Credit and Liquidity Policies during Large Crises

Mahdi Ebsim
NYU

Miguel Faria-e-Castro
FRB St. Louis

Julian Kozlowski
FRB St. Louis

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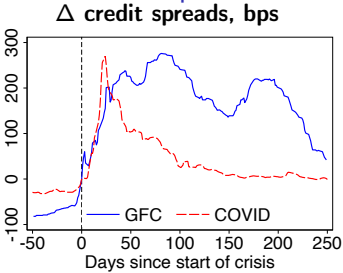
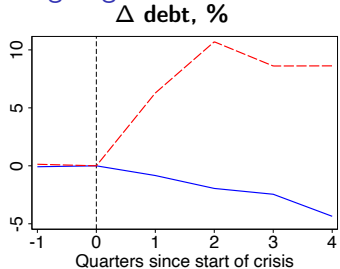
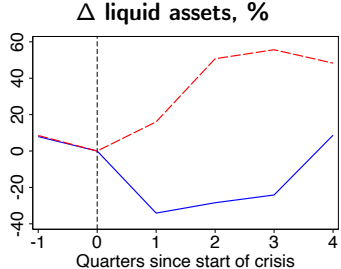
Non-financial corporate business during large crises







Aggregate data

- **GFC**: negative comovement between (i) credit spreads and (ii) debt and liquid assets
- **COVID-19**: positive comovement between (i) credit spreads and (ii) debt and liquid assets

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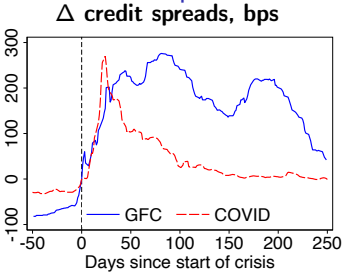

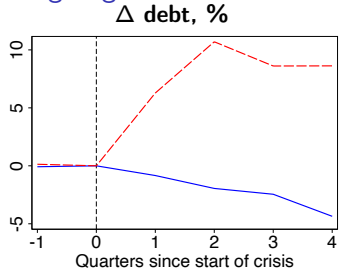

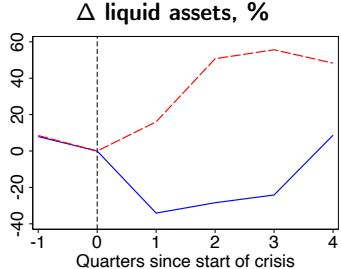

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- Debt is an important determinant of credit spreads both during GFC and COVID
- Liquidity matters during COVID: Firms with more liquid assets had lower increase in spreads

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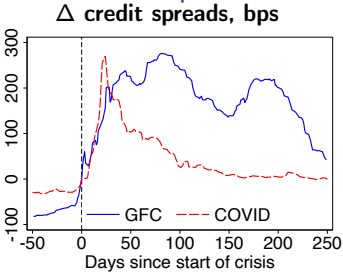

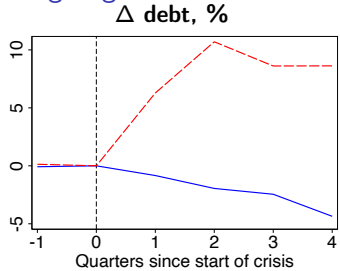

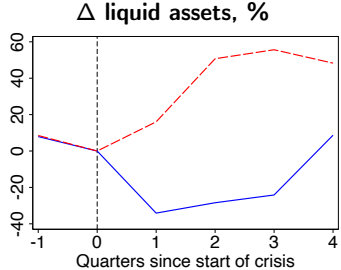

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This paper:

- How do large shocks affect credit spreads, debt, and liquid assets holdings for non-financial firms?
- How effective are credit and liquidity policies during large crises?

Credit and liquidity policies during large crises

Model

- Investment & balance sheet: defaultable debt, liquid assets, and costly short-term loans
- Ex-ante heterogeneous firms: differ in leverage & liquidity needs

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Large crises

- Real+financial: negative comovement between (i) spreads and (ii) debt, liquid assets (GFC)
- +Liquidity: positive comovement between (i) spreads and (ii) debt, liquid assets (COVID)

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Policies

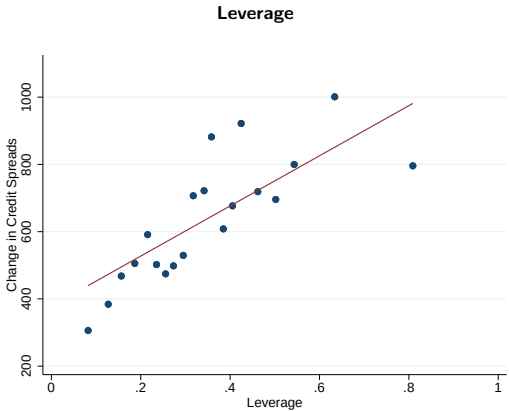
- Corporate Credit facilities allowed firms to borrow and accumulate liquid assets
- Lending programs can be beneficial iff (i) liquidity crisis, and (ii) helps with liquidity needs

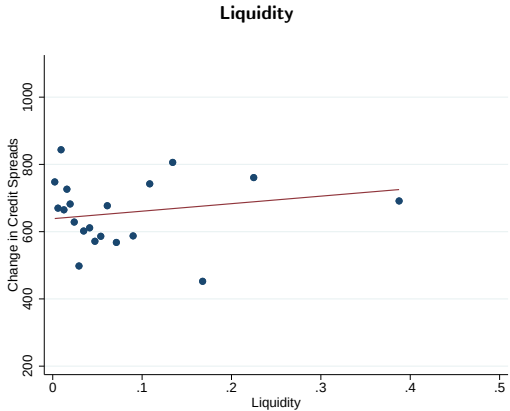
Empirical analysis

Credit spread data ▷ Details

- Maturity-matched corporate bond spreads, following Gilchrist & Zakrajsek (2012)
- Data: Compustat, TRACE, FISD.
- $\sim$ 40k firm-quarter observations, June 2002 to December 2020

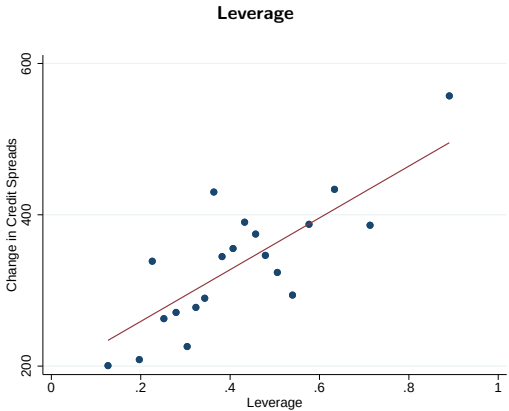
Great Recession

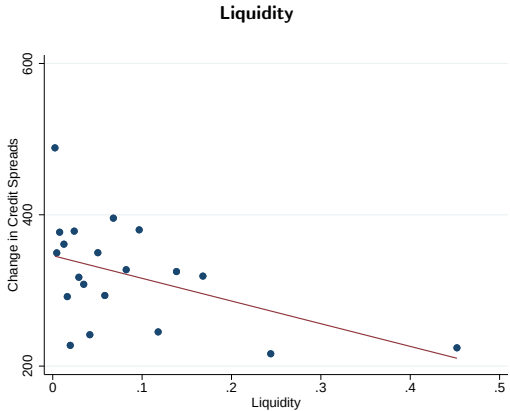




- Firms with higher leverage had a larger increase in spreads
- Liquidity does not seem to matter

COVID-19





- Both leverage and liquidity were important during COVID

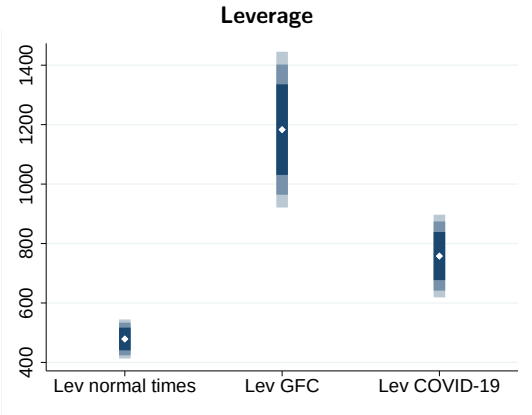
Credit spreads, leverage and liquid assets

- Estimate

$$\text{credit spreads}_{f,t} = \alpha_t + \gamma_f + \underbrace{\sum_{i \in \mathbf{E}} \beta_i \mathcal{I}_{t \in i} \text{liq}_{f,t-2}}_{\text{liquid assets}} + \underbrace{\sum_{i \in \mathbf{E}} \phi_i \mathcal{I}_{t \in i} \text{lev}_{f,t-2}}_{\text{leverage}} + \Phi X_{f,t} + \varepsilon_{f,t}$$

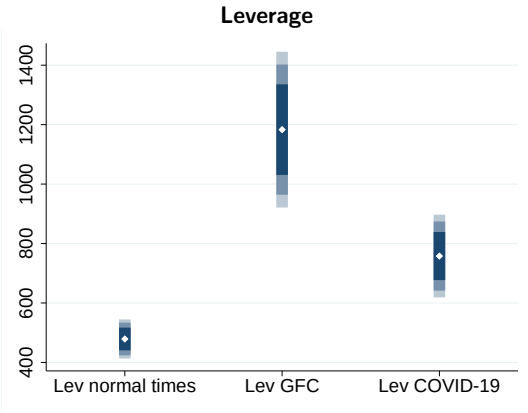
- E indicates if quarter t is:
  1. Normal times
  2. GFC (2008:Q2 - 2009:Q2)
  3. COVID-19 (2020:Q1 - 2020:Q2)
- $X_{f,t}$ includes other firm-time controls (size, etc.)

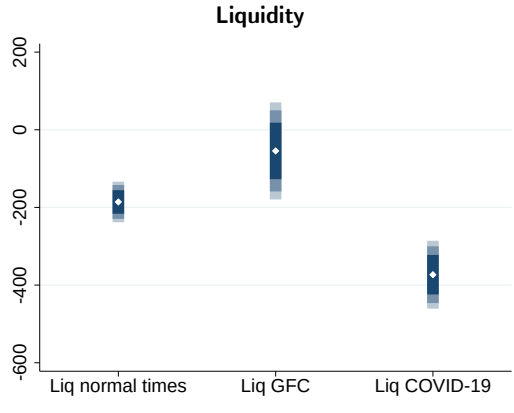
Credit spreads, leverage and liquid assets ▷ Regressions & robustness



- Leverage: important determinant of credit spreads both during GFC and COVID

Credit spreads, leverage and liquid assets ▷ Regressions & robustness



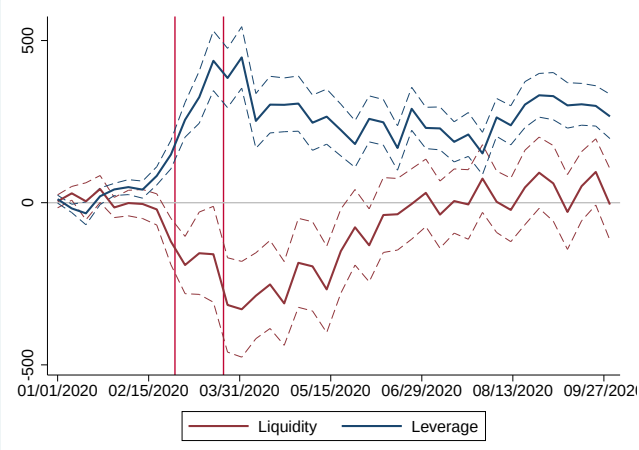


- Leverage: important determinant of credit spreads both during GFC and COVID
- Liquidity matters during COVID: firms with higher liquidity had lower increase in spreads

Event Study: Credit spreads during COVID

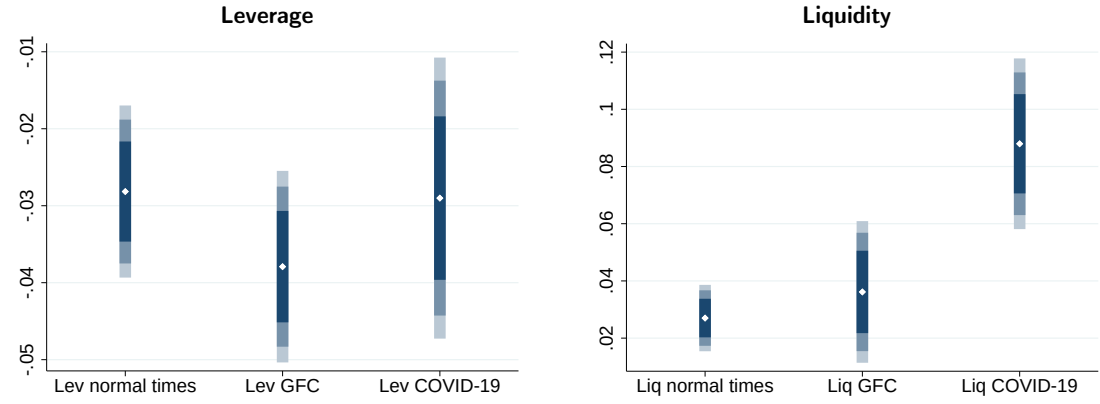
2020 weekly cross-sectional regression:

$$\Delta s_{f,t} = \alpha_s + \beta_t \text{liq}_f + \gamma_t \text{lev}_f + \Gamma' X_f + \varepsilon_{f,t}$$



Notes: The vertical lines correspond to the weeks of February 28th and March 23rd, respectively.

Investment



- Leverage: similar role both during GFC and COVID
- Liquidity matters during COVID: firms with higher liquidity had lower reduction of investment

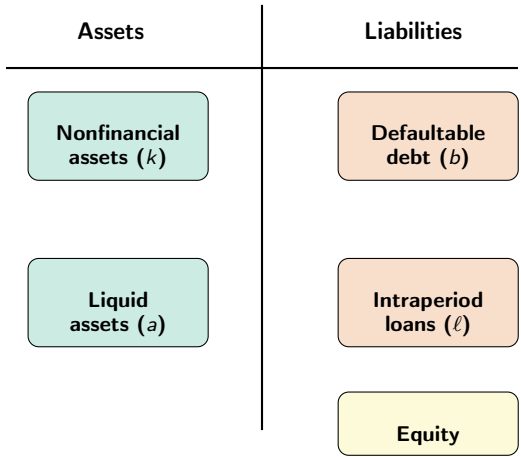
A macro-financial model with liquidity shocks

A macro-financial model with liquidity shocks ▷ Environment

Model of investment with a rich balance sheet:

- Defaultable debt: 1-period bonds, priced by risk-neutral investors (Eaton & Gersovitz '82)
- Liquidity constraint:
  - Firm subject to negative liquidity shocks (e.g., working capital needs)
  - Liquid assets: Dominated in rate of return, but useful to satisfy liquidity needs
  - Can access costly intraperiod loans to satisfy liquidity needs
- Costly equity issuance

Firm's balance sheet



Liquidity constraint

- Liquidity shocks: iid shocks ω

$$\omega = \begin{cases} \overline{\omega} & \text{w.p. } p_{\bar{\omega}} \\ 0 & \text{otherwise} \end{cases}$$

- Firms need to finance working capital ωk at the beginning of the period
  - E.g., trade credit or supply chain disruptions (Boissay et al. 2020, Baqaee and Farhi 2022)
- Can use liquid assets a, and/or take an intraperiod loan ℓ

$$\omega k \leq a + \ell$$

- Cost of borrowing in the intraperiod market: $\mathcal{A}^L(\ell) = \ell r \exp(s_\ell \ell)$

Default

- Firm draws iid extreme-value shocks ε^P and ε^D (e.g., Dvorkin et al., 2021)

$$\mathcal{V}(k, b, a) = \mathbb{E}_{\varepsilon^P, \varepsilon^D, \omega} \left[\max \left\{ V(k, b, a, \omega) + \varepsilon^P, V^D(k, b, a, \omega) + \varepsilon^D \right\} \right]$$

- Normalize $V^D = 0$
- $\varepsilon^P - \varepsilon^D$ follows mean-zero logistic distribution with scale κ. Probability of repayment:

$$\mathcal{P}(k, b, a) = \mathbb{E}_{\omega} \left[\frac{\exp[V(k, b, a, \omega)/\kappa]}{1 + \exp[V(k, b, a, \omega)/\kappa]} \right]$$

- Bond price: Risk-neutral lenders + frictions:

$$q\left(k', b', a'\right) = (1 + \chi) \frac{\mathcal{P}\left(k', b', a'\right)}{1 + r}$$

χ summarizes frictions in debt markets (e.g., the benefits of debt financing due to tax shield)

$$V(k,b,a,\omega) = \max_{k',b',a',\ell \geq 0} div \overbrace{-\frac{\rho}{2}\max\{-div,0\}^2}^{\text{costly equity issuance}} + \beta\, \mathcal{V}(k',b',a')$$

$$\text{flow dividend} : div = \pi(k) \underbrace{+(1-\delta)k - k' - \frac{\psi}{2}\left(\frac{k'-k}{k}\right)^2}_{\text{capital}} \overbrace{-b + q\left(k',b',a'\right)b'}^{\text{debt}}$$

$$\underbrace{-\mathcal{A}^L(\ell)}_{\text{intraperiod loan}} \overbrace{+a - q^a a'}^{\text{liquid assets}}$$

$$\text{static profit} : \pi(k) = \max_n z^{1-\nu} k^{\alpha} n^{\nu} - wn$$

$$\text{liq. constraint} : \omega k \leq a + \ell$$

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Firm's problem ▷ Demand for liquid assets

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Crises: Real (z), liquidity (ω), and financial (χ)

Calibration

Quantitative strategy & calibration

1. Steady state calibration

1. Some common external parameters ▷ External Calibration
2. Four types of firms: high/low leverage & high/low liquidity
3. Target aggregate and cross-sectional moments in normal times ▷ Aggregate, ▷ Cross-section
4. Calibration matches non-targeted moments ▷ Non-targeted Moments

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2. Large crises: COVID and GFC

1. Large unexpected shocks: real (z), liquidity (ω), and/or financial (χ) w/ persistence ζ
2. Use aggregate and cross-sectional moments to compare data during GFC and COVID

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3. Credit and lending policies during large crises

- Use the calibrated model and crises to evaluate policies

Crisis Experiments

The COVID-19 crisis: Aggregate moments

Aggregate targets:

1. 4.33% drop in GDP (real shock, z)
2. 270 bps rise in credit spreads (financial shock, χ)
3. 50% rise in liquid assets (liquidity shock, ω)

	Variation wrt SS
GDP, percent	-4.33
Spreads, bps	270.00
Liquid assets, percent	50.73
Debt owed, percent	51.59

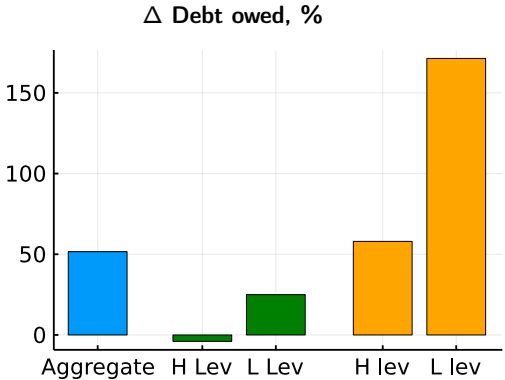
- Positive comovement between (i) spreads and (ii) debt and liquid assets

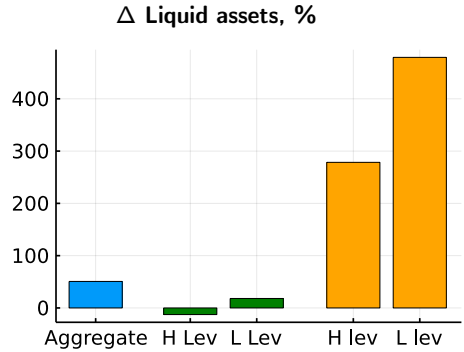
The COVID-19 crisis: Cross-sectional elasticities

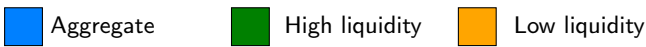
	Data	Model
Spreads wrt leverage	757.87	531.53
Spreads wrt liquidity	-373.24	-302.96
Investment rate wrt leverage	-2.90	-1.69
Investment rate wrt liquidity	8.80	7.26

- Model replicates non-targeted cross-sectional elasticities during COVID
- Worse outcomes for firms with:
  - low liquid assets
  - high leverage

Cross-sectional responses on debt and liquid assets







- Firms with low liquid assets: borrow and accumulate liquid assets
- Firms with high liquid assets: more muted response

Evidence on cross-sectional liquidity responses

Model: Low-liquidity firms increase more their holdings of liquid assets

Data: Regress growth rate of liquid assets on (lagged) liquid assets

$$\frac{a_{f,t} - a_{f,t-2}}{a_{f,t-2}} = \alpha_t + \beta_t \text{liq}_{f,t-2} + \phi_t \text{lev}_{f,t-2} + \Gamma_t' X_{f,t-2} + \varepsilon_{f,t}$$

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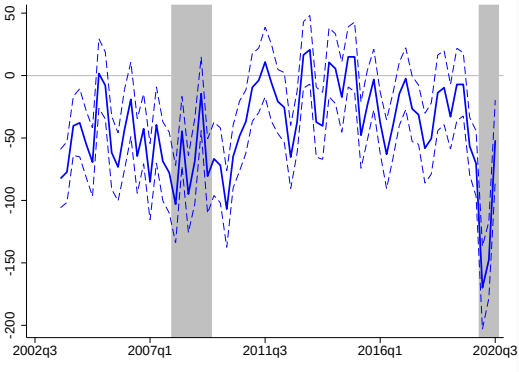

Low liquidity firms rapidly increase their liquid asset holdings during COVID (as in the model)

Shock interaction and amplification

	Real	Financial	Liquidity	Benchmark (all)	Interaction
Spreads, bps	3.28	240.21	22.33	270.00	4.18
GDP, percent	-4.33	0.00	0.00	-4.33	0.00
Liquid assets, percent	-0.68	-30.94	99.58	50.73	-17.24
Debt owed, percent	0.05	-61.34	90.99	51.59	21.90
Default prob., pp	0.04	0.02	0.22	0.29	0.01

Feed each shock one by one. The fourth column presents the results for the benchmark case.

- Real shock $\rightarrow$ GDP
- Financial shock $\rightarrow$ Spreads, negative co-movement
- Liquidity shock $\rightarrow$ Liquid assets, debt and default
- Liquidity shock: Positive co-movement between (i) spreads, and (ii) debt and liquid assets

The GFC and the role of liquidity

Aggregate targets:

1. 3.81% drop in GDP (real shock, z)
2. 258 bps rise in credit spreads (financial shock, χ)
3. No liquidity shock

	Variation wrt SS
Spreads, bps	258.00
GDP, percent	-3.81
Liquid assets, percent	-33.71
Debt owed, percent	-61.01

- Negative comovement between (i) spreads and (ii) debt and liquid assets

The GFC: Cross-sectional elasticities

	Data	Model
Spreads wrt leverage	1183.19	527.55
Spreads wrt liquidity	-54.49	30.64
Investment rate wrt leverage	-3.80	-2.32
Investment rate wrt liquidity	3.60	-0.82

- Model without liquidity shock replicates non-targeted cross-sectional elasticities during GFC

The GFC: Cross-sectional elasticities

	Data	Model
Spreads wrt leverage	1183.19	527.55
Spreads wrt liquidity	-54.49	30.64
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Investment rate wrt liquidity	3.60	-0.82

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- GFC: financial + real
- COVID-19: liquidity + financial + real
- Aggregate shocks are typically unobservable, but credit spreads are available at daily frequency
- Cross-sectional elasticities (+ structural model) can help identify the aggregate shocks

Policy interventions

Corporate credit facilities during COVID

- Primary and Secondary Market Corporate Credit Facilities (CCF) during COVID
- Outright purchases of corporate bonds by eligible US companies
- Model CCF as a subsidy to corporate debt

$$q^{CCF}(k', a', b') = (1 + \chi + \chi^{CCF}) \frac{\mathcal{P}(k', a', b')}{1 + r}.$$

- CCF caused a 70 bps redction on credit spreads (Gilchrist Wei Yue and Zakrajŝek 2020)
- Benchmark exercise included CCF, we now evaluate the counterfactual of no policy

CCF during COVID

	With Policy	Without Policy
Aggregate		
Spreads, bps	270.00	340.00
GDP, percent	-4.33	-4.33
Liquid assets, percent	50.73	34.60
Debt owed, percent	51.59	43.30
Cross-sectional elasticities		
Spreads wrt leverage	531.53	531.51
Spreads wrt liquidity	-302.96	-310.92

- Smaller increase in liquid assets and debt
- Higher elasticities with respect to liquidity $\rightarrow$ the effects might be heterogeneous across firms

The cross-sectional effects of CCF

	Δ Spreads, bps	Δ Liquid assets, percent	Δ Debt owed, percent	Value of Policy, % of EBITDA
Aggregate	70.00			
High lev, high liq	69.63			
Low lev, high liq	69.64			
High lev, low liq	70.36			
Low lev, low liq	70.37			

- Similar increase in spreads of 70 bps

The cross-sectional effects of CCF

	Δ Spreads, bps	Δ Liquid assets, percent	Δ Debt owed, percent	Value of Policy, % of EBITDA
Aggregate	70.00	-16.13		
High lev, high liq	69.63	-8.99		
Low lev, high liq	69.64	-9.66		
High lev, low liq	70.36	-59.95		
Low lev, low liq	70.37	-69.41		

- Firms with low liquidity see a larger drop in liquid assets
- CCF is effective at allowing low liquidity firms to borrow and accumulate liquid assets

The cross-sectional effects of CCF

	Δ Spreads, bps	Δ Liquid assets, percent	Δ Debt owed, percent	Value of Policy, % of EBITDA
Aggregate	70.00	-16.13	-8.29	
High lev, high liq	69.63	-8.99	-6.27	
Low lev, high liq	69.64	-9.66	-10.91	
High lev, low liq	70.36	-59.95	-6.41	
Low lev, low liq	70.37	-69.41	-12.31	

- Firms with low leverage see a larger drop in debt without policy

The cross-sectional effects of CCF

	Δ Spreads, bps	Δ Liquid assets, percent	Δ Debt owed, percent	Value of Policy, % of EBITDA
Aggregate	70.00	-16.13	-8.29	0.94
High lev, high liq	69.63	-8.99	-6.27	0.96
Low lev, high liq	69.64	-9.66	-10.91	0.45
High lev, low liq	70.36	-59.95	-6.41	1.34
Low lev, low liq	70.37	-69.41	-12.31	1.02

- The aggregate value of the policy is of about 1% of EBITDA
- Firms with lower liquidity and/or higher leverage benefit more from the CCF

Lending Programs

- Lending programs (LP) during COVID-19: PPP, SBA, and MSLP.
- The type of firms that we focus on were either not eligible for many of these programs (such as the PPP or the SBA), or used them in a very limited capacity
- What would have happened if LP were used by large public firms?

Lending Programs

- Lending programs (LP) during COVID-19: PPP, SBA, and MSLP.
- The type of firms that we focus on were either not eligible for many of these programs (such as the PPP or the SBA), or used them in a very limited capacity
- What would have happened if LP were used by large public firms?

Modeling LP:

- Loan size of \$300 million, interest rate LIBOR + 3% (Brauning and Paligorova, 2021)
- Increase resources at t, and liabilities at $t+1$
- Benchmark: Helps with liquidity constraint (consider if not later)

$$\omega k \leq a + \ell + L$$

LP during COVID

Policy	Spreads, bps	Liquid assets, percent	Debt owed, percent	Value of Policy, % of EBITDA
CCF	270.00	50.73	51.59	0.94
CCF+LP	265.36	37.41	39.44	8.41

- Lower increase in liquid assets and debt
- The endogenous decrease in borrowing contributes to the reduction in credit spreads
- Very large value, decompose in the next slide.

▷ Cross-section

LP & liquidity

Policy	Spreads, bps	Liquid assets, percent	Debt owed, percent	Value of Policy, % of EBITDA
LP	335.87	20.73	31.08	7.60
No liquidity shock	314.43	-41.10	-64.31	0.28
No liquidity benefit	339.91	34.79	43.53	0.13

- Much lower benefits without liquidity shock (GFC)
- Very low value if loan does not provide liquidity
- The relatively high value of LP crucially relies on:
  1. the presence of a liquidity crisis
  2. its ability to circumvent the liquidity constraint
- LP without liquidity generates negative value for low-leverage & high-liquidity firms ▷ cross-section

Conclusions

Empirical analysis of credit spreads and firm financials during two large crises

- Aggregate debt and liquid assets moved in opposite directions during the last two crises
- **GFC** key variable: leverage
- **COVID** key variable: liquid assets

Quantitative model calibrated to match firm distribution of liquidity and leverage

- Liquidity shocks essential to explain data during COVID
- Corporate Credit facilities allowed firms to borrow and accumulate liquid assets
- Lending programs can be beneficial iff (i) liquidity crisis, and (ii) helps with liquidity needs

Cross-sectional data, available in real time, useful to identify the underlying shock

APPENDIX

Literature

- **Role of firm heterogeneity in the response to shocks**: Kudlyak Sanchez '17; Jeenas '19; Ottonello Winberry '20
  New: Large crisis, and/or liquid assets

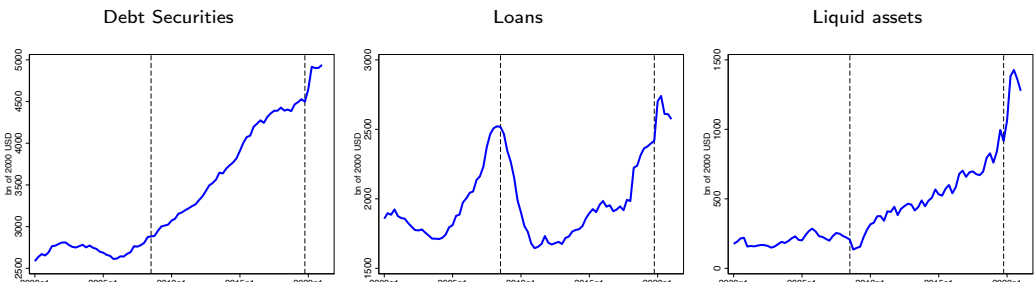
- **Modeling of firm's balance sheet & liquid assets**: Bolton Chen Wang '14; Nikolov Schmid Steri '19; Bacchetta Benhima Poilly '19; Jeenas '19
  New: Defaultable debt & liquid assets

- **Credit Spreads during COVID-19**: Kargar et al. '20; Boyarchenko et al. '20; Gilchrist et al. '20
  New: Cross-sectional analysis with Compustat data

- **Policy and firm heterogeneity during COVID-19**: Crouzet Gourio '20; Elenev et al. '20; Crouzet Tourré '21
  New: Liquidity policies

Empirics

Debt and liquid assets ▷ Back



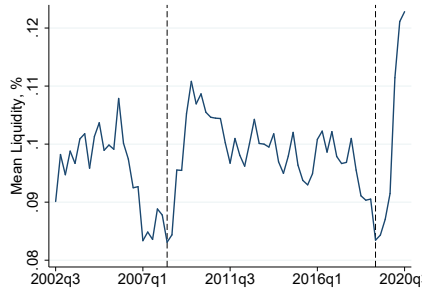
Source: Financial Accounts of the United States, FRB

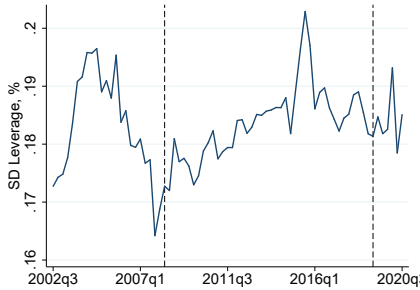
Data ▷ Back

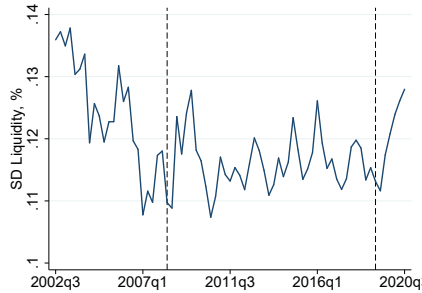
Variable	Mean	SD	Min	Median	Max
Number of bonds per firm/week	4.34	9.25	1.00	2.00	425.00
Market value of issue ($ mil)	548.55	582.73	1.80	400.00	15000.00
Maturity at issue (years)	9.80	6.71	1.00	9.25	30.00
Coupon (pct)	5.55	2.26	0.00	5.55	19.00
Credit Spread (basis points)	261.39	333.19	5.00	155.90	3499.93
Nominal yield (basis points)	575.68	446.87	17.55	494.09	10434.36
Number of observations	3,005,602				
Number of bonds	18,256				
Number of firms	2,019				
Callable (pct)	0.73				

- Bond yields sourced from TRACE, bond characteristics from Mergent FISD
- Sample selection: fixed- and zero-coupon bonds issued by US corporates, amount at issuance $>$ $ 1 M, maturity at issuance between 1 and 30 years

Data: Leverage and liquidity







Credit spreads, liquid assets and leverage ▷ Back

	(1)	(2)	(3)	(4)
Leverage				
Normal	478.842***	479.817***	435.049***	
	(32.942)	(32.859)	(30.977)	
Before GFC				340.031***
				(38.749)
After GFC				549.198***
				(34.137)
GFC	1183.187***	1184.709***	1138.658***	1170.893***
	(131.358)	(130.837)	(133.092)	(133.736)
COVID-19	757.864***	758.117***	691.565***	788.070***
	(69.725)	(69.610)	(59.664)	(69.337)
Liquidity				
Normal	-185.914***	-185.759***	-182.068***	
	(26.131)	(26.154)	(28.934)	
Before GFC				-165.340***
				(39.406)
After GFC				-195.488***
				(24.823)
GFC	-54.488	-55.665	-18.865	-57.279
	(62.667)	(62.961)	(67.885)	(61.131)
COVID-19	-373.238***	-373.683***	-347.407***	-384.071***
	(43.854)	(43.974)	(44.106)	(42.353)
Controls	Size	Size, Maturity	Size, Maturity, EBITDA	Size, Maturity
N	46534	46534	44432	46534
R^2	0.67	0.67	0.68	0.67

Economic Significance: Spreads ▷ Back

	$+1\sigma$ leverage	$+1\sigma$ liquid assets
Normal	144 bps	-21 bps
GFC	224 bps	-5 bps
COVID	91 bps	-43 bps

Investment, liquid assets and leverage ▷ Back

	(1)	(2)	(3)	(4)
Leverage				
Normal	-0.028***	-0.028***	-0.021***	
	(0.006)	(0.006)	(0.007)	
Before GFC				-0.035***
				(0.005)
After GFC				-0.025***
				(0.007)
GFC	-0.038***	-0.038***	-0.028***	-0.039***
	(0.006)	(0.006)	(0.006)	(0.006)
COVID-19	-0.029***	-0.029***	-0.021**	-0.028***
	(0.009)	(0.009)	(0.010)	(0.009)
Liquidity				
Normal	0.027***	0.027***	0.026***	
	(0.006)	(0.006)	(0.006)	
Before GFC				0.014**
				(0.006)
After GFC				0.034***
				(0.006)
GFC	0.036***	0.036***	0.038***	0.034***
	(0.012)	(0.012)	(0.013)	(0.012)
COVID-19	0.088***	0.088***	0.082***	0.092***
	(0.015)	(0.015)	(0.015)	(0.015)
Controls	Size	Size, Maturity	Size, Maturity, EBITDA	Size, Maturity
N	43126	43126	42596	43126
R^2	0.099	0.099	0.11	0.099

Coefficient tests ▷ Back

$$y_{f,t} = \alpha_t + \gamma_f + \beta_{E(t)}\, \text{liq}_{f,t-r} + \gamma_{E(t)}\, \text{lev}_{f,t-r} + \Phi X_{f,t} + \varepsilon_{f,t}$$

Coefficient equality tests:

$$\beta_{\text{Normal}} = \beta_{\text{GFC}}, \beta_{\text{Normal}} = \beta_{\text{COVID}}$$
$$\gamma_{\text{Normal}} = \gamma_{\text{GFC}}, \gamma_{\text{Normal}} = \gamma_{\text{COVID}}$$

	Credit Spreads	Investment Rate
Leverage		
GFC	0.00	0.25
COVID-19	0.00	0.92
Liquidity		
GFC	0.05	0.39
COVID-19	0.00	0.00

Model

Environment & technology ▷ Back

- Time is discrete and infinite, $t = 0, 1, \ldots$
- Finite set of firm types, $i = 1, \ldots, N$ with mass $\lambda_i, \sum_{i=1}^{N} \lambda_i = 1$
- Firms produce according to a DRS production function that employs capital and labor

$$y = z^{1-\nu} k^{\alpha} n^{\nu}, \alpha + \nu < 1$$

- Investment in capital is subject to convex adjustment costs

$$\mathcal{A}^{K}(k', k) = \frac{\psi}{2} \left(\frac{k' - k}{k} \right)^{2} k$$

- Firms have constant productivity z, subject to two iid shocks:
  1. **Default Shocks** ε, "preference" shocks that follow Extreme Value distribution
  2. **Liquidity Shocks** ω, follow a binomial distribution, $\omega = \omega_i$ w.p. p_ω, zero otherwise
- State variables:

$$s = \left(\underbrace{k}_{\text{capital}}, \overbrace{b}^{\text{debt}}, \underbrace{a}_{\text{liq. assets}}, \overbrace{\omega}^{\text{liq shock}}, \underbrace{\varepsilon}_{\text{pref shock}} \right)$$

Demand for liquid assets ▷ Back

- Assume no cost to issue equity ($\rho = 0$) and no default.

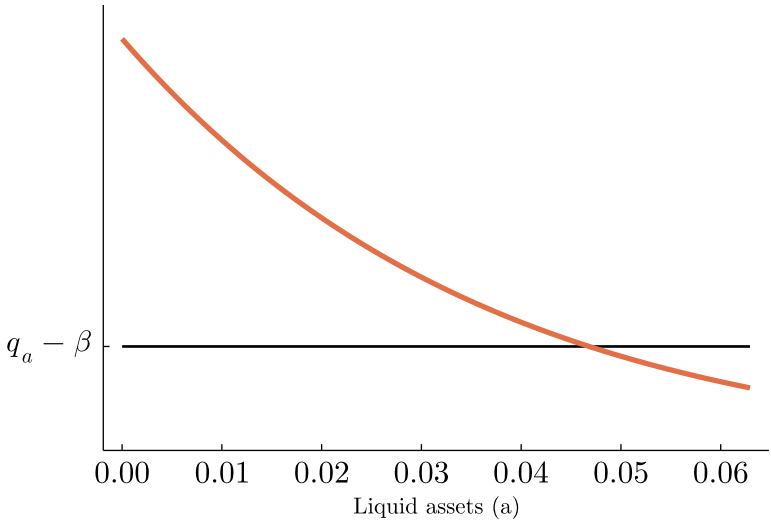
- Euler equation

$$q^a = \beta \left(1 + p_{\bar{\omega}} \frac{\partial \mathcal{A}^L(\ell')}{\partial \ell'}\right)$$

$$\frac{\partial \mathcal{A}^L(\ell')}{\partial m'} = r \exp\left(s_\ell\left(\bar{\omega}k' - a'\right)\right)\left(1 + s_\ell\left(\bar{\omega}k' - a'\right)\right)$$

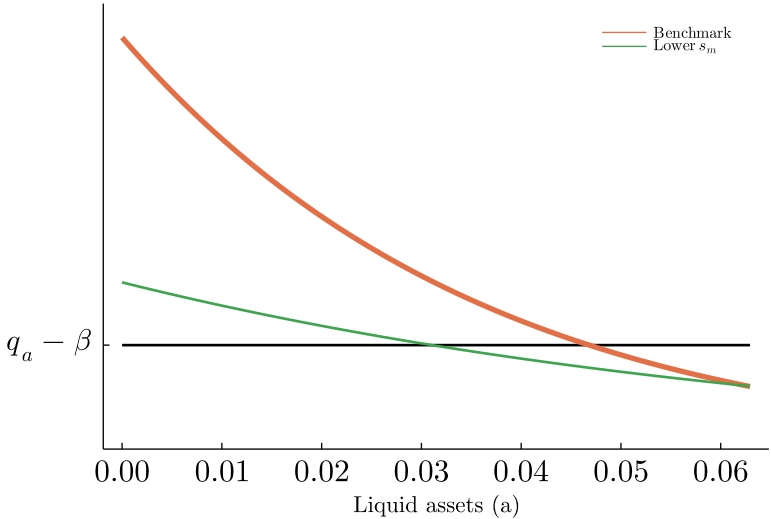
Demand for liquid assets ▷ Back

$$q^a - \beta = \beta p_{\tilde{\omega}} \frac{\partial \mathcal{A}^L(\ell')}{\partial \ell'}$$



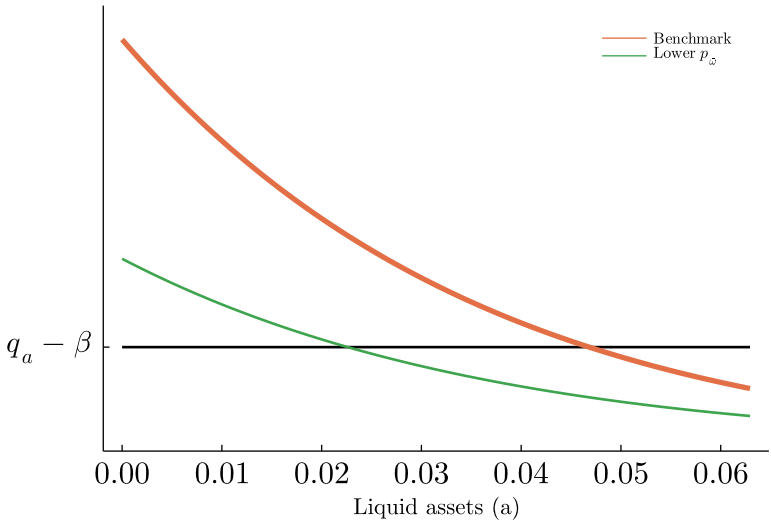
Demand for liquid assets ▷ Back

$$q^a - \beta = \beta p_{\tilde{\omega}} \frac{\partial \mathcal{A}^L(\ell')}{\partial \ell'}$$



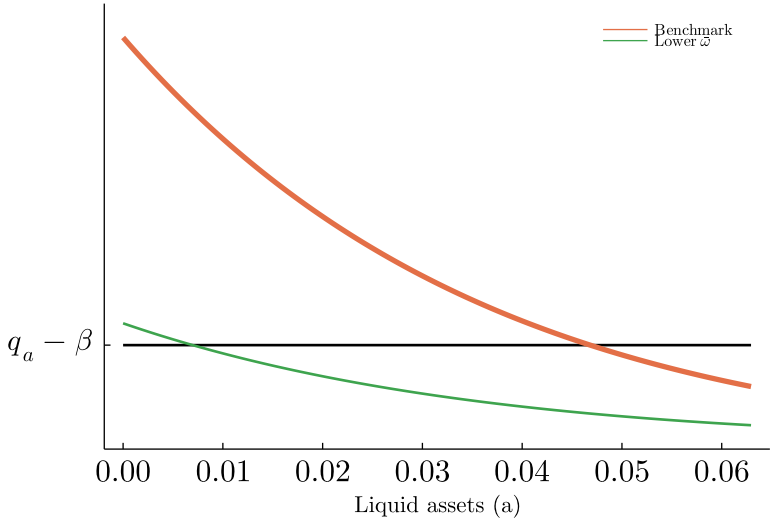
Demand for liquid assets ▷ Back

$$q^a - \beta = \beta p_{\tilde{\omega}} \frac{\partial \mathcal{A}^L(\ell')}{\partial \ell'}$$



Demand for liquid assets ▷ Back

$$q^a - \beta = \beta p_{\bar{\omega}} \frac{\partial \mathcal{A}^L(\ell')}{\partial \ell'}$$



Liquid assets decreasing for:

- Lower s_ℓ
- Lower $p_{\bar{\omega}}$
- Lower $\bar{\omega}$

Externally calibrated parameters ▷ Back

Parameter	Value	Description
Production		
α	0.2550	Capital share, Gilchrist et al. (2014)
ν	0.5950	Labor share, Gilchrist et al. (2014)
δ	0.0963	Depreciation rate, Gilchrist et al. (2014)
ψ	0.4550	Capital adjustment, Cooper and Haltiwanger (2006)
ρ	3.0000	Zero equity issuance in SS
w	1.0000	Wage, normalization
z	1.0000	TFP, normalization
Prices		
β	0.9500	Discount factor
r	$1/\beta - 1$	Interest rate
q^a	1.0000	Price of liquid assets

Internally calibrated I: Aggregate moments related to liquidity needs ▷ Back

Slope of intra-period borrowing cost s_ℓ $\rightarrow$ Intra-period borrowing ratio $\ell/(\ell + b')$ (credit lines)
Probability of needs for liquidity $p_{\bar{\omega}}$ $\rightarrow$ Cost of liquidity (spread on prime loan rates)

Parameter	Value	Target Moment	Data	Model
s_ℓ	19.1	$\frac{\ell}{\ell+b'}$	15.0%	15.0%
$p_{\bar{\omega}}$	0.555	$r \times [\exp(s_\ell m) - 1]$	3.1%	3.1%

Internally calibrated II: Cross-sectional heterogeneity ▷ Back

4 types of firms (Compustat data): high/low leverage (48% or 26%) and liquidity (11% or 1.6%)

Liquidity risk $\bar{\omega}$ → liquid asset holdings $a/(k+a)$
Frictions in debt markets χ → leverage $b/(k+a)$
Extreme-value shocks, scale κ → credit spreads $1/q-(1+r)$

		High lev high liq	Low lev high liq	High lev low liq	Low lev low liq
Debt preference	χ	0.0165	0.0052	0.0157	0.0054
Liquidity needs	$\bar{\omega}$	0.2053	0.1763	0.0959	0.0694
Idiosyncratic risk	κ	0.3589	0.2953	0.3809	0.3180
Mass	λ	0.2117	0.2877	0.3094	0.1913
Leverage	*Data*	0.4820	0.2580	0.4820	0.2580
	Model	0.4864	0.2574	0.4860	0.2579
Liquidity	*Data*	0.1080	0.1080	0.0160	0.0160
	Model	0.1080	0.1081	0.0160	0.0160
Spreads	*Data*	198.51	91.26	215.61	108.36
	Model	198.68	91.23	216.61	108.29

Non-targeted moments ▷ Back

	Data		Model
	2007Q2	2019Q4	
Income to Assets	13.40	11.10	14.38
Debt to Income	2.21	3.24	2.61
Default rate	3.00	3.00	2.51

Figure 4: Individual Parameter Identification

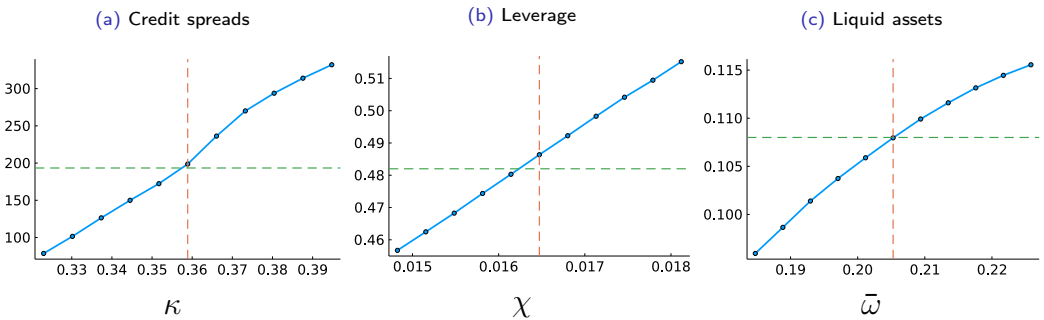
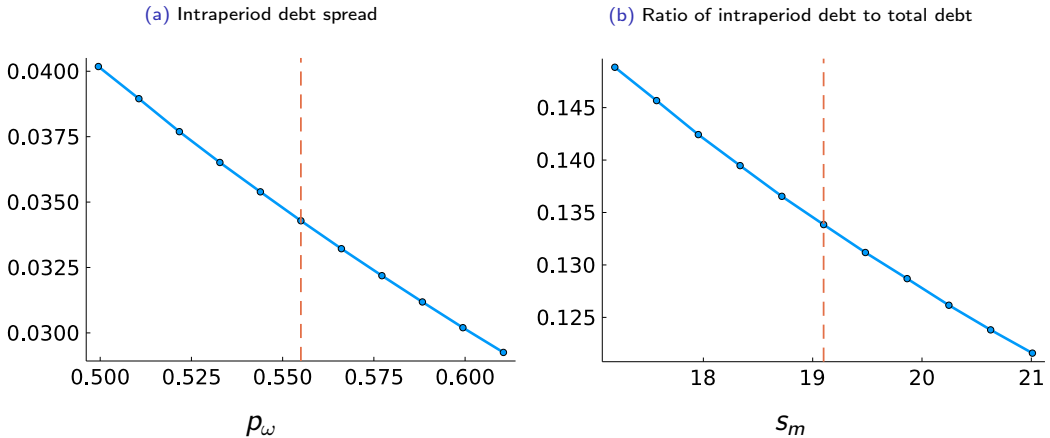


Figure 6: Common Parameter Identification



Cross-sectional Effects of LP ▷ Back

Policy	Spreads, bps	Liquid assets, percent	Debt owed, percent	Value of Policy, % of EBITDA
High leverage, high liquidity				
CCF	316.85	-12.67	-3.97	0.96
CCF+LP	313.13	-17.52	-9.69	4.14
Low leverage, high liquidity				
CCF	191.48	18.12	24.96	0.45
CCF+LP	190.36	11.46	13.06	4.68
High leverage, low liquidity				
CCF	338.28	278.46	57.98	1.34
CCF+LP	330.63	223.55	47.40	10.15
Low leverage, low liquidity				
CCF	225.82	479.23	171.35	1.02
CCF+LP	219.73	399.45	144.00	15.93

- LP valuable for firms with low liquidity
- CCF helped firms with high leverage (conditional on liquidity)

Lending Programs and Liquidity ▷ Back

Policy	Spreads, bps	Liquid assets, percent	Debt owed, percent	Value of Policy, % of EBITDA
High leverage, high liquidity				
LP	384.32	-26.34	-15.84	3.28
No liquidity shock	375.11	-45.97	-58.34	0.43
No liquidity benefit	386.34	-21.48	-10.02	0.21
Low leverage, high liquidity				
LP	259.59	0.43	1.32	4.34
No liquidity shock	252.40	-25.82	-81.96	0.13
No liquidity benefit	261.12	8.72	14.48	-0.01
High leverage, low liquidity				
LP	402.31	164.37	41.03	8.95
No liquidity shock	367.56	-100.00	-51.29	0.40
No liquidity benefit	408.45	218.32	51.64	0.25
Low leverage, low liquidity				
LP	289.50	331.73	132.21	15.11
No liquidity shock	254.64	-91.97	-79.27	0.14
No liquidity benefit	296.16	409.79	159.34	0.05