# Credit and Liquidity Policies during Large Crises


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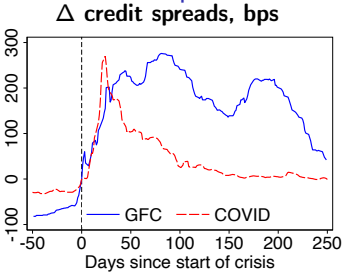
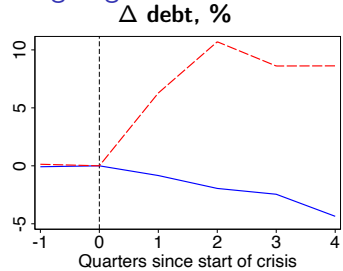
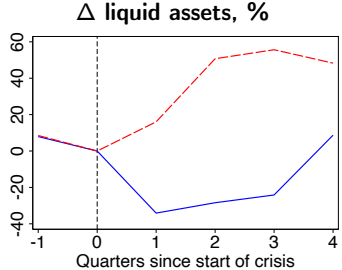
Stabilization policies: Lessons from the COVID-19 crisis and prospects for future policy strategies

December 13, 2021

# 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

**Cross-section**

- 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

**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

**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)

**Policies**

- Credit policies (e.g. CCF): credit spreads $\downarrow$, borrowing $\uparrow$, bankruptcies $\sim$
- Liquidity policies (e.g. PPP): credot spreads $\sim$, borrowing $\downarrow$, bankruptcies $\downarrow$
- State dependence: liquidity policies a bad idea against real or financial shocks

# Empirical analysis

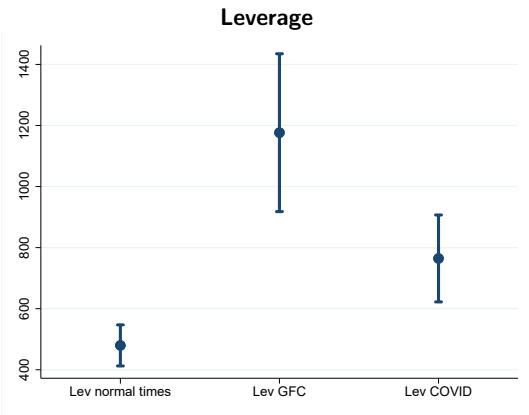
# Credit spreads, leverage and liquid assets

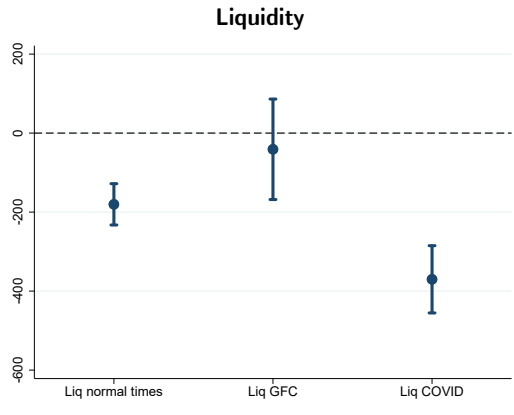
- Maturity-matched corporate bond spreads, following Gilchrist & Zakrajsek (2012)
- $\sim$ 40k firm-quarter observations, June 2002 to December 2020 ▷ Details
- Estimate

$$\text{credit spreads}_{f,t} = \alpha_t + \gamma_f + \underbrace{\beta_{E(t)}\, \text{liq}_{f,t-2}}_{\text{liquid assets}} + \underbrace{\gamma_{E(t)}\, \text{lev}_{f,t-2}}_{\text{leverage}} + \Phi X_{f,t} + \varepsilon_{f,t}$$

- $E(t)$ 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
- Liquidity matters during COVID: firms with higher liquidity had lower increase in spreads

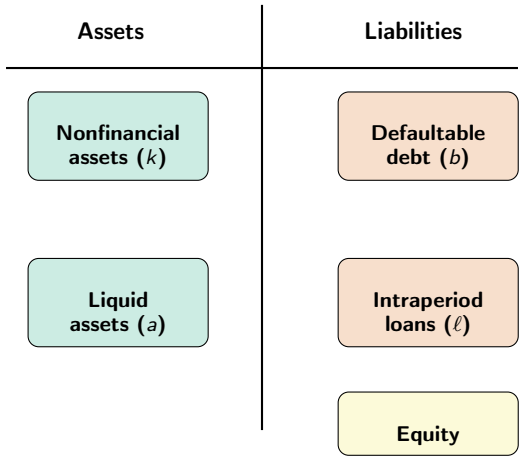
# A macro-financial model with liquidity shocks

# A macro-financial model with liquidity shocks

**Model** of investment with a rich balance sheet: ▷ Environment

- 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 $\omega$

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

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

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

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

# Default

- Firm draws iid extreme-value shocks $\varepsilon^P$ and $\varepsilon^D$ (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 $\kappa$. 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:

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

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

# Firm's problem

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

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

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

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

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

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

Crises: Real ($z$), liquidity ($\omega$), and financial ($\chi$)

▷ Demand for liquid assets

# 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 ▷ Internal Calibration I, ▷ Internal Calibration II
4. Calibration matches untargeted moments ▷ Untargeted Moments

**2. Large crises**

1. Large unexpected shocks: real ($z$), liquidity ($\omega$), and/or financial ($\chi$) w/ persistence $\zeta$
2. Use aggregate and cross-sectional moments to compare data during GFC and COVID

**3. Credit and liquidity policies during large crises**

- Use the calibrated model and crises to evaluate credit and liquidity policies

# Crisis Experiments

# Aggregate response to real, financial, and liquidity shocks

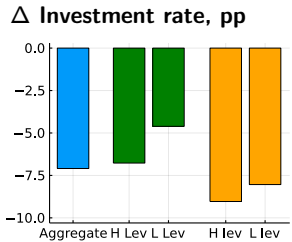
Benchmark targets for shocks (COVID-19)

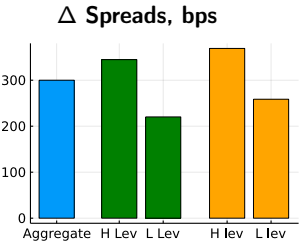
1. 5% drop in GDP (real shock, $z$)
2. 300 bps rise in credit spreads (financial shock, $\chi$)
3. 50% rise in liquid assets (liquidity shock, $\omega$)

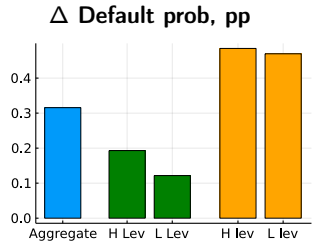
| | *Variation wrt SS* |
|---|---|
| Spreads, bps | 300.00 |
| GDP, percent | -5.00 |
| Liquid assets, percent | 50.00 |
| Debt owed, percent | 52.10 |
| Investment rate, pp | -7.09 |
| Default prob., pp | 0.32 |

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

# Cross-sectional responses




Aggregate  High liquidity  Low liquidity

Worse outcomes for firms with:

- low liquid assets
- high leverage

▷ Debt and Liquidity, ▷ Empirical evidence on responses

# The effects of liquidity shocks: Aggregate Implications

| | Benchmark | No Liquidity |
|---|---|---|
| Spreads, bps | 300.00 | 272.88 |
| GDP, percent | -5.00 | -5.00 |
| Liquid assets, percent | 50.00 | -36.65 |
| Debt owed, percent | 52.10 | -62.01 |
| Investment rate, pp | -7.09 | -4.39 |
| Default prob., pp | 0.32 | 0.06 |

- COVID-19: Benchmark (liquidity + financial + real)
- GFC: No Liquidity (financial + real)

▷ No Financial, No Real

# The effects of liquidity shocks: Cross-sectional elasticities

| | Model | | Data | |
|---|---|---|---|---|
| | Benchmark | No Liquidity | COVID-19 | GFC |
| Elasticity of spreads wrt leverage | 525.39 | 524.00 | 764.59 | 1176.47 |
| Elasticity of spreads wrt liquidity | -341.65 | 31.13 | -370.18 | -41.01 |
| Elasticity of inv. rate wrt leverage | -0.018 | -0.024 | -0.025 | -0.037 |
| Elasticity of inv. rate wrt liquidity | 0.077 | -0.009 | 0.091 | 0.034 |

- COVID-19: Benchmark (liquidity + financial + real)
- GFC: No 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

▷ Shock interaction and amplification

# Credit and liquidity policies

# Credit and liquidity policies

## Credit Policies

1. **Corporate Credit Facilities (CCF)**: subsidized debt prices $\chi^{CCF}$

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

2. **Credit Guarantees**: pay lenders a fraction $\phi^{CG}$ of principal in case of default

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

## Liquidity Policies

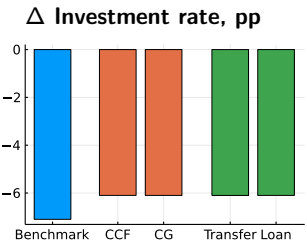
1. **Subsidized Loans** $L$: increase dividends, $t + 1$ liability $(1 + r)L$, helps with liquidity constraint

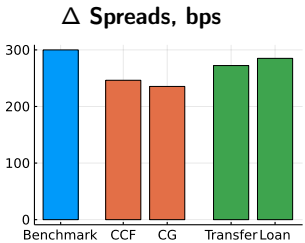
$$\omega k \leq a + \ell + L$$

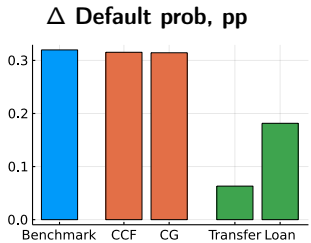
2. **Transfers**: lump-sum transfers $\tau$, increase dividends, and help with liquidity constraint

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

# Credit and liquidity policies in a crisis

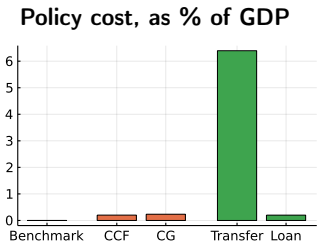


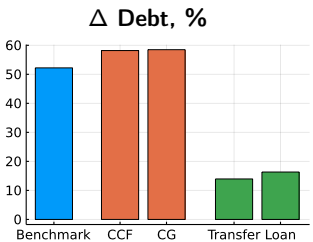



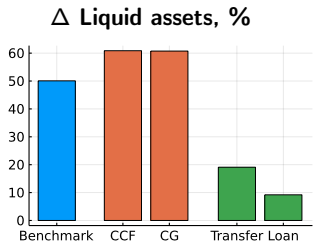




- Calibrate all policies to have a 1pp lower drop on investment rates
- Credit policies more effective at reducing spreads, "work through the market"
- Liquidity policies are more effective in reducing bankruptcies, "bypass the market"

# Credit and liquidity policies in a crisis

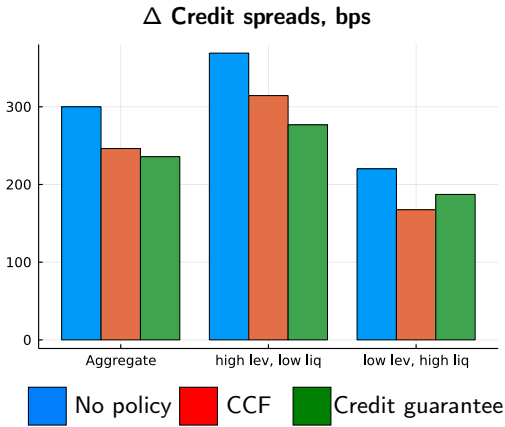



- Credit policies incentivize borrowing and liquid asset accumulation ⇒ smaller effects on defaults
- Liquidity policies bypass the need to borrow ⇒ larger effects on defaults

# Cross-sectional effects of credit policies: Riskier vs safer firms



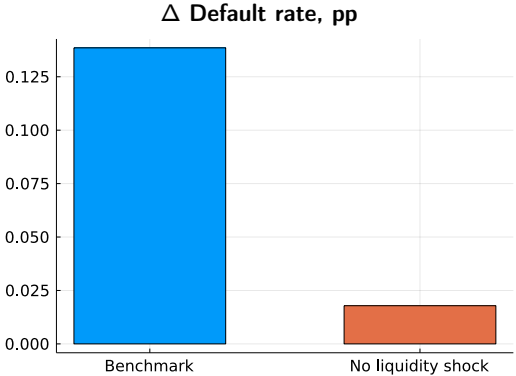

- Credit policies:

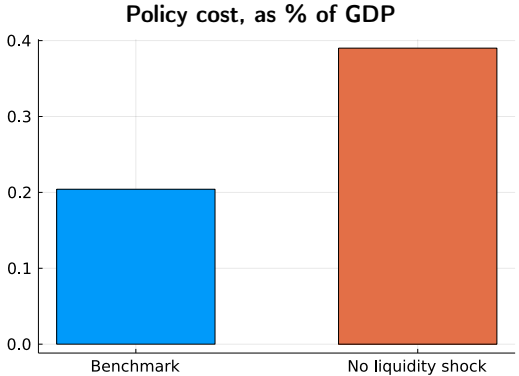
$$q^{CCF} = (1 + \chi + \chi^{CCF})\frac{\mathcal{P}}{1+r}$$

$$q^{CG} = (1 + \chi)\frac{\mathcal{P}}{1+r} + \phi^{CG}\frac{1-\mathcal{P}}{1+r}$$

- CCF $\rightarrow$ subsidy to safer firms (low lev, high liq)
- CG $\rightarrow$ subsidy to riskier firms (high lev, low liq)

# Do loans prevent default when there is no liquidity shock?




Without liquidity shock:

- Smaller effect on reducing default
- Loans become very costly

Subsidized loans are a bad idea if there is no liquidity shock

# 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
- Credit policies incentivize borrowing and liq. asset accumulation
- Liquidity policies reduce need to do this, more effective at containing defaults
- Different policies effective against different types of shocks

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

# APPENDIX

# Literature

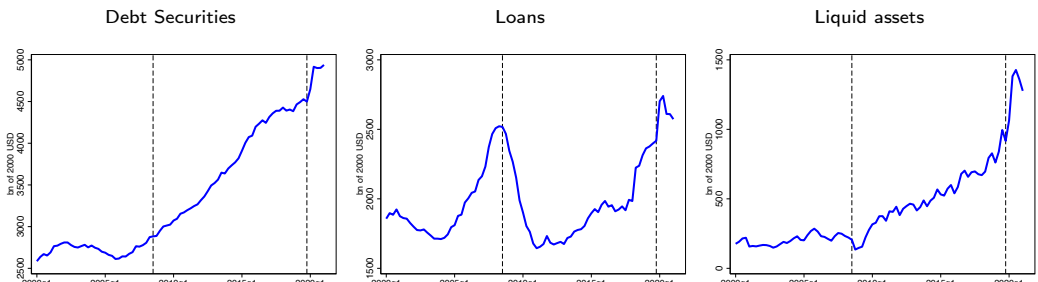
- **Role of firm heterogeneity in the response to shocks**: Kudlyak & Sanchez '17; Ottonello & Winberry '20; Jeenas '19
  New: Large crisis, and/or liquid assets

- **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; Tourré & Crouzet '21
  New: Liquidity policies

# Empirics

# Debt and liquid assets ▷ Back



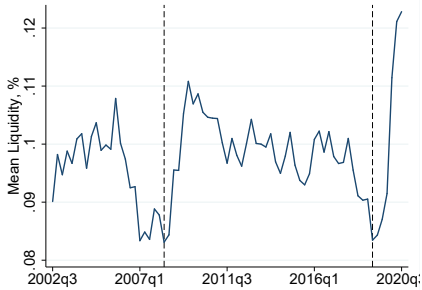

Source: Financial Accounts of the United States, FRB

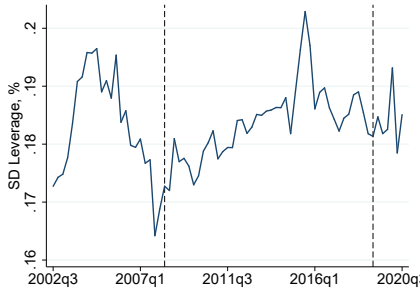
## Data ▷ Back

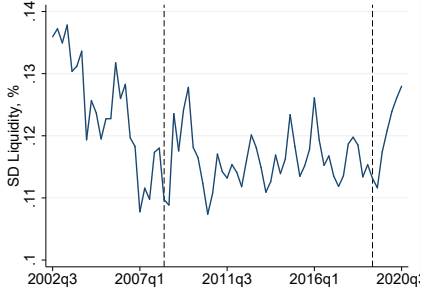
| Variable | Mean | SD | Min | Median | Max |
|---|---|---|---|---|---|
| Number of bonds per firm/week | 4.59 | 9.28 | 1.00 | 2.00 | 425.00 |
| Market value of issue ($ mil) | 524.34 | 553.59 | 1.80 | 400.00 | 15000.00 |
| Maturity at issue (years) | 10.34 | 7.23 | 1.00 | 9.67 | 30.00 |
| Coupon (pct.) | 5.58 | 2.21 | 0.00 | 5.62 | 19.00 |
| Credit Spread (basis points) | 249.51 | 324.83 | 5.00 | 145.69 | 3499.93 |
| Nominal yield (basis points) | 565.18 | 442.40 | 17.55 | 483.16 | 10434.36 |
| Number of observations | 3,451,219 | | | | |
| Number of bonds | 21,091 | | | | |
| Number of firms | 2,131 | | | | |
| 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

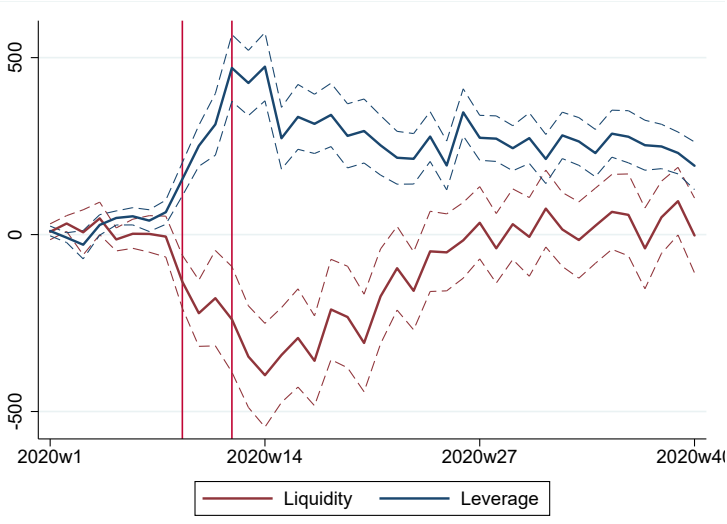
# Credit spreads, liquid assets and leverage ▷ Back

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| **Leverage** | | | | |
| Normal | 479.800*** | 480.904*** | 434.747*** | |
| | (33.712) | (33.663) | (31.586) | |
| Before GFC | | | | 339.909*** |
| | | | | (40.214) |
| After GFC | | | | 551.782*** |
| | | | | (34.834) |
| GFC | 1176.468*** | 1178.176*** | 1128.119*** | 1164.460*** |
| | (129.569) | (129.136) | (130.428) | (132.058) |
| COVID | 764.589*** | 764.801*** | 696.210*** | 795.855*** |
| | (71.379) | (71.260) | (61.096) | (70.983) |
| **Liquidity** | | | | |
| Normal | -180.351*** | -180.009*** | -177.908*** | |
| | (26.221) | (26.282) | (29.165) | |
| Before GFC | | | | -155.907*** |
| | | | | (40.894) |
| After GFC | | | | -192.059*** |
| | | | | (24.556) |
| GFC | -41.008 | -42.282 | -5.095 | -43.399 |
| | (63.768) | (64.010) | (68.625) | (62.158) |
| COVID | -370.180*** | -370.525*** | -345.277*** | -382.428*** |
| | (42.695) | (42.920) | (42.837) | (41.095) |
| Controls | Size | Size, Maturity | Size, Maturity, EBITDA | Size |
| N | 46345 | 46345 | 44248 | 46345 |
| R2 | 0.67 | 0.67 | 0.68 | 0.67 |

# Economic Significance: Spreads ▷ Back

| | $+1\sigma$ leverage | $+1\sigma$ liquid assets |
|---|---|---|
| Normal | 92 bps | -21 bps |
| GFC | 226 bps | -5 bps |
| COVID | 147 bps | -44 bps |

# Event Study: Credit spreads during COVID ▷ Back

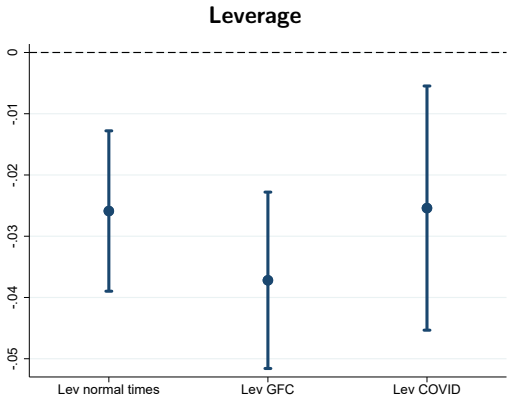


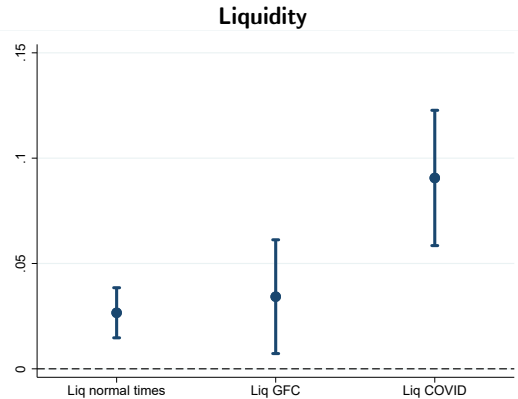

*Notes: The vertical lines correspond to the weeks of February 28th and March 23rd, respectively.*

# Investment, liquid assets and leverage ▷ Back

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| **Leverage** | | | | |
| Normal | -0.026*** | -0.026*** | -0.018** | |
| | (0.007) | (0.007) | (0.009) | |
| Before GFC | | | | -0.036*** |
| | | | | (0.006) |
| After GFC | | | | -0.021*** |
| | | | | (0.008) |
| GFC | -0.037*** | -0.037*** | -0.027*** | -0.039*** |
| | (0.007) | (0.007) | (0.007) | (0.007) |
| COVID | -0.025** | -0.025** | -0.016 | -0.023** |
| | (0.010) | (0.010) | (0.011) | (0.010) |
| **Liquidity** | | | | |
| Normal | 0.027*** | 0.027*** | 0.025*** | |
| | (0.006) | (0.006) | (0.006) | |
| Before GFC | | | | 0.012* |
| | | | | (0.006) |
| After GFC | | | | 0.035*** |
| | | | | (0.007) |
| GFC | 0.034** | 0.034** | 0.037** | 0.032** |
| | (0.014) | (0.014) | (0.015) | (0.014) |
| COVID | 0.091*** | 0.091*** | 0.083*** | 0.096*** |
| | (0.016) | (0.016) | (0.017) | (0.017) |
| Controls | Size | Size, Maturity | Size, Maturity, EBITDA | Size |
| N | 38286 | 38286 | 37814 | 38286 |
| R2 | 0.100 | 0.100 | 0.11 | 0.100 |

# Investment ▷ Back



## Coefficient tests ▷ Back

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

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 | 0.26 |
| COVID | 0.00 | 0.96 |
| **Liquidity** | | |
| GFC | 0.05 | 0.51 |
| COVID | 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** $\varepsilon$, "preference" shocks that follow Extreme Value distribution
  2. **Liquidity Shocks** $\omega$, follow a binomial distribution, $\omega = \omega_i$ w.p. $p_\omega$, 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.

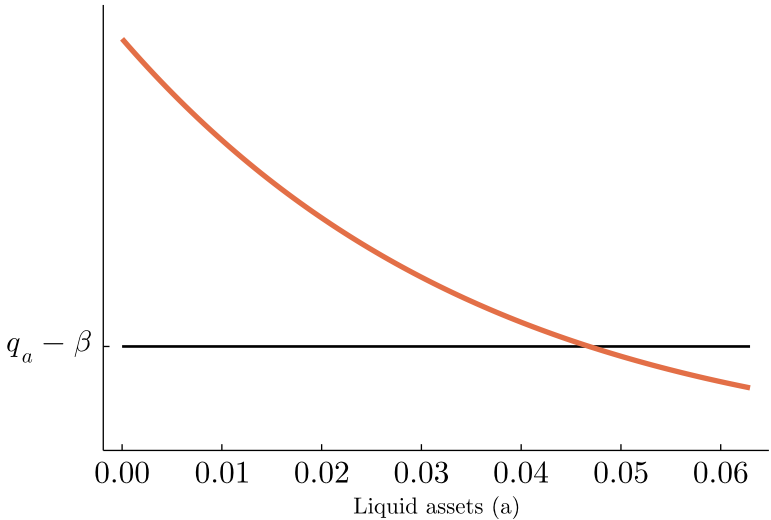
- Euler equation

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

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

## Demand for liquid assets ▷ Back

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



## Externally calibrated parameters ▷ Back

| Parameter | Value | Description |
|---|---|---|
| *Production* | | |
| $\alpha$ | 0.2550 | Capital share, Gilchrist et al. (2014) |
| $\nu$ | 0.5950 | Labor share, Gilchrist et al. (2014) |
| $\delta$ | 0.0963 | Depreciation rate, Gilchrist et al. (2014) |
| $\psi$ | 0.4550 | Capital adjustment, Cooper and Haltiwanger (2006) |
| $\rho$ | 3.0000 | Zero equity issuance in SS |
| $w$ | 1.0000 | Wage, normalization |
| $z$ | 1.0000 | TFP, normalization |
| *Prices* | | |
| $\beta$ | 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 $s_m$ → Intra-period borrowing ratio $m/(m+b')$ (credit lines)
Probability of needs for liquidity $p_{\tilde{\omega}}$ → Cost of liquidity (spread on prime loan rates)

| Parameter | Value | Target Moment | Data | Model |
|---|---|---|---|---|
| $s_m$ | 20 | $\frac{m}{m+b'}$ | 15% | 14.4% |
| $p_{\tilde{\omega}}$ | 0.555 | $r \times [\exp(s_m m) - 1]$ | 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 $\chi$ → leverage $b/(k+a)$
Extreme-value shocks, scale $\kappa$ → credit spreads $1/q-(1+r)$

| | | High lev high liq | Low lev high liq | High lev low liq | Low lev low liq |
|---|---|---|---|---|---|
| debt preference | $\chi$ | 0.0163 | 0.0053 | 0.0155 | 0.0054 |
| Liquidity needs | $\bar{\omega}$ | 0.2012 | 0.1736 | 0.0916 | 0.0668 |
| Idiosyncratic risk | $\kappa$ | 0.3595 | 0.2960 | 0.3811 | 0.3185 |
| Mass | $\lambda$ | 0.212 | 0.309 | 0.288 | 0.191 |
| Leverage | *Data* | 0.482 | 0.258 | 0.482 | 0.258 |
| | *Model* | 0.482 | 0.258 | 0.482 | 0.258 |
| Liquidity | *Data* | 0.108 | 0.108 | 0.016 | 0.016 |
| | *Model* | 0.108 | 0.108 | 0.016 | 0.016 |
| Spreads | *Data* | 198.86 | 91.39 | 215.46 | 107.98 |
| | *Model* | 198.91 | 91.42 | 215.37 | 108.03 |

## Non-targeted moments ▷ Back

| | Data | | Model |
|---|---|---|---|
| | 2007Q2 | 2019Q4 | |
| Income to Assets | 13.40 | 11.10 | 14.35 |
| Debt to Income | 2.21 | 3.24 | 2.60 |
| Default rate | 3.00 | 3.00 | 2.50 |

Figure 2: Individual Parameter Identification

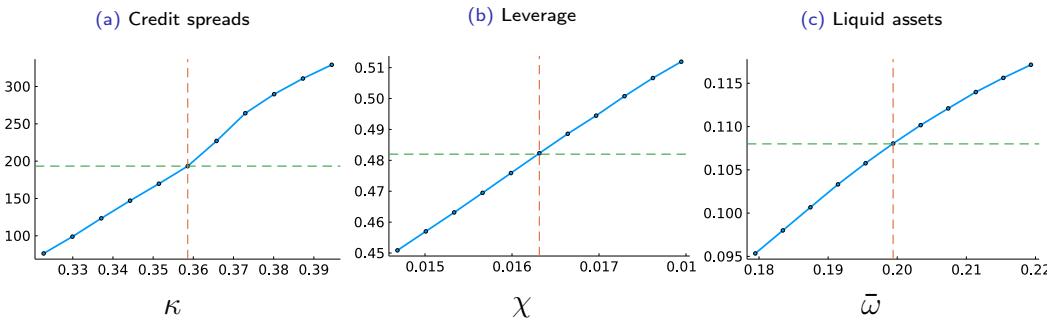
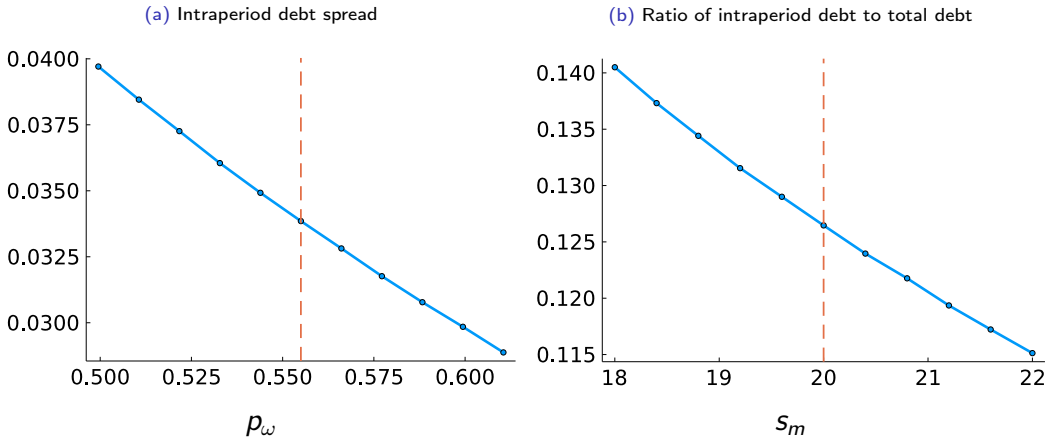
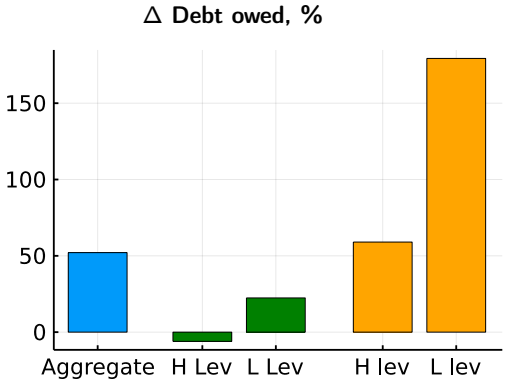
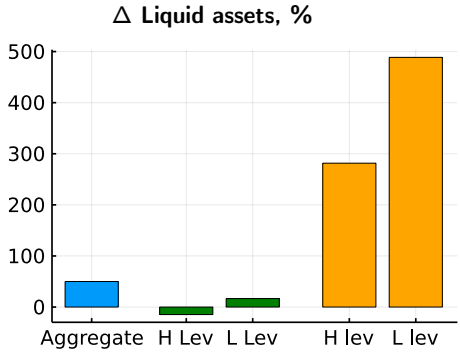


Figure 4: Common Parameter Identification



## Cross-sectional responses ▷ Back




Aggregate | High liquidity | Low liquidity

- Firms with low liquid assets: increase liabilities and liquid assets
- Firms with high liquid assets: more muted response

# Evidence on cross-sectional liquidity responses ▷ Back

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


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

# Shock interaction and amplification ▷ Back

| | Liquidity | Financial | Real | Benchmark (all) | Interaction |
|---|---|---|---|---|---|
| Spreads, bps | 24.79 | 265.62 | 4.60 | 300.00 | 5.00 |
| GDP, percent | 0.00 | 0.00 | -5.00 | -5.00 | 0.00 |
| Liquid assets, percent | 103.82 | -34.82 | -1.23 | 50.00 | -17.77 |
| Debt owed, percent | 94.83 | -64.47 | -0.75 | 52.10 | 22.49 |
| Investment rate, pp | -1.60 | -3.82 | -0.42 | -7.09 | -1.25 |
| Default prob., pp | 0.24 | 0.02 | 0.04 | 0.32 | 0.02 |

# Crisis: Decomposition ▷ Back

| *Variation wrt SS* | (1) Benchmark | (2) No Liquidity | (3) No Financial | (4) No Real |
|---|---|---|---|---|
| **Aggregate** | | | | |
| Spreads, bps | 300.00 | 272.88 | 29.91 | 294.62 |
| GDP, percent | -5.00 | -5.00 | -5.00 | 0.00 |
| Liquid assets, percent | 50.00 | -36.65 | 101.16 | 52.53 |
| Debt owed, percent | 52.10 | -62.01 | 93.61 | 50.27 |
| Investment rate, pp | -7.09 | -4.39 | -2.03 | -6.60 |
| Default prob., pp | 0.32 | 0.06 | 0.29 | 0.27 |
| **Cross-Section** | | | | |
| Elasticity of spreads wrt leverage | 525.39 | 524.00 | 9.04 | 514.23 |
| Elasticity of spreads wrt liquidity | -341.65 | 31.13 | -351.07 | -331.95 |
| Elasticity of inv. rate wrt leverage | -0.02 | -0.02 | 0.00 | -0.02 |
| Elasticity of inv. rate wrt liquidity | 0.08 | -0.01 | 0.06 | 0.08 |

# Crisis: Policies

| *Variation wrt SS* | (1) No Policy | (2) CCF | (3) Credit Guarantee | (4) Transfer | (5) Loan |
|---|---|---|---|---|---|
| Spreads, bps | 300.00 | 246.26 | 235.80 | 272.23 | 285.05 |
| GDP, percent | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 |
| Liquid assets, percent | 50.00 | 60.81 | 60.72 | 18.19 | 7.81 |
| Debt owed, percent | 52.10 | 58.09 | 58.38 | 13.19 | 15.37 |
| Investment rate, pp | -7.09 | -6.09 | -6.09 | -6.09 | -6.09 |
| Default prob., pp | 0.32 | 0.31 | 0.31 | 0.06 | 0.18 |
| Cost of policy over GDP, pp | 0.00 | 0.20 | 0.23 | 6.48 | 0.20 |
| Elasticity of spreads wrt leverage | 525.39 | 518.72 | 307.49 | 476.18 | 517.25 |
| Elasticity of spreads wrt liquidity | -341.65 | -336.02 | -226.23 | -189.63 | -164.37 |
| Elasticity of inv. rate wrt leverage | -0.02 | -0.02 | -0.01 | -0.01 | -0.02 |
| Elasticity of inv. rate wrt liquidity | 0.08 | 0.07 | 0.07 | 0.07 | 0.07 |