Marshall Lecture 2: Banks, Central Banking, and Crises

Raghuram G. Rajan
Reserve Bank of India

Motivation

- Yesterday:
  - Why banks? Partial equilibrium.
- Today:
  - Consequences of bank structure. General equilibrium.

Motivation

- Institutions face illiquidity and insolvency when they finance long term assets with short term debt.
  - Historically, banks
  - Now, investment banks and insurance companies
- In a crisis
  - The authorities can bail out banks and repudiate debt contracts.
  - Lend to change interest rates and restore stability.
- What makes more sense? What are the costs? What can be done?

Motivation contd.

- Interest rate policy is across-the-board, and when there is a systemic liquidity problem, it can give a boost to all those reliant on short-term funding.

- Conventional wisdom: It does not look like subsidized intervention.

- Is this true?
  - What are the costs ex post of “low for long”?
  - What are the costs ex ante of anticipated interest rate intervention?

Based on

- "Illiquid Banks, Financial Stability, and Interest Rate Policy", with Douglas Diamond, *Journal of Political Economy* Volume: 120 Issue: 3 Pages: 552-591, JUN 2012

- Related reading: "Fear of Fire Sales, Illiquidity Seeking, and Credit Freezes", with Douglas Diamond, *Quarterly Journal of Economics* Volume: 126 Issue: 2 Pages: 557-591: May 2011.

Related literature

- Acharya, Viral and Tanjul Yorulmazer (2007), “Too many to fail: An analysis of time-inconsistency in bank closure policies”, *Journal of Financial Intermediation*, *16 (1): 1-31.*

- Bhattacharya, Sudipto, and Douglas Gale (1987),"Preference Shocks, Liquidity and Central Bank Policy," in New Approaches to Monetary Economics, edited by W. Barnett and K. Singleton, (Cambridge: Cambridge University Press).

- Farhi, Emmanuel and Jean Tirole (2009), “Collective Moral Hazard, Maturity Mismatch, and Systemic Bailouts”, working paper, June 29, 2009,Toulouse.

- Freixas, Xavier, Antoine Martin and David Skeie (2009), “Bank liquidity, interbank markets and monetary policy,” working paper, Federal Reserve Bank of New York.

Outline

- Model
- Analysis of basic problem
- Intervention
  - Bailouts
  - Interest rate policy
- Ex ante distortions/Moral hazard
- Implications for policy

The Model

- Three dates: 0, 1, and 2
- On date 0, households are endowed with one unit of goods which are required inputs. Goods are in short supply relative to projects.
- Households have no production opportunities, but can lend them to banks, and banks can lend to entrepreneurs (with no own endowments).
- Banks are needed to force entrepreneurs to repay (e.g., Diamond-Rajan (2001).)

Households and endowments:

- Households are risk averse and consume at dates 1 and 2.
- Household utility is Log(C1) + Log (C2)
- Households each get date 1 endowment of $e_1 > 0$ and learn (on date 1) their date 2 endowment, which could be $e_2^L > 0$ or $e_2^H > e_2^L > 0$.

Households and Endowments

- Economy has n states at date 1, indexed by s.
- States differ in the fraction of households θ^s with high date 2 endowment.

$$\theta^{s+k} > \theta^s \quad when \quad k > 0$$

- Aggregate consumption growth will be higher in higher states, requiring higher real interest rates from date 1 to 2 (details later)

Banks and entrepreneurs (risk neutral for simplicity only)

- Entrepreneurs: Project requires a unit input at date 0 to produce $\tilde{Y}_2$ at date 2. The realization of $\tilde{Y}_2$ is learned at date 1.
- Project can be liquidated for X_1 > storage return at date 1.
- Bank can collect γY_2 from a borrower at date 2, or liquidate for X_1 at date 1.
- All banks have the same ex-post distribution of loan realizations (no aggregate asset-side uncertainty)

Financial Contracts (Diamond Rajan (2001))

- Basic commitment problem: banks can renegotiate any borrowing they do by threatening to withdraw their human capital.
- This ordinarily limits borrowing to the collateral value of illiquid bank assets (value in depositor hands, e.g., X_1).
- By borrowing using demandable deposits, banks can commit to pay up to the entire cash flow collected ΥY_2
- Intuition: Collective action problem in demandable claims enhances banker commitment and ability to borrow as in lecture yesterday.

Banks are competitive

- Each chooses D at date 0 to maximize the expected utility of households (to attract deposits).
- Equilibrium is Nash (and unique when there is no intervention).
- With intervention, there may be multiple equilibria.

Date 0	Date 1	Date 2
Households invest 1 each in banks in return for a promised payment of D at date 1. **Banks lend to entrepreneurs.**	**State s is revealed. Higher is s, more households get the high date-2 endowment.** **Banks offer market clearing interest rate r_{12}^{S}.** **Households decide how much to withdraw (if a run, all withdraw everything and all loans liquidated) and how much to consume.** **Bank chooses which loans to liquidate.**	**Projects mature, loans repaid, and deposits fully withdrawn from banks. All agents consume.**

Outline

- Motivation and preview of results
- Model
- Analysis of basic problem
- Intervention
- Moral Hazard
- Implications for policy

Fundamental tension

- Higher state => more optimists about future growth => greater desire to consume for any interest rate.
  - Equivalently lower current endowment
- More projects have to be liquidated to satisfy consumption needs.
- Market clearing deposit interest rate r_{12}^{s} rises to equate goods obtained from liquidation to goods withdrawn.
- Bank asset values fall with the interest rate while demandable liabilities do not.
- High demand for liquidity (optimism about future or current bad conditions) => bank insolvency => runs.

What happens in a run (assumed to occur only if bank insolvent)?

- Banks liquidate all loans, even those worth more in the future, pay off deposits.
- $\frac{X_1}{D}$ households at the front of the line get D and

the rest get nothing.

- Run bad because
  - Indiscriminate liquidation of even high return projects
  - Poor risk sharing amongst households

At date 0, competitive banks choose a non-state contingent D

- Higher the optimism in a state, higher the interest rate, and lower the promised payment that triggers a run.
- Trade-off – greater payout to depositors if D high against greater probability of costly runs.
- Bankers optimally choose a high D (with runs in optimistic states) if the probability of optimistic states is low.
- High interest rates then bring down banks in the low-probability optimistic states.
- Bankers optimally choose a low D with lower expectation of runs if the probability of optimistic states is high.
- Promises are countercyclical. Is this consistent with reality?

Is there an externality in setting D?

- No
- But runs are very costly ex post
- Are there better contracts? Optimal unconstrained contracts would be household type- and state-contingent. However
  - Need demandability to commit to pay more.
  - State-contingent demandability not practical – runs whenever reduction in face value anticipated
  - Contracts to encourage households to self-select will not work if depositors can freely move deposits or borrow against them: will pick deposits that pay highest present value at the market interest rate
- Demand deposits may be optimal contracts given constraints.

Outline

- Motivation and preview of results
- Model
- Analysis of basic problem
- Intervention
- Moral Hazard
- Implications for policy

Intervention

- Suppose the social planner/authorities dislike the costs of runs and would like to stop them.
  - They can tax households and transfer e_1 to banks.
  - They can borrow from households and lend to banks.
  - They can intervene (with capital requirements) ex ante to limit D.
- Consider the case where the social planner wants to maximize household utility given that producers (banks and entrepreneurs) meet low threshold utility.
  - Household-friendly planner.
  - Paper considers producer-friendly planner as well.

Direct Intervention to stop runs: Direct Bailouts

- Planner's willingness to tax and transfer e_1 directly (direct bailout) prevents runs but also undermines disciplinary effect of deposits.
  - Willingness to prevent runs stemming from insolvency also means willingness to prevent runs stemming from strategic default
- Planner forced to intervene more ex post.
- Banker potentially gets rents ex post.
- Bank competition offsets rent, leading to more leverage ex ante (e.g., $D+ e_1$).
  - System fails in at least as many states, and sometimes more than without intervention.
- No social benefit from limiting ex ante promises (e.g., through capital requirements), given anticipated ex post intervention.

Limits on Intervention: Lending to solvent banks

- Can we do better, for example, by constraining planner ex post?
- Possibly yes, by lending instead of being willing to transfer.
- Still a bailout!
- Ex ante banker actions in setting D still affected.

Arm's length Intervention: Lending at date 1

- Planner can tax households at date 1 and lend to banks, returning bank repayment to households at date 2.

- Impose requirement that planner lends only to banks solvent at the equilibrium interest rate.
  - Lend only if depositors willing to lend, and only at that market rate.
  - Planner can affect solvency only if it can lower rates.

- Households can't borrow against future endowments, can withdraw only up to D, the amount deposited.

Why does this have an effect?

- If all households undo the loan by withdrawing more from the bank => no effect.
- However, at low rates the type H households (with high future endowments) will want to fully withdraw.
- Planner effectively makes a loan to banks at an interest rate that a household type H would not make (reducing rates).
- Market rate is set by L households MRS.
- Large enough planner loans can reduce rates considerably. Quantitative easing?

Implications of Interest Rate Policy

- Pushing down rates in high rate states so banks are just solvent, allows runs to be avoided, allowing a Pareto improvement in those states (back door state-contingency).
- Pushing rates further down reduces liquidation and benefits producers (banks and entrepreneurs).
- But further reductions hurts households
  - H type makes more loans they would not make
  - Increases MRS gap of H and L.
  - Investment opportunity set of L households reduced.

Solution: Further constraints on ex post intervention

- Household friendly planner / central bank wants to intervene only to avoid runs.
- It can implement this without commitment, if the central bank lends at the market rate but there is any stigma (non-pecuniary penalty) to borrowing from it.
- In equilibrium, rate never goes below household friendly one (Bagehot except cost stigma rather than explicit penalty rate).
- Nevertheless, even this limited policy intervention creates problems ex ante.

Outline

- Motivation and preview of results
- Model
- Analysis of basic problem
- Intervention
- Moral Hazard
  - Leverage
  - Illiquidity
- Implications for policy

Ex-ante effects of Intervention: a) Greater Promises of Liquidity

- Knowing that the central bank will intervene to push down rates to restore system solvency ex post, banks will set deposit rates higher.
- Externality: Depositors pick highest D offered at date 0, ignoring the cost of future interest rate intervention, which is spread across all households.
- Banks choose too much leverage (too high a D), due to anticipated reductions in interest rates.
- Limits to D (leverage limits or capital requirements) useful here, but likely to be ineffective if regulatory arbitrage possible: SIVs or Conduits

Ex-ante effects of Intervention: b) More illiquid assets

- Banks need not respond only on the liability side
- Can hold more illiquid assets: Suppose that banks can choose between liquid loans and illiquid loans with higher long term payoffs.
- Intuitively, lower the ex post interest rate, lower the value from having low return liquid assets, which will be reinvested at a low rate.
- Equivalently, lower the cost of refinancing high return illiquid assets.
- Preference for illiquid assets is shorting liquidity, similar to preference for short term leverage.
- May be hard to affect either if incentives strong.

Outline

- Motivation and preview of results
- Model
- Analysis of basic problem
- Intervention
- Moral Hazard
  - Leverage
  - Illiquidity
- Implications for policy

Policies

- Ex post intervention=> Ex ante regulation
- But what if regulation ineffective?
- Need to alter ex ante incentives.
- How? Cannot commit not to rescue banking system when it is in trouble ➔ Greenspan/Bernanke put hard to eliminate.
- What about raising interest rates in normal times?

Bottom line

- Banks are fragile and structurally constructed to be prone to failure
- Ex post intervention to restore solvency or full deposit insurance increases rents to the banker if he does not “give” it back through higher leverage.
- So capital requirements in the face of too big to fail would limit failure but increase banker rents and thus the effective cost of capital (the current situation).
- If, in addition, banks can raise leverage in hidden ways, rents and cost of capital would go down, at the risk of overwhelming the system with failure.
- Monetary policy may be a better way of intervening, but it needs to be symmetric for the reasons we have discussed. Asymmetric monetary policy (the Greenspan Put) again encourages leverage, or equivalently, illiquidity.

Another application of D&R (2001)

- "Fear of Fire Sales, Illiquidity Seeking, and Credit Freezes"
- Distressed banks may have illiquid assets to sell if they get into trouble – fire sales if few buyers.
- This will raise potential returns for those who can buy the assets and have cash.
- Interesting implications
  - Distressed banks will not sell the potentially illiquid assets today. Instead they will load up on them in what we call illiquidity seeking.
  - Healthy banks who can potentially buy assets will not make other loans, as they wait, vulture-like, for potential fire sales. This can lead to credit freezes.
- Why cleaning up the system early makes sense.