Liquidity Freezes Under Adverse Selection

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Monetary Policy

- Corrects the aggregate shortage of liquidity in the economy.
- Assumes that once inserted, liquidity flows to where it is needed.
- This is the implication of, for example, models of Holmström and Tirole.

Monetary Policy

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by JACOB GOLDSTEIN

December 01, 2010 5:43 PM ET

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Monetary Policy

- Contemporary counterexamples:
  - US Commercial Paper Market 2008.
  - Euro Area Financial Institutions 2008 and 2012.
- Proposed explanation:
  - Adverse Selection among Institutions.

Results

- Adverse selection raises cost of insurance.
- Firms reduce insurance and switch to larger investment.
- Ex post rescue of firms is optimal, but causes further increase in size and decrease in insurance.

Literature

- Segmentation of liquidity markets and adverse selection
  - Freixas and Holthausen (2005), Freixas and Jorge (2008), Bruche and Suarez (2010).
- Ex ante vs ex post liquidity
  - Allen, Carletti and Gale (2009), Freixas, Martin and Skeie (2011), Kahn and Wagner (2012), Fahri and Tirole (2012).

Two cases

- Idiosyncratic liquidity shocks
  - Firm types uncorrelated and deterministic in aggregate.
- Aggregate liquidity shocks
  - Perfect correlation within types.

Holmström -Tirole Model

Liquidity can be seen as:

- Collateral, like pledgeable income or T-bills,
- Insurance, like credit lines.

Holmström -Tirole Model

Three dates: 0, 1, and 2.

Holmström -Tirole Model

- Firm's project is constant returns to scale. Return realized in period 2:
  - ρ_1 (total return), ρ_0 (pledgeable return).
- Project scale I equals initial investment requirement in period 0.
- Endowment A of pledgeable assets ("capital", "collateral", "liquidity").

Holmström -Tirole Model

- Period 1 liquidity shock: additional investment needed to continue project, either
  - ρ_L or ρ_H units per unit investment.
  - probabilities f_L , $f_H = 1 - f_L$.
- Given shock, firm chooses continuation scale i, where $0 \leq i \leq I$.
- Total investment = Initial investment + Additional investment needed for liquidity shock
  - $I + i\rho_L$ or $I + i\rho_H$.

Holmström -Tirole Model

- Assumptions

$$0 \leq \rho_L < \rho_0 < \rho_H < \rho_1.$$

Need to prepare for high liquidity shock ρ_H.

- Project socially useful but not self-financing,
- Thus scale limited by size of up-front pledgeable endowment A.

Holmström -Tirole Model

- Result: contract specifies initial and continuation scales.
- Depending on parameters:
  - Firm continues at full scale regardless of liquidity needs.
  - Firm continues at full scale under low needs but shuts down under high needs.

Holmström -Tirole Model

Trade-off between insurance and size

- Insurance: continuing in high shock state, $i_H > 0$,
- Size: setting initial investment I.
- Trade-off not important in Holmström-Tirole Model, but key feature under adverse selection.

Holmström -Tirole Model

Firm pledges (equivalently, transfers) entirety of endowment A, investors pay for initial investment and guarantee specified top-up investments, at a scale which breaks even.

Holmström -Tirole Model

- Equivalent interpretation in terms of liquidity insurance:
  - Firms do not need extra liquidity in low shock cases.
  - Depending on parameter values, they may or may not choose to buy liquidity insurance for high shock cases.

Holmström -Tirole Model

- There is a positive shadow value to liquidity A in the sense that increasing the firm's initial pledgeable endowment increases expected output by more than one for one.
- With no aggregate uncertainty, there is no shortage of or misallocation of outside liquidity: it flows freely to all firms at a shadow price of 1 (no liquidity premium).

Adding Adverse Selection

- Firm heterogeneity,
- fraction α "good" and $1-\alpha$ "bad" firms.
- Probability of high liquidity shock is larger for bad firms
- The type of the firm is private information.

Adding Adverse Selection

Restrictions

- Good and average projects not self-financing.
- Bad projects not socially useful.
- Average project socially useful, and best to continue in both states.

Optimal Contracting Problem

Separating Contract

- Good firms signal that they are good, and set $i_H = 0$,
- Under separation, bad firms cannot get financing.

Optimal Contracting Problem

Pooling Contract

- All firms get financing,
- Insurance is expensive, and two cases may happen:
  - Good firms fully insured,
  - No insurance $(i_H = 0)$.

Pooling Contract

Definition

- The optimal pooling contract is stable if there is no incentive for high quality firms to deviate to a separating equilibrium.

Results

Condition for a pooling equilibrium to be stable:

- Fraction of bad firms small.
- Bad firms not *too* bad.

Results

Can find parameter values such that:

- Planner's problem would have all firms receive liquidity insurance.
- But pooling equilibrium has no one receiving insurance.

Result for the No-Aggregate Shock Case with Adverse Selection

- Outside liquidity not useful; the firms as a whole can generate adequate aggregate liquidity.
- However, may not be able to redistribute it because of imperfect information. In this case illiquid firms are terminated.

Result for the No-Aggregate Shock Case with Adverse Selection

- Whether equilibrium achieves the efficient outcome depends on whether shadow value of liquidity to good firms is greater or less than 1.

Model with Aggregate Shocks

- When shocks are correlated, corporate sector cannot redistribute liquidity.
- Becomes necessary to specify modeling of outside liquidity.

Model with Aggregate Shocks

- Sole source of outside liquidity, in form of government bonds. Riskless because backed by taxing power.
- Government bond price at date 0: $q \geq 1$.

Provision of Outside Liquidity

- Liquidity is provided by firms hoarding bonds at date 0.
- When all firms suffer high liquidity shock, government bonds only possible source of liquidity; in their absence all firms must liquidate projects.

Model with Aggregate Shocks

- Similar restrictions on parameters.

Model with Aggregate Shocks

Pooling equilibrium

- As before, firm behavior depends on shadow value of liquidity to firm $\overline{q}$.
- However, price of liquidity may exceed 1.

Analysis of Aggregate Shock Case

- Focus on case where pooling is an equilibrium (impose additional assumption to ensure this holds).
- Two forms the contract may take:
  - Good firms fully insured,
  - No insurance ($i_H = 0$).

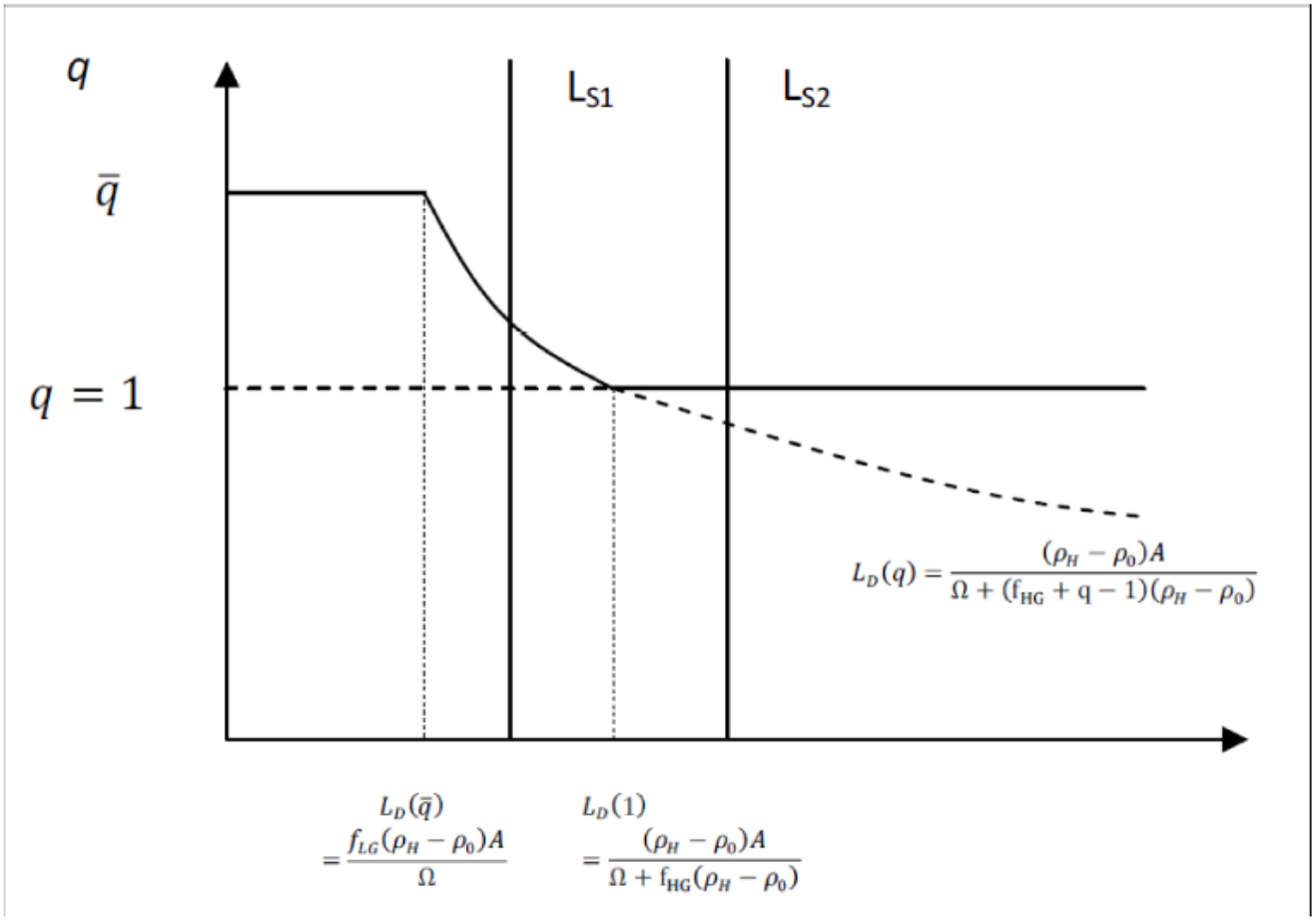

Figure 1: The aggregate shocks case with $\overline{q} > 1$. The aggregate demand for liquidity and the supply of outside liquidity are represented by the solid lines. The demand for liquidity by the corporate sector is represented by $L_D(q)$.

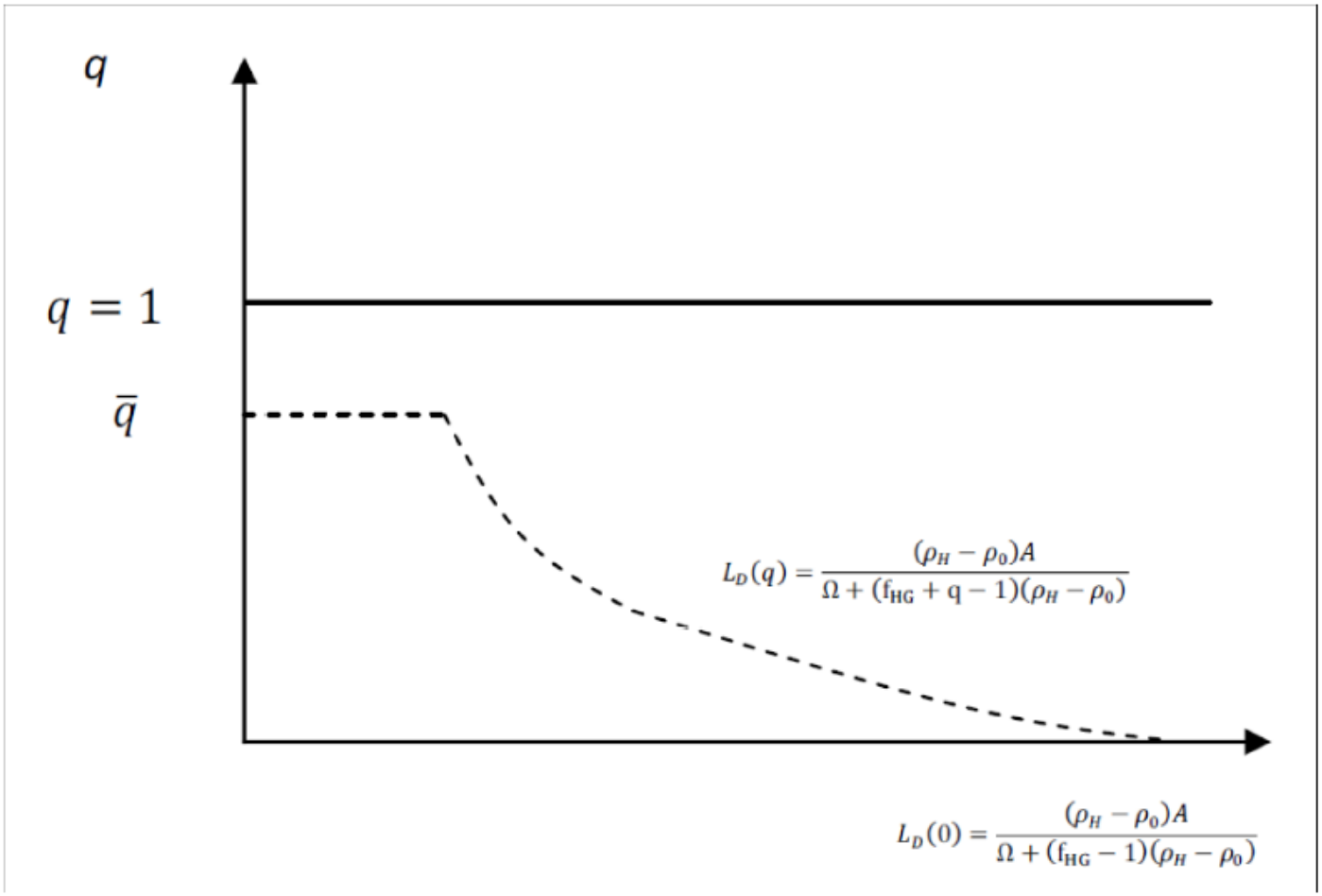

Figure 2: The aggregate shocks case with $\overline{q} < 1$. The aggregate demand for liquidity is represented by the horizontal solid line. The demand for liquidity by the corporate sector is represented by the dashed line.

Provision of Outside Liquidity

Again — good firms compare shadow value of liquidity with the market price.

Welfare clash with equilibrium same as before.

Provision of Outside Liquidity

- Central bank does not increase aggregate liquidity when lends funds against liquid collateral such as T-bills.
- Central bank increases aggregate liquidity when lends funds against illiquid collateral.

Policy

- Ex post it is optimal to rescue firms that did not get insurance and suffered high liquidity shocks.
- However, such bailout changes incentives at initial date, as entrepreneurs anticipate intervention and increase investment without getting insurance ex ante.
- Thus bailouts cause ex ante insurance to unravel.

Policy with Commitment

- Policies affect the pledgeable income of the corporate sector (they cannot turn nonpledgeable income into pledgeable income).

Policy with Commitment

- If liquidity flows in economy, implement through injecting liquidity until price equals 1.
- **If shadow value of liquidity to good firms is less than 1, then providing additional liquidity does not help.**
- An alternative is to subsidize insurance (contingent transfer committed to upfront, in case of high liquidity shock).
- Optimal policy combines this with policy discouraging initial overinvestment (effectively a tax on debt).

Conclusion

- In the absence of the adverse selection problem, provision of sufficient liquidity encourages second best levels of investment (constrained only by limits to pledgeability).
- In the case of no aggregate uncertainty, outside liquidity is unnecessary — firms can generate sufficient liquidity insurance themselves.

Conclusion

- Adverse selection discourages firms from spreading liquidity even in the absence of aggregate shocks.
- If this is a problem, then increasing the availability of outside liquidity does not help.
- Instead, subsidies to liquidity insurance become effective.
- Since these subsidies encourage investment at possibly excessive scale, taxes on debt become a supplement.