Corporate Debt Structure
and the Financial Crisis

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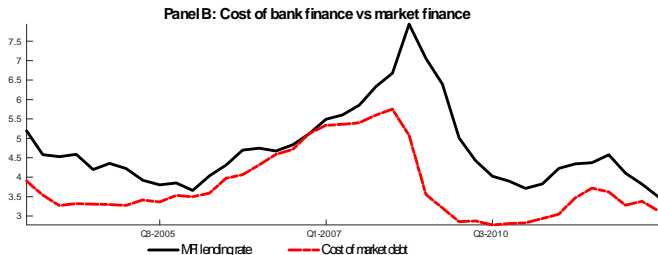
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Motivation

- Two key facts on the 2008-09 crisis in the euro area:

  - Shift of corporate debt from bank loans to debt securities

  - At the time when the cost of market finance increased above the cost of bank finance

Bank loans and debt securities for euro area NFCs

Panel A: Corporate debt and GDP in the euro area

Loans (LHS) ── Debt securities (LHS) ── GDP (RHS)

Panel B: Cost of bank finance vs market finance

MFI lending rate ── Cost of market debt

Legend: Panel A; Annual growth rates in percentage points. Panel B; Percentage points, annual

Debt and equity finance for euro area NFCs
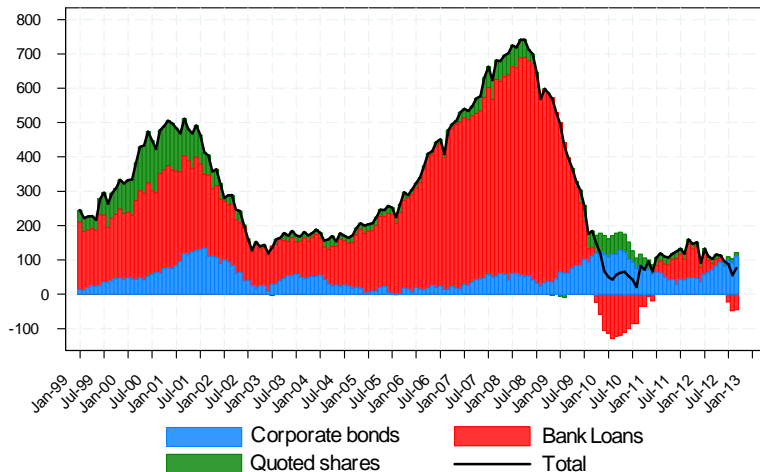
Legend: Euro Area non-financial corporations (billion EUR, 12-month cumulated flows).

The Questions

1. What explains the observed change in the composition of corporate debt during the crisis?

2. What role does it play in determining the response of real activity to shocks?

Methodology

DSGE model. Key features:

1. Firms are heterogeneous in observed productivity at the time of financial decisions.

2. Two types of financial intermediaries: banks and capital market funds (CMF). Banks offer more flexibility to firms with low productivity and high default risk, at a cost.

3. Firms optimally choose among two instruments of debt finance: bank loans and corporate bonds. Composition of corporate debt evolves endogenously over the cycle.

Results: preview

- The model accounts for the observed facts about corporate finance as a response to a reduction in bank efficiency and an increase in the uncertainty about productivity of credit constrained firms.

- Financial flexibility is crucial for mitigating the macroeconomic impact of distress in financial markets.

The literature: Theory

- Holstrom and Tirole (QJE, 1997): small (large) net worth firms have access to banks (bond mkts). At odds with evidence during the crisis.

- Adrian, Colla and Shin (2012): A shock to default risk induce banks to reduce loan supply. Bond yields need to increase to induce risk-averse investors to buy firms' debt.

- Crouzet (2014): Banks accept debt restructuring offers that limit firms' liquidation. A shift from bank finance to market finance exacerbates fall in investment as firms expect harder debt restructuring in the future.

The literature: Evidence

- Adrian, Colla and Shin (2012): Micro data on new loans, bond issuance and price of debt for U.S. firms confirm macro evidence.

- Antoun de Almeida and Masetti (2015): Firm-level data show that roughly 26% of EA firms that financed only through banks turned to bond issuance during the crisis.

- Becker and Ivashina (2011): A reduction in loan supply exerts larger effects on investment for firms that are excluded from bond mkts than for firms that can access both bond and loan mkts.

The environment

- Households

- Entrepreneurs/firms

- Two type of financial intermediaries:
  - Commercial banks
  - Capital market funds

- Central bank

Firms' net worth

- Indexed by $i \in [0, 1]$, each endowed with capital z_{it}.

- Entrepreneur's net worth:

$$n_{it} = (1 - \delta + r_t)\, z_{it}.$$

- Pre-payment of the factors:

$$x_{it} = w_t H_{it} + r_t K_{it}.$$

- Need for debt finance as $n_{it} \leq x_{it}$.

Firms' production

- Production of firm i :

$$y_{it} = \varepsilon_{1,it}\varepsilon_{2,it}\varepsilon_{3,it}H_{it}^{\alpha}K_{it}^{1-\alpha},$$

  where $\varepsilon_{j,it}$, for $j = 1, 2, 3$, are iid shocks with mean one, SD σ_j and density $\varphi\left(\varepsilon_j; \sigma_j\right)$.

- $\varepsilon_{1,it}$: public knowledge; introduce ex-ante heterogeneity

- $\varepsilon_{2,it}$: private knowledge, observable at a cost $\tau_t n_{it}$; provides a role for banking

- $\varepsilon_{3,it}$: observed by entrepreneur, can be monitored at cost μy_{it}.

Financial intermediation

- Define available net worth as

$$\widehat{n}_{it} = \left\{ \begin{array}{l} (1 - \tau_t)\, n_{it}, \text{ if bank finance} \\ \, n_{it}, \text{ if CMF finance} \end{array} \right. .$$

- Size of the project the intermediary is willing to finance:

$$x_{it} = \xi \widehat{n}_{it}.$$

Timing of financial decisions

Stage I: $\varepsilon_{1,it}$ realizes. Entrepreneurs: approach bank, CMF or abstain.

Stage II: $\varepsilon_{2,it}$ realizes.

At bank: pay $\tau_t n_{it}$; observe shock; proceed or abstain.

At CMF: proceed.

Stage III: $\varepsilon_{3,it}$. Entrepreneurs pay factors and produce.

Uncertain productivity

- ω is uncertain productivity when financial decisions are taken,

$$\omega \equiv \left\{ \begin{array}{ll} \varepsilon_2\varepsilon_3 & \text{if CMF finance} \\ \varepsilon_3 & \text{if bank finance} \end{array} \right.$$

- σ is SD of uncertain productivity factor ω

$$\sigma^2 \equiv \left\{ \begin{array}{ll} \sigma_2^2 + \sigma_3^2 & \text{if CMF finance} \\ \sigma_3^2 & \text{if bank finance} \end{array} \right.$$

Stage III: financial contract

- Optimal financial decision solves a costly state verification problem, i.e. firms maximize profits subject to

    - amount of external finance
    - feasibility
    - incentive compatibility constraint for intermediary.

- Solution: $\overline{\omega}_{it}$. If $\omega_{it} \geq \overline{\omega}_{it}$, repayment occurs. If $\omega_{it} < \overline{\omega}_{it}$, the intermediary monitors at the cost μy_{it}.

- $\overline{\omega}_{it}$ depends on the debt instrument:

$$\overline{\omega}_{it} \equiv \begin{cases} \overline{\omega}^c(\varepsilon_{1,i}; q_t, R_t, \sigma_{2t}, \sigma_{3t}) & \text{if CMF finance} \\ \overline{\omega}^b(\varepsilon_{1,i}, \varepsilon_{2,i}; q_t, R_t, \sigma_{3t}) & \text{if bank finance} \end{cases}$$

where R_t is banks' funding cost and q_t a financial markup.

Stage II:banks

- Conditional on on $\varepsilon_1 \varepsilon_2$, unit expected payoff is:

    - 1 from abstaining;

    - $F^d(\varepsilon_{1,i} \varepsilon_{2,i}; q_t, R_t, \sigma_{3,t})$ from producing under bank finance.

- Find threshold for $\varepsilon_{2,i}$ that makes the firm indifferent

$$F^d(\varepsilon_{1,i} \overline{\varepsilon}_t^d; q_t, R_t, \sigma_{3,t}) = 1.$$

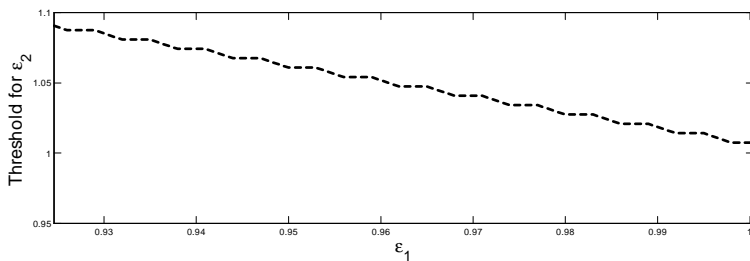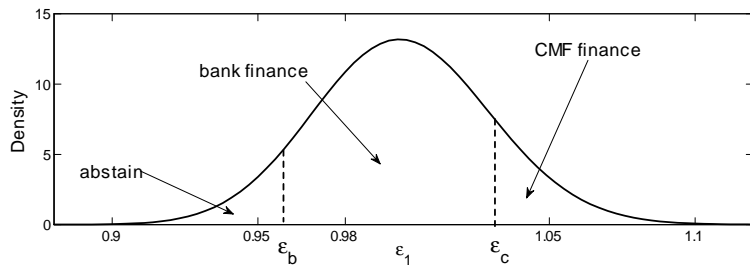- Take up bank loans and produce if $\varepsilon_{2,i} > \overline{\varepsilon}_{d,t}$.

Stage I: financing choices

- Conditional on ε_1, choose among:

    - 'abstain', with expected payoff 1
    - 'bank', with expected payoff $F^b(\varepsilon_1; q_t, R_t, \sigma_{2,t}, \sigma_{3,t})$
    - 'CMF', with expected payoff $F^c(\varepsilon_1; q_t, R_t, \sigma_{2,t}, \sigma_{3,t})$.

- Find thresholds for ε_1, that make the firm indifferent, i.e.

$$
\begin{aligned}
F^b(\overline{\varepsilon}_{bt}; q_t, R_t, \sigma_{2,t}, \sigma_{3,t}) &= 1 \\
F^b(\overline{\varepsilon}_{ct}; q_t, R_t, \sigma_{2,t}, \sigma_{3,t}) &= F^c(\overline{\varepsilon}_{ct}; q_t, R_t, \sigma_{2,t}, \sigma_{3,t})
\end{aligned}
$$

# Endogenous financial structure

Calibration

- Most parameters: standard values from literature.

- Other parameters: $\tau = .01$, $\gamma = .977$, $\xi = 3.19$, $\sigma_{\varepsilon_1} = .017$, $\sigma_{\varepsilon_2} = .023$, $\sigma_{\varepsilon_3} = .171$. Criterion: match pre-crisis averages:

  - ratio of bank loans to corporate bonds: 5.5
  - aggregate debt to equity ratio: .64
  - average spread on bonds (annual): 143 bps
  - average spread on loans (annual): 119 bps
  - average default rate on bonds: 5 percent
  - expected return on firms capital: 9.3 percent

- Idiosyncratic shocks: lognormally distributed.

Facts

- We seek to account for the documented evidence about corporate finance during the financial crisis of 2008-09.

- Peak effects: max percentage deviation of a variable over 2008-09, relative to average over 1999-2010:

  - ratio of loans to bonds fell by approx 5 percent (6.2 to 5.9)

  - spread on bonds increased by 120 percent (57 to 190 bps)

  - spread on loans increased by 104 percent (23 to 64 bps)

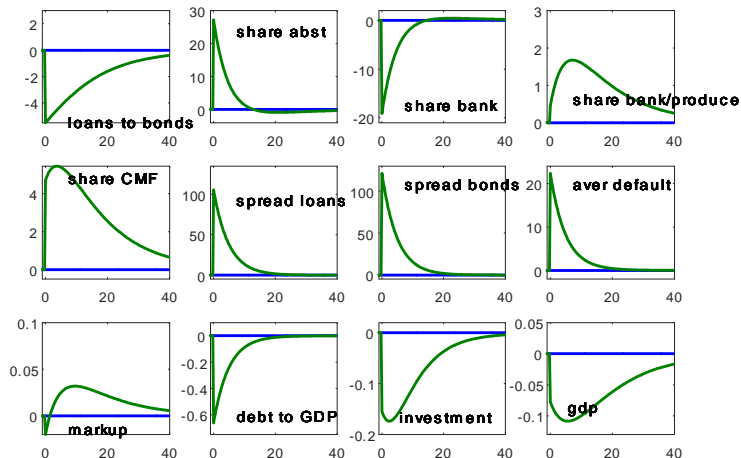 - default on bonds increased by 110 percent (1.3 to 2.7%)
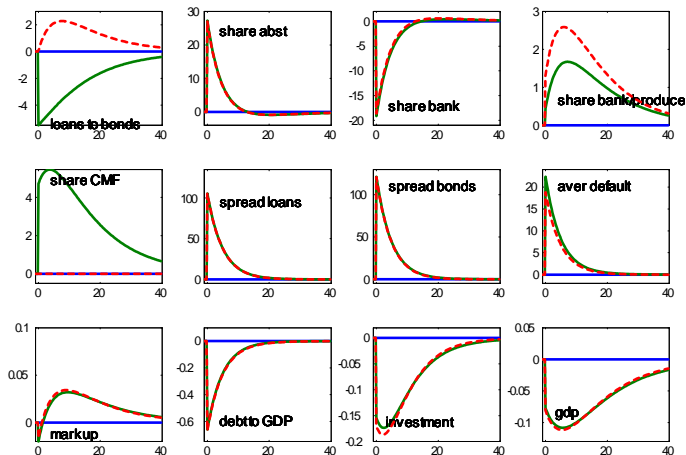
Increase in bank costs τ: comparative statics
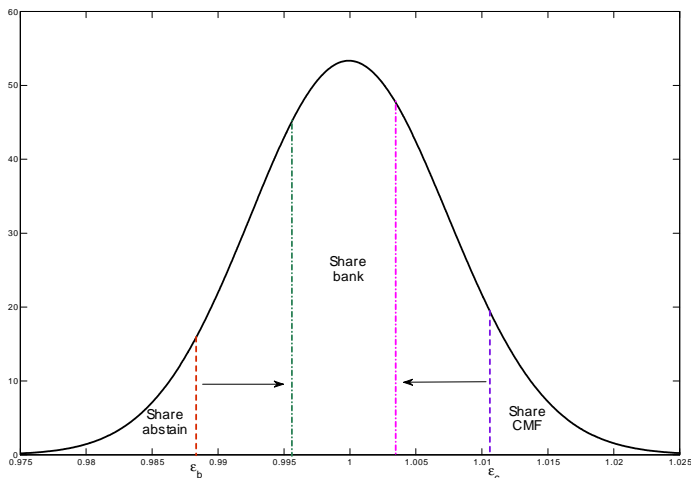
Response to a temporary increase in bank costs (τ)
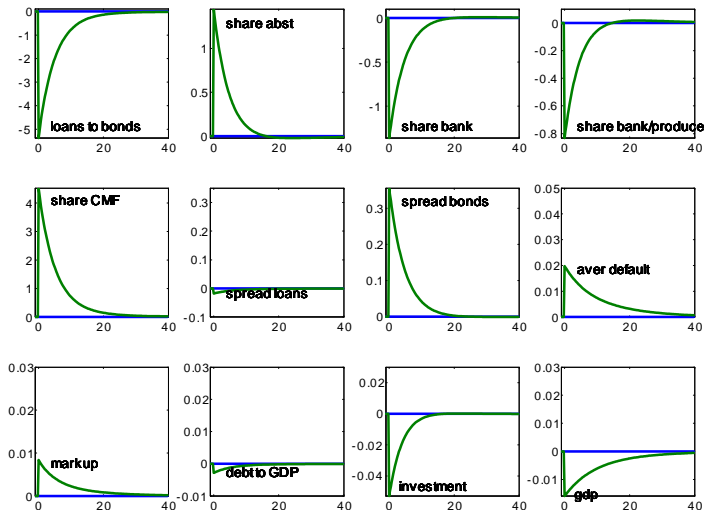
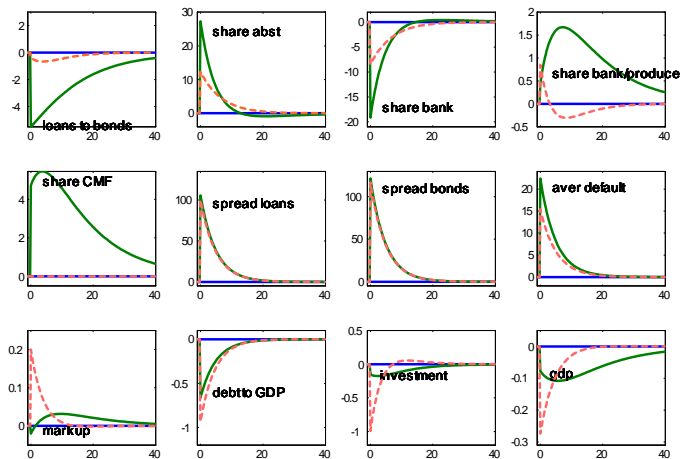# Increase in bank costs (τ) and uncertainty (σ_2, σ_3)

Exclusion from bond markets

Dashed line: exlusion from bond markets, i.e. $\overline{\varepsilon}_b$ arbitrarely large.

Solid line: bank loans and corporate bonds are both available.

Exclusion from bond markets, no bank flexibility

Dashed line: bonds not available ($\overline{\varepsilon}_b$ large), banks not flexible ($\overline{\varepsilon}_d$ fixed).
Solid line: bank loans and corporate bonds are both available.

Conclusions

- In our model, a deterioration in banks' efficiency and an increase in uncertainty about firms' productivity is needed to account for the evidence on corporate debt during the 2008-09 financial crisis.

- When firms benefit from financial flexibility - be it access to alternative financial markets or efficient monitoring of project progress in banking relationships - adverse financial shocks generate mild effects on real activity.

- Only when firms do not, the macroeconomic impact of financial distress is severe.

- Importance of fostering financial flexibility as much as of ensuring bank health through regulation. Capital market union goes in the right direction.