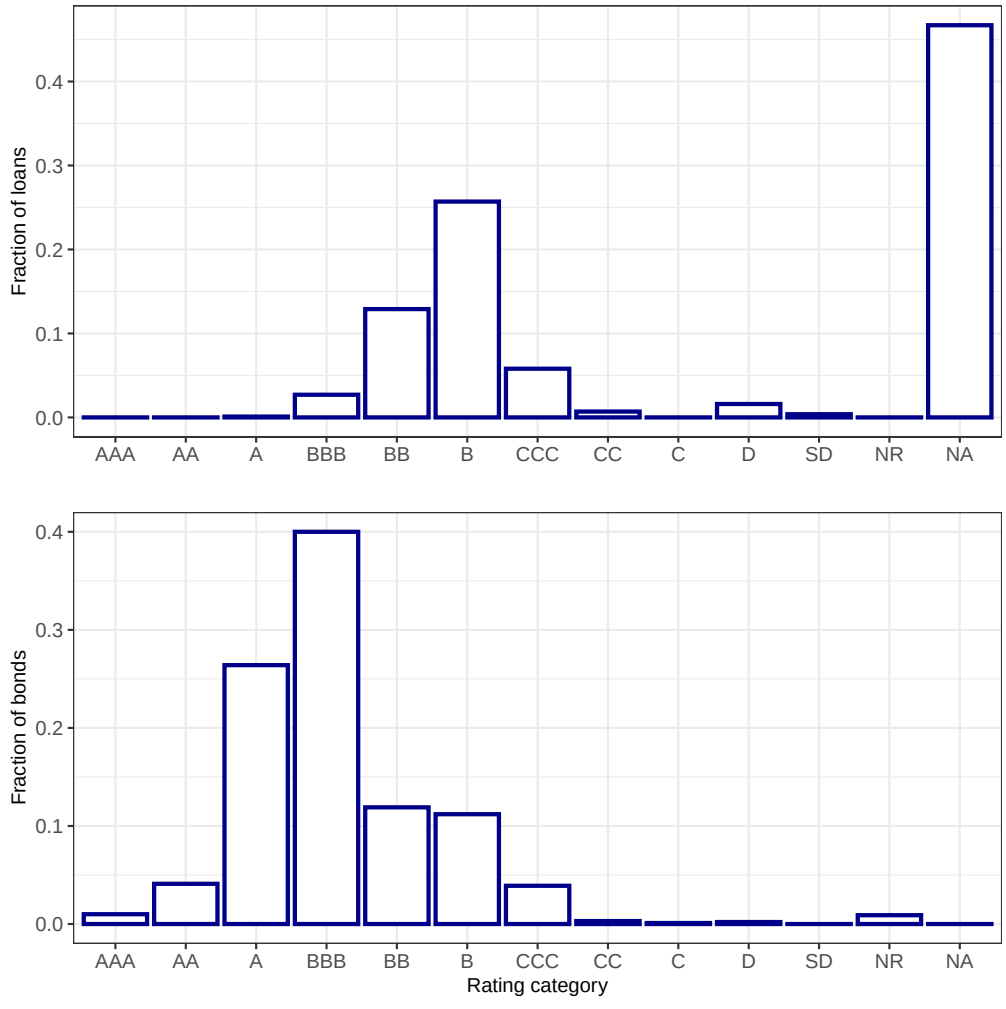
RATING DISTRIBUTION – BOND VS LOAN MARKET



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ROBUSTNESS

	Industrial Production; Forecast horizon: 3 months					
	(1) Terms	(2) Liq	(3) Equity	(4) VIX	(5) Ex. 08-09	(6) Ex. 08-09
ΔS_t^{Loan}		-0.358	-0.378	-0.264	-0.148	
		(-5.150)	(-5.370)	(-4.400)	(-1.980)	
$\Delta S_t^{Bond\ PC}$						0.063
						(0.756)
Residual ΔS_t^{Loan}	-0.389					
	(-5.413)					
Bid-Ask		-0.311				
		(-2.920)				
Δ S&P500			0.152			
			(2.990)			
ΔVIX				-0.351		
				(-3.110)		
Term Spread	✓	✓	✓	✓	✓	✓
FFR	✓	✓	✓	✓	✓	✓
Adjusted R^2	0.325	0.401	0.354	0.407	0.107	0.091
Incremental R^2	+0.136	+0.212	+0.165	+0.218	+0.016	+0.000
LR Test(χ)	45.310	41.986	23.841	20.062	10.087	2.830
Observations	241	241	241	241	225	225

▸ Back

Alternative outcome variables

	Forecast horizon: 3 months					
	IP	PEMP	UE	TCU	NEW	INV
	(1)	(2)	(3)	(4)	(5)	(6)
ΔS_t^{Loan}	-0.356 (-4.590)	-0.177 (-3.380)	0.314 (3.060)	-0.329 (-3.670)	-0.227 (-4.510)	-0.191 (-3.090)
Term Spread	✓	✓	✓	✓	✓	✓
FFR	✓	✓	✓	✓	✓	✓
$\Delta S_t^{Bond\ PC}$	✓	✓	✓	✓	✓	✓
Adjusted R^2	0.343	0.664	0.183	0.235	0.224	0.599
Incremental R^2	+0.154	+0.054	+0.023	+0.133	+0.071	+0.067
LR Test(χ^2)	33.26	35.14	33.01	30.21	15.98	23.68
Observations	241	241	241	241	241	241

▸ Alternative timing - A ▸ Alternative timing - B ▸ Back

Alternative standard errrors

	Forecast horizon: 3 months					
	IP	PEMP	UE	TCU	NEW	INV
	(1)	(2)	(3)	(4)	(5)	(6)
ΔS_t^{Loan}	-0.405 (-6.761)	-0.239 (-3.633)	0.362 (2.725)	-0.376 (-6.634)	-0.280 (-3.223)	-0.259 (-3.423)
Term Spread	✓	✓	✓	✓	✓	✓
FFR	✓	✓	✓	✓	✓	✓
$\Delta S_t^{Bond\ PC}$	✓	✓	✓	✓	✓	✓
Adjusted R^2	0.335	0.672	0.286	0.375	0.140	0.575
Observations	241	241	241	241	241	241

- Results remain highly significant with Hansen-Hodrick standard errors.

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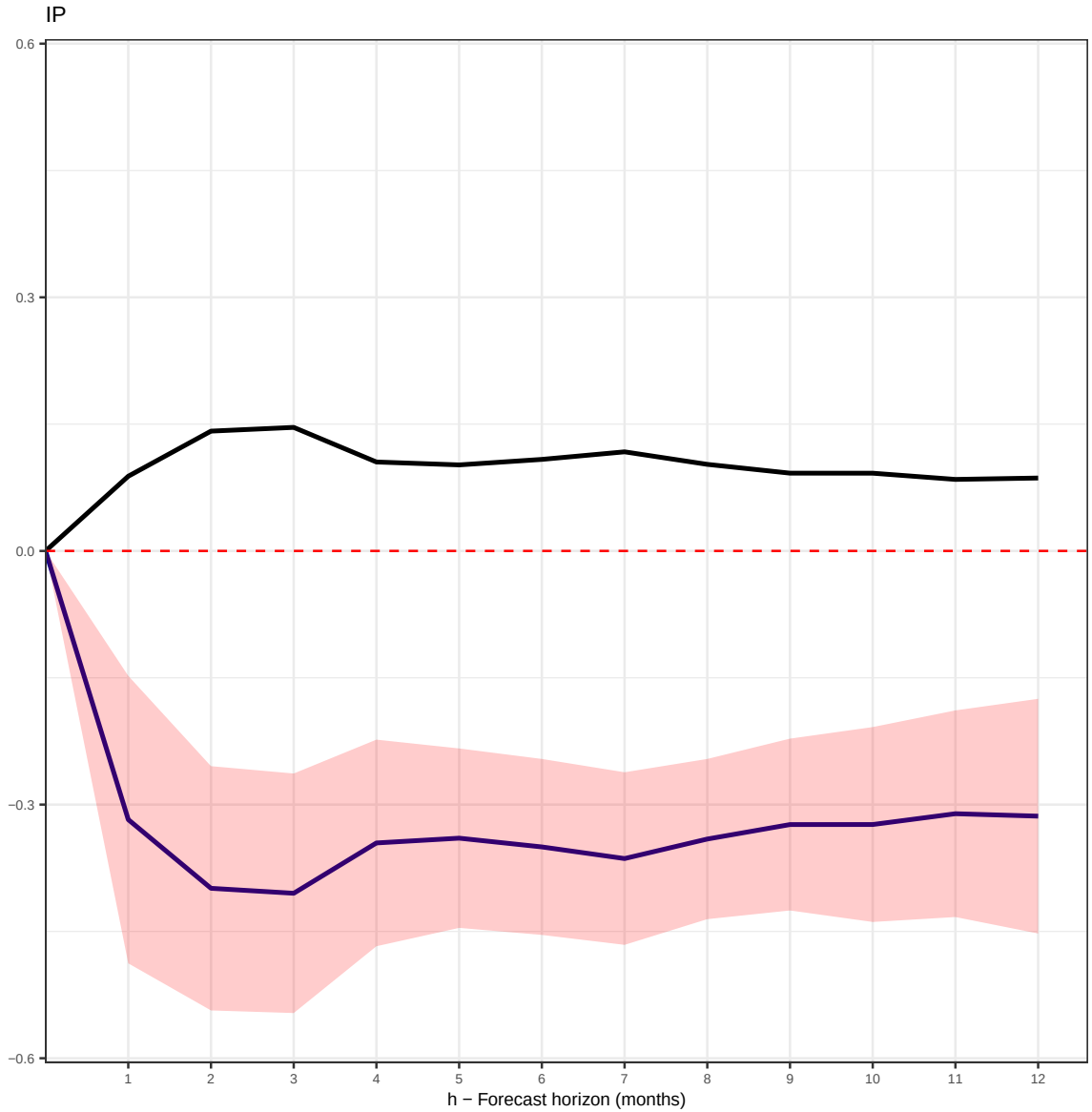
Evidence from Europe

	MAN	MAN	MAN	MAN	MAN	UE
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Germany						
ΔS_t^{HYBond}		-0.280				
		(-1.861)				
ΔS_t^{Bond}			-0.187			
			(-1.659)			
ΔS_t^{Loan}				-0.379	-0.316	0.153
				(-2.455)	(-2.423)	(2.470)
$\Delta S_t^{Bond\ PC}$					-0.128	0.0004
					(-1.802)	(0.006)
Adjusted R^2	0.141	0.207	0.171	0.263	0.271	0.415
Incremental R^2	-	+0.065	+0.029	+0.122	+0.129	+0.016
Contribution from ΔS_t^{Loan}	-	-	-	-	0.704	0.890
Observations	227	227	227	227	227	227

▸ France ▸ Spain ▸ Spreads plot ▸ Back

Dynamics - Local Projections



▸ Other variables ▸ Back

Alternative timing conventions

	Forecast horizon: 3 months					
	IP	PEMP	UE	TCU	NEW	INV
	(1)	(2)	(3)	(4)	(5)	(6)
ΔS_t^{Loan}	-0.309 (-4.841)	-0.146 (-3.867)	0.325 (3.123)	-0.287 (-4.773)	-0.226 (-3.777)	-0.117 (-2.057)
Term Spread	✓	✓	✓	✓	✓	✓
FFR	✓	✓	✓	✓	✓	✓
$\Delta S_t^{Bond\ PC}$	✓	✓	✓	✓	✓	✓
Adjusted R^2	0.361	0.850	0.240	0.414	0.160	0.566
Incremental R^2	+0.216	+0.026	+0.102	+0.191	+0.056	+0.023
LR Test(χ^2)	72.1	41.3	32.6	70.2	17.6	14.7
Observations	241	241	241	241	241	241

- Defines growth rate as the growth from t to $t+3$

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Alternative timing conventions

	Forecast horizon: 3 months					
	IP	PEMP	UE	TCU	NEW	INV
	(1)	(2)	(3)	(4)	(5)	(6)
ΔS_t^{Loan}	-0.252 (-3.597)	-0.190 (-4.839)	0.267 (3.728)	-0.228 (-3.538)	-0.243 (-3.918)	-0.201 (-3.931)
Term Spread	✓	✓	✓	✓	✓	✓
FFR	✓	✓	✓	✓	✓	✓
$\Delta S_t^{Bond\ PC}$	✓	✓	✓	✓	✓	✓
Adjusted R^2	0.452	0.862	0.389	0.505	0.123	0.604
Incremental R^2	+0.132	+0.045	+0.082	+0.113	+0.069	+0.063
LR Test(χ^2)	54.1	71.4	32.4	52.0	19.8	37.9
Observations	241	241	241	241	241	241

- Defines growth rate as the growth from t to $t+3$ and lag period as $t-3$ to t

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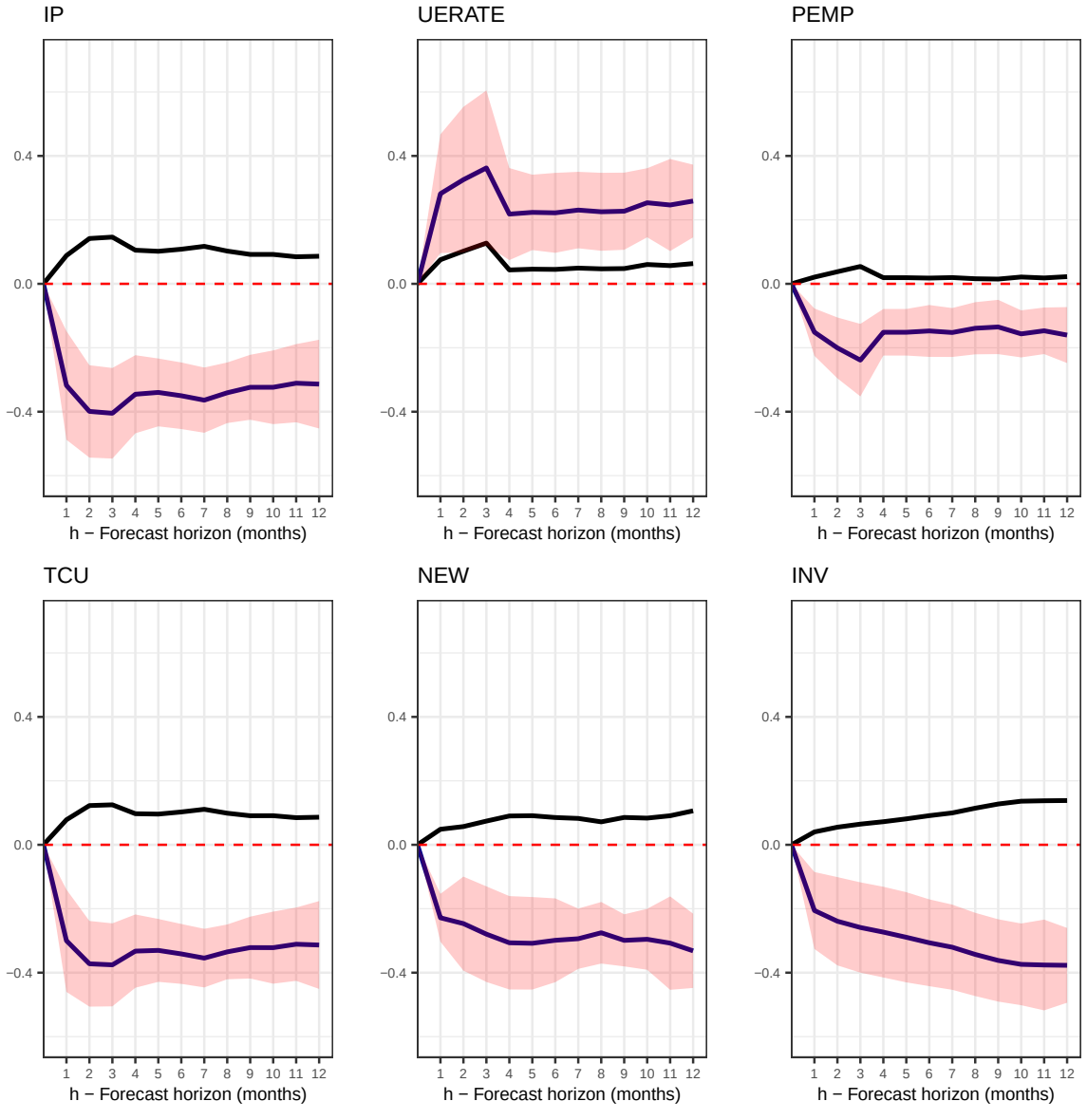
Dynamics - Local Projections



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Out-of-sample

	OOS horizon: h = 3 month		
	RMSE	Normalized RMSE	$T-stat(p-value)$
	(1)	(2)	(3)
Panel A. IP			
Baseline	0.0125	0.7033	-
Baseline + $\Delta S_t^{Bond\ PC}$	0.0125	0.7027	-
Baseline + ΔS_t^{Loan}	0.0113	0.6359	$-2.836(0.005)$

- RMSE calculated via cross validation with expanding rolling window
- Loan spread significantly better at OOS forecasting

▸ Back ▸ Other variables

Out-of-sample

	OOS horizon: h = 3 month		
	RMSE	Normalized RMSE	$T-stat(p-value)$
	(1)	(2)	(3)
Panel A. IP			
Baseline + $\Delta S_t^{Bond\ PC}$	0.0125	0.7027	-
Baseline + ΔS_t^{Loan}	0.0113	0.6359	$-2.836(0.005)$
Panel B. PEMP			
Baseline + $\Delta S_t^{Bond\ PC}$	0.00328	0.4843	-
Baseline + ΔS_t^{Loan}	0.00315	0.4660	$-1.115(0.266)$
Panel C. UE			
Baseline + $\Delta S_t^{Bond\ PC}$	0.3182	0.7528	-
Baseline +ΔS_t^{Loan}	0.3014	0.7130	$-1.583(0.115)$
Panel D. TCU			
Baseline + $\Delta S_t^{Bond\ PC}$	0.9775	0.6823	-
Baseline + ΔS_t^{Loan}	0.9009	0.6289	$-2.482(0.014)$
Panel E. NEW			
Baseline + $\Delta S_t^{Bond\ PC}$	0.1031	0.7839	-
Baseline +ΔS_t^{Loan}	0.0985	0.7493	$-1.733(0.085)$
Panel F. INV			
Baseline + $\Delta S_t^{Bond\ PC}$	0.0097	0.5142	-
Baseline +ΔS_t^{Loan}	0.0092	0.4838	$-1.652(0.100)$

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Evidence from Europe

	MAN	MAN	MAN	MAN	MAN	UE
	(1)	(2)	(3)	(4)	(5)	(6)
Panel B. France						
ΔS_t^{HYBond}		-0.241				
		(-1.661)				
ΔS_t^{Bond}			-0.138			
			(-0.937)			
ΔS_t^{Loan}				-0.338	-0.289	0.263
				(-2.167)	(-2.170)	(2.232)
$\Delta S_t^{Bond\ PC}$					-0.102	0.065
					(-1.080)	(0.727)
Adjusted R^2	0.097	0.143	0.110	0.192	0.195	0.217
Incremental R^2	-	+0.046	+0.013	+0.095	+0.098	+0.070
Contribution from ΔS_t^{Loan}	-	-	-	-	0.730	0.775
Observations	188	188	188	188	188	188

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Evidence from Europe

	MAN	MAN	MAN	MAN	MAN	UE
	(1)	(2)	(3)	(4)	(5)	(6)
Panel C. Spain						
ΔS_t^{HYBond}		-0.292				
		(-1.935)				
ΔS_t^{Bond}			-0.188			
			(-1.184)			
ΔS_t^{Loan}				-0.238	-0.122	0.103
				(-1.972)	(-1.145)	(2.268)
$\Delta S_t^{Bond\ PC}$					-0.224	0.085
					(-1.398)	(1.173)
Adjusted R^2	0.132	0.180	0.153	0.180	0.207	0.712
Incremental R^2	-	+0.069	+0.030	+0.048	+0.075	+0.021
Contribution from ΔS_t^{Loan}	-	-	-	-	0.371	0.553
Observations	187	187	187	187	187	187

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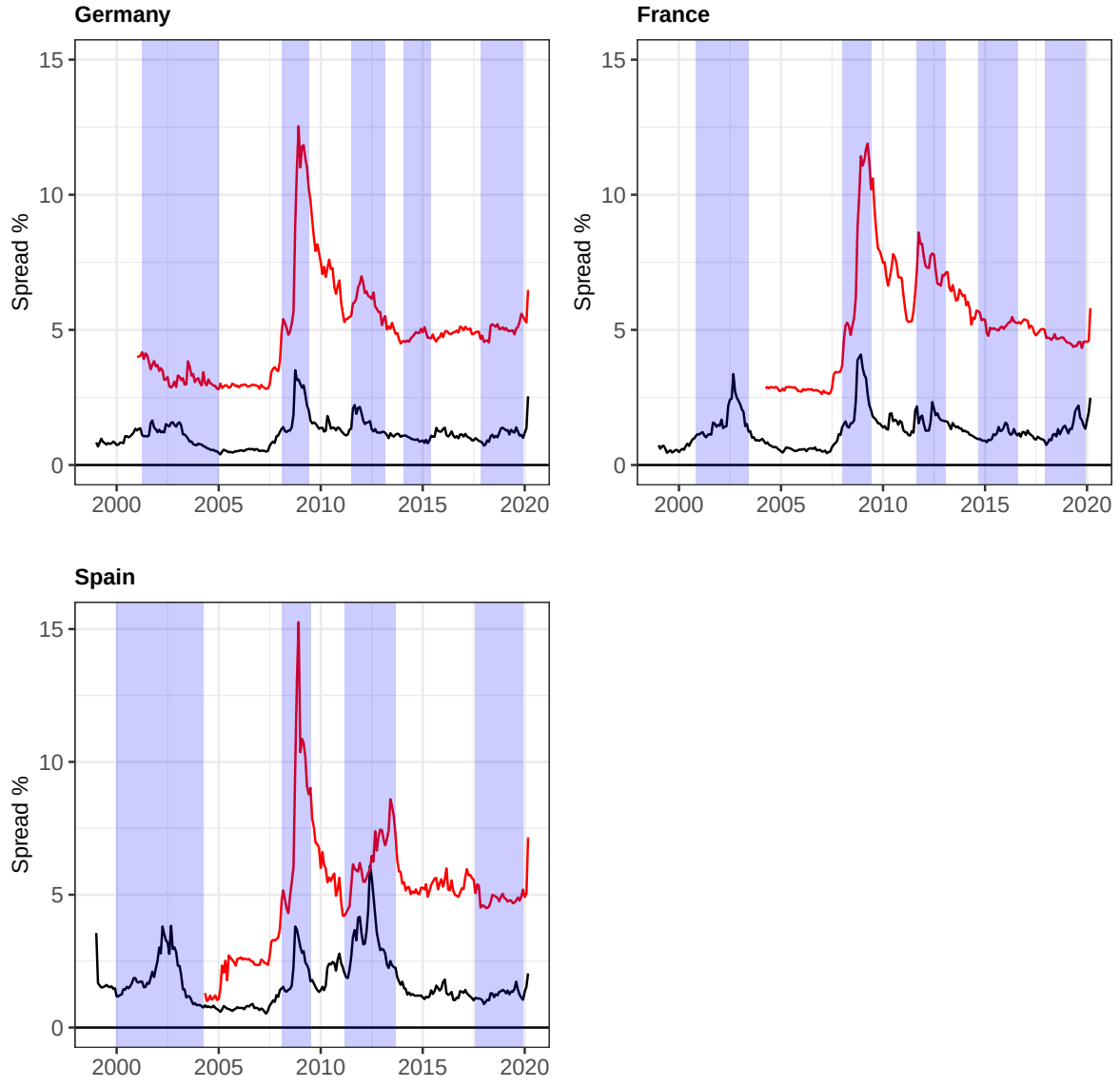
Evidence from Europe



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Credit conditions – Europe

	Credit conditions based on loan officer surveys	
	(1)	(2)
Germany		
ΔS_t^{Loan}	0.376	
	(3.748)	
ΔS_t^{Bond}		0.159
		(1.182)
Adjusted R^2	0.128	0.011
Observations	70	70
France		
ΔS_t^{Loan}	0.480	
	(3.545)	
ΔS_t^{Bond}		0.329
		(1.436)
Adjusted R^2	0.218	0.094
Observations	64	64
Spain		
ΔS_t^{Loan}	0.370	
	(2.018)	
ΔS_t^{Bond}		0.176
		(1.008)
Adjusted R^2	0.122	0.015
Observations	63	63

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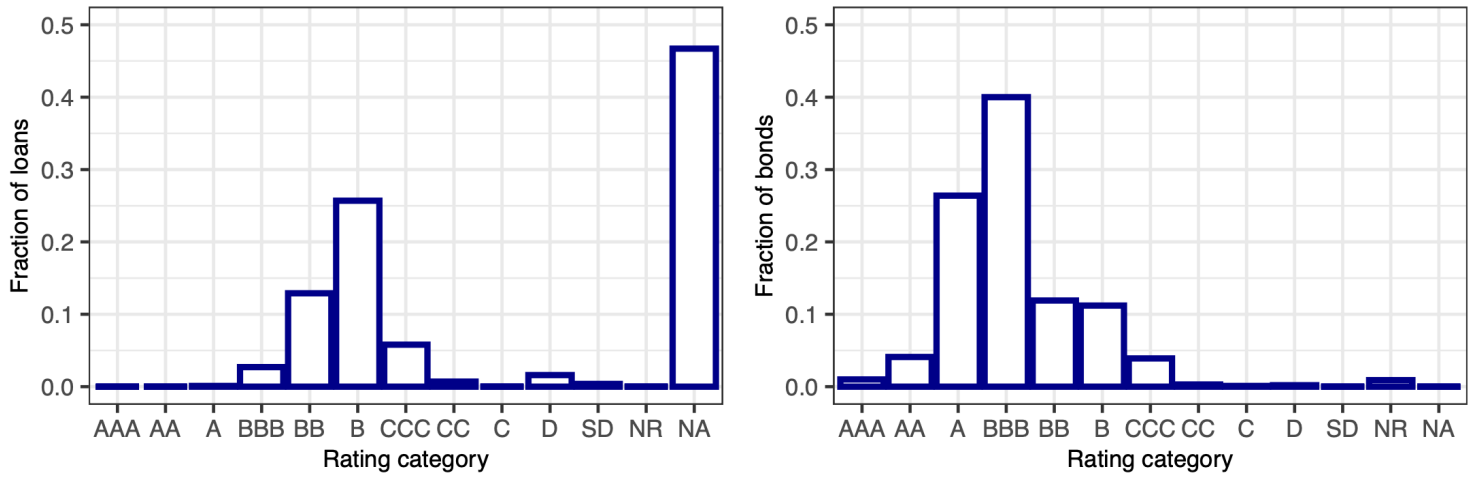
Borrower Rating



- Half of loan market borrowers are private/unrated firms. Limited overlap between bond and loan borrowers

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Borrower Rating

	Industrial production; Forecast horizon: 3 months			
	(1)	(2)	(3)	(4)
ΔS_t^{Loan}[BBB]	−0.101			
	(−1.532)			
ΔS_t^{Loan}[BB]		−0.260		
		(−3.600)		
ΔS_t^{Loan}[B and below]			−0.422	
			(−5.311)	
ΔS_t^{Loan}[Not Available]				−0.410
				(−3.972)
Term Spread	✓	✓	✓	✓
FFR	✓	✓	✓	✓
Adjusted R^2	0.195	0.251	0.345	0.336
Incremental R^2	+ 0.006	+0.062	+0.156	+0.147
Observations	241	241	241	241

- Half of loan market borrowers are private/unrated firms. Limited overlap between bond and loan borrowers
- Repricing of risk by banks may be better reflected in loan spread

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Alternative explanation I: Uncertainty

	Industrial Production; Forecast horizon: 3 months				
	(1)	(2)	(3)	(4)	(5)
ΔS_t^{Loan}	-0.264	-0.385	-0.321	-0.245	-0.489
	(-4.404)	(-5.323)	(-5.039)	(-2.932)	(-3.672)
VIX	-0.351				
	(-3.109)				
EPU Index		-0.106			
		(-1.592)			
FinUn Index			-0.408		
			(-3.383)		
'Recession Index'				-0.500	
				(-4.190)	
PVS Index					0.238
					(1.647)
Term Spread	✓	✓	✓	✓	✓
FFR	✓	✓	✓	✓	✓
Adjusted R^2	0.407	0.341	0.458	0.516	0.255
Observations	241	241	241	241	

- Uncertainty proxies contain predictive power for future outcomes
- Uncertainty can, however, not explain the incremental predictive power of the loan spread

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Alternative explanation II: Sentiment

- Investor sentiment appears important to understand credit spreads:
  - Credit spreads are too narrow during booms and proceed economic downturns (Greenwood and Hanson (2013)), López-Salido, Stein, and Zakrajšek (2017))
  - Investors under-price risk in good times, creating a credit boom. During downturns spreads overract in the opposite direction (Bordalo, Gennaioli, and Shleifer (2018)).
- Our focus in on the *relative* predictive power vis-a-vis bond spreads
- Borrower fundamentals drive relative predictive power of the loan spread (not excess loan premium, which would capture sentiment)

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Size Effect – Literature

- Evidence in the literature that it is the large firms that *drive* the business cycle
  - E.g. Crouzet and Mehrotra (2020), Gabaix (2011)
- On the other hand, smaller firms are more sensitive to changes in economic conditions
  - E.g. Begenau and Salomao (2019), Pflueger, Siriwardane, and Sunderam (2020), Crouzet and Mehrotra (2020)
- Our evidence suggests that smaller firms contain *information* about future business cycle movements

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Alternative weighting schemes

	Industrial production; Forecast horizon: 3 months			
	(1)	(2)	(3)	(4)
ΔS_t^{Loan}	−0.405			
	(−5.600)			
ΔS_t^{Loan}[GDP]		−0.393		
		(−4.941)		
ΔS_t^{Loan}[Industry]			−0.439	
			(−5.944)	
ΔS_t^{Loan}[EFD]				−0.431
				(−4.488)
Term Spread	✓	✓	✓	✓
FFR	✓	✓	✓	✓
Adjusted R^2	0.335	0.328	0.363	0.353
Incremental R^2	+ 0.146	+0.139	+0.173	+0.164
Observations	241	241	241	241

- Thinking about how to aggregate measures from microdata can help improve business cycle forecast.

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