

Liquidity, Contagion and Crisis

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Motivation

- Frictions in financial system can have repercussions for real economy
 - Yet, most research in macroeconomics does not contain a financial sector
 - Research gives little guidance as to policies useful in current crisis
- Role of financial frictions in economic crisis:
 - The Fisher (1933) effect
 - Over indebtedness ... distressed selling ... deflation ...
 - First modelled in Bernanke & Gertler (1989), Kiyotaki and Moore (1997), Suarez & Sussman (1997) and others

Basic approach

- Recent attempts to embed financial sector in infinite horizon macro models (e.g., Gertler & Kiyotaki, 2010)
 - Infinite horizon imposes many modelling restrictions: financial constraints end up being assumed, not derived
 - Policy analysis in terms of impulse response functions, not welfare
- (i) Go back to finite horizon, (ii) model fully the financial frictions with focus on role of (lack of) liquidity, (iii) welfare analysis of policy proposals

Model set-up

- Model ingredients: 4 dates $t = 0, 1, 2, 3$
 - At date 0 speculators (vultures) set aside liquidity
 - Banks can “invest in a project” (extend loans) at $t=1$, cash flows from project (loan repayment) in $t=2$ and 3
 - Investment requires funds
 - Banking sector in aggregate has sufficient funds
 - Date 1 redistributive shock to bank’s own capital determines the aggregate number of banks with insufficient funds
 - Funds come from (i) rich banks, (ii) vultures

Model Set-up

- Investment in project (if funded) occurs at $t=1$
 - Total cash flows are 2y deterministically
 - With probability π project yields cash flow y at $t=2$ and $t=3$
 - With probability $1-\pi$ project yields cash flow 0 at $t=2$ and $2y$ at $t=3$
- Contracts
 - Cash flows are unobservable
 - Contract specifies date $t=2$ payment R and fraction β of assets pledged as collateral (seized if date 2 payment not made)

Model set-up

- Asset deployment
 - No settlement in kind: collateral must be sold in spot market to repay creditor
 - Deadweight loss in liquidating collateral (pays $\delta < y$)
- Liquidity
 - Necessary to absorb asset sales
 - Profit opportunity for vultures if price $q < \delta$

Financial contract

- If cash flow is y , repayment of R must be incentive compatible:

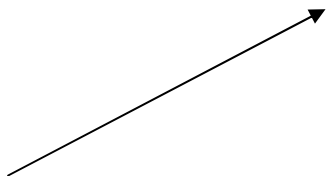
$$R \leq \beta y \quad (\text{IC})$$

- If cash flow is 0 at $t=2$, creditor seizes β :


Creditor's participation constraint

$$\pi R + (1 - \pi) \beta q = (1 - w^s) \delta / q \quad (\text{PC})$$

Expected return on loan
drops in fire-sales price q



Return from hoarding
liquidity increases in q



- As q drops, β has to increase *more than proportionally* to induce lending

Financial Contract

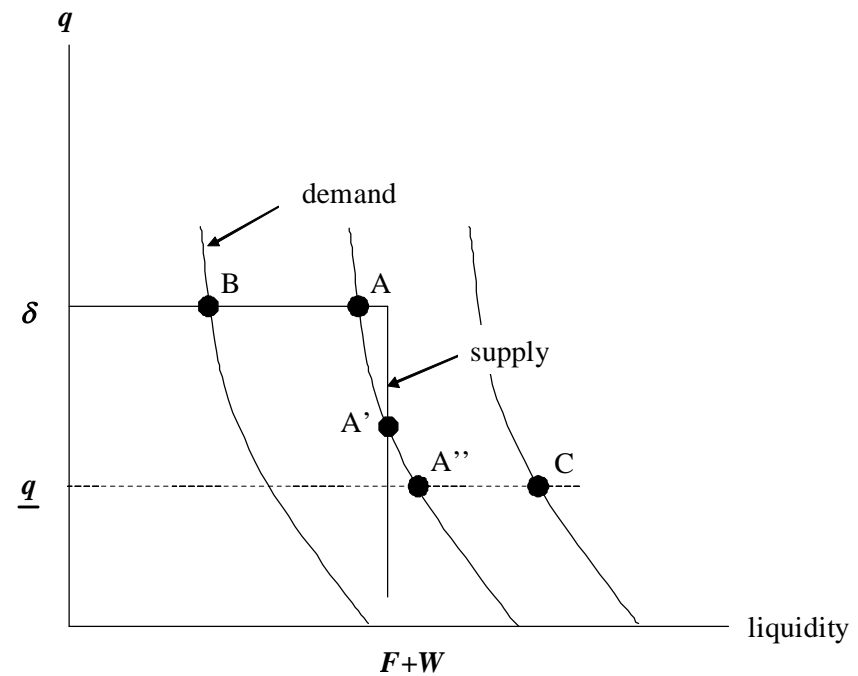
- Properties of contract
 - In crisis, collateral requirements increase
 - Increases liquidity demand
 - Further depresses fire-sales price q ...
...further increases collateral requirements
 - Lower bound on q attained when $\beta = 1$
 - Total liquidity demand $q^*\beta(q)$ increases as q drops (i.e., as liquidity is more expensive)
 - Demand and supply of liquidity slope in same direction

Fire-sales prices

- Contagion
- Liquidity black holes
- **multiplier effects**
- Panics
 - multiple equilibria

and also

- simultaneous
hoarding & rationing



Competitive equilibrium

- Vultures' $t=0$ choice of liquidity is determined by profit maximisation
 - The $t = 0$ expectation of payoff to liquidity is
$$\Pr(\text{no crisis}) + \Pr(\text{crisis}) * \delta/q_{min}$$
 - Must be equal to return ρ_0 of illiquid investment
 - Since $1 < \rho_0 < \delta/q_{min}$ we have $\Pr(\theta > \theta_2) > 0$
- ⇒ *Crisis is an inherent feature of a competitive market*

Policy

- The competitive equilibrium is inefficient
- Policy options we investigate (assuming government has no technology advantage)
 - Liquidity injection
 - Government sets aside liquidity to buy fire-sales assets in case of a crisis
 - Equity injection
 - Government directly injects equity (indiscriminately)
 - Bail-outs
 - Government pays off creditors of defaulting companies (at terms so as to exclude strategic default)

Liquidity injection

- Liquidity funded through taxation
 - Same opportunity cost ρ_0 as private sector
 - No tax distortion

Proposition 4: The optimal policy involves a zero probability of a crisis.

Remark: Liquidity injection crowds out private speculators. The policy thus requires nationalization of liquidity supply.

Numerical example: welfare gain is 0.3% at national debt of 2.6% of GDP.

Equity injection

- Since shock to endowment unobservable, government injects E to all companies
- This has two effects
 - It reduces the financing need for capital short entrepreneurs.
 - Credit rationing hits at lower fire-sales prices (and larger shocks)
 - It increases the liquidity supply (non-constrained entrepreneurs can use the cash to buy fire-sales assets).
 - The 2nd effect is exactly like a liquidity injection
- Equity injection dominates liquidity injection
 - The lower financing need means less collateral has to be pledged and sold later
 - Crowding-out is less than 1:1

Bail-outs

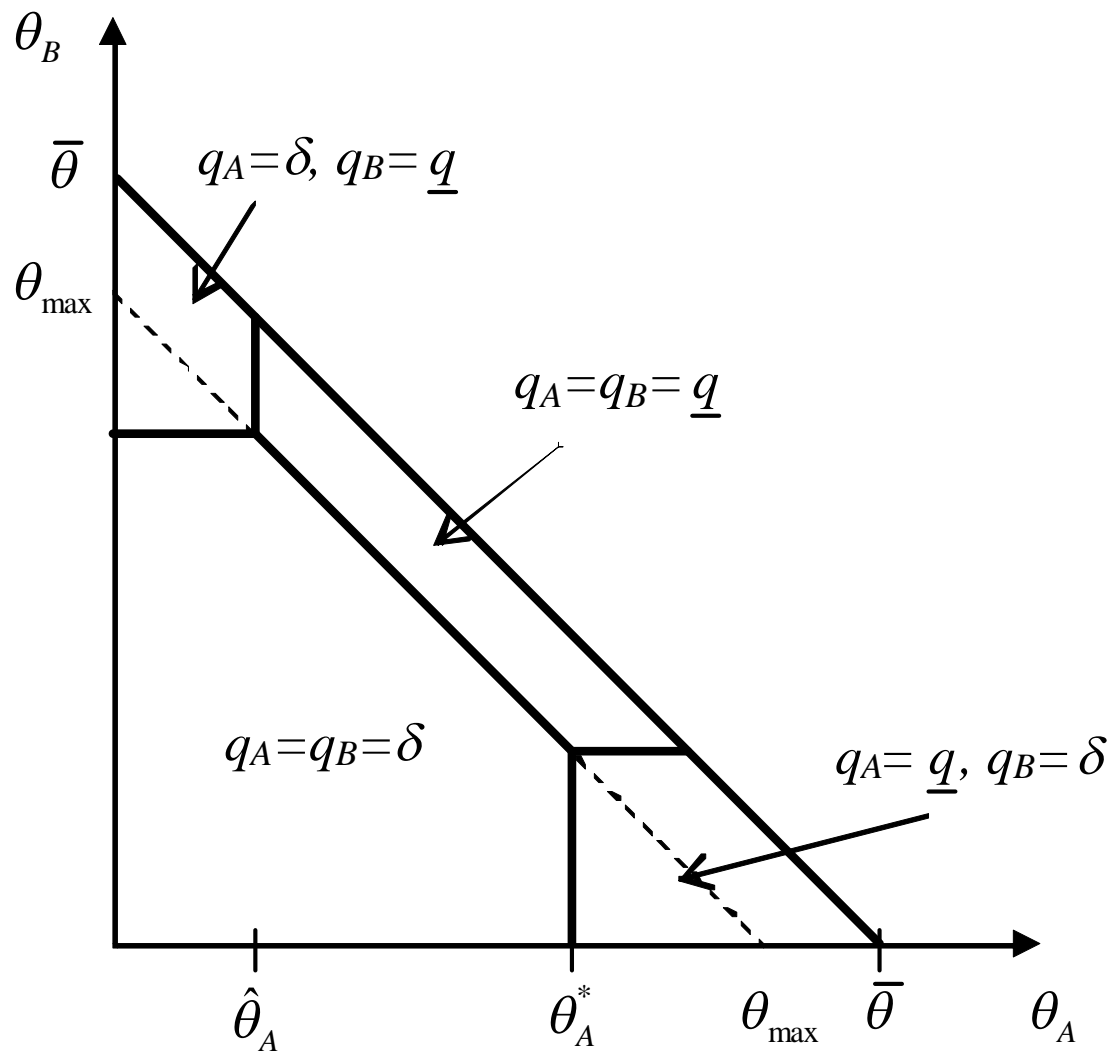
- Government buys creditor's liquidation rights and writes them off
- A complete bail-out provides incentives for non-distressed companies to default strategically
 - Design *partial* bail-out so as to be incentive compatible only for distressed companies
 - This will put a constraint on the size of the bail-out that is implementable

Proposition 6: In the region where a bail-out program is feasible it can reduce the level of liquidations (to a given amount) at a lower national debt than an equity injection.

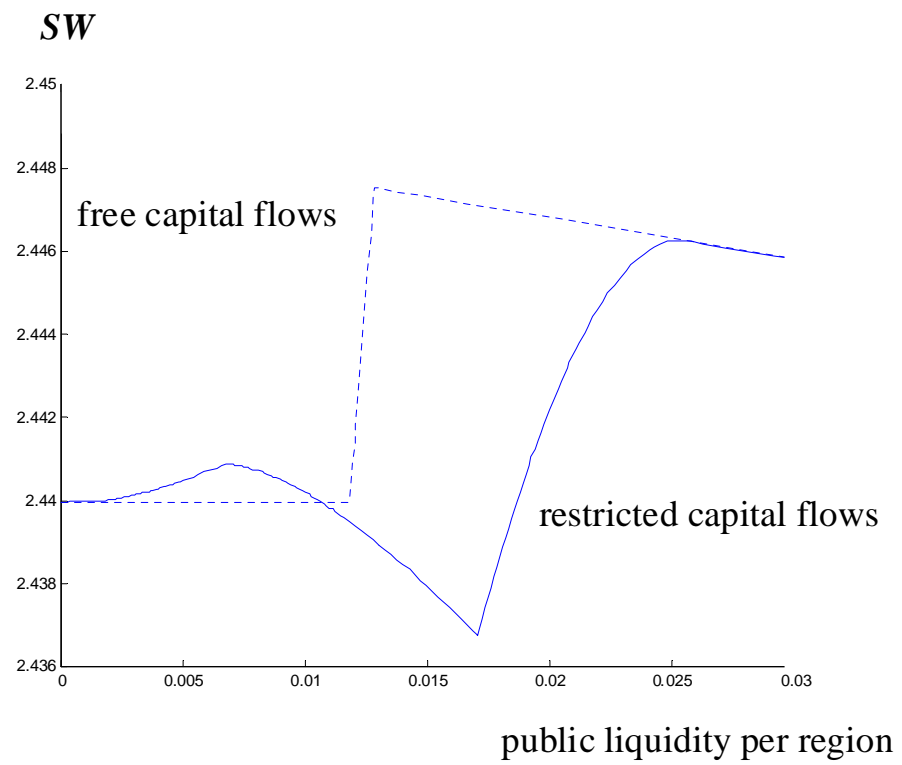
Market fragmentation

- Suppose the economy is made up of two regions (say countries *A* and *B*)
- How does increased international capital mobility affect welfare?
 - With mobile capital a crisis in one country can spill over to the other
 - Locally held reserves can shield a country from a crisis
 - But at what cost?
- Effects
 - Crowding out (less when public capital not mobile)
 - Crises can be contained locally under capital mobility constraints
 - Liquidity is used less efficiently (sits idly in country *A* when *B* is in a crisis)

International contagion



Social welfare



Social welfare

- Increased capital mobility leads to increased incidence of spillovers
- Using constraints on capital flows can facilitate a policy of public liquidity provision
 - But incurs a cost of using liquidity less efficiently
- Fine-tuning the policy requires a lot of information on the underlying economy
- The problem isn't capital mobility per se, but the public good nature of liquidity