Deposit Insurance without Commitment: Wall St. vs. Main St.

Russell Cooper* Hubert Kempf**

*European University Institute and University of Texas at Austin

**Banque de France and Paris School of Economics

May 2011

Outline

1. Motivation
2. Planner's Problem
3. Decentralization
4. Systemic Runs and DI: Timing
   - Optimal Taxes Ex Post
   - Taxes Set Ex Ante: Type Independent
   - Taxes Set Ex Ante: Type Dependent
5. Partial Runs
6. Preventing Runs
7. Conclusions

Deposit Insurance in Theory

- assumed to be credible
- avoids runs equilibrium

Deposit Insurance in Practice

- Prevalent in various forms around the globe
- But commitment assumed in theory is less clear
  - UK: Northern Rock (partial coverage and caps)
  - US: redesign of program mid-crisis
  - EMU: how is DI financed?
  - China: 1980s and current regulations
  - bailouts of non-bank intermediaries in many countries
- Question: in the absence of commitment, will DI (an *ex post* bailout) be provided?

Deposit Insurance in Theory

- assumed to be credible
- avoids runs equilibrium

Deposit Insurance in Practice

- Prevalent in various forms around the globe
- But commitment assumed in theory is less clear
  - UK: Northern Rock (partial coverage and caps)
  - US: redesign of program mid-crisis
  - EMU: how is DI financed?
  - China: 1980s and current regulations
  - bailouts of non-bank intermediaries in many countries
- Question: in the absence of commitment, will DI (an *ex post* bailout) be provided?

Deposit Insurance in Theory

- assumed to be credible
- avoids runs equilibrium

Deposit Insurance in Practice

- Prevalent in various forms around the globe
- But commitment assumed in theory is less clear
  - UK: Northern Rock (partial coverage and caps)
  - US: redesign of program mid-crisis
  - EMU: how is DI financed?
  - China: 1980s and current regulations
  - bailouts of non-bank intermediaries in many countries
- Question: in the absence of commitment, will DI (an *ex post* bailout) be provided?

Deposit Insurance in Theory

- assumed to be credible
- avoids runs equilibrium

Deposit Insurance in Practice

- Prevalent in various forms around the globe
- But commitment assumed in theory is less clear
  - UK: Northern Rock (partial coverage and caps)
  - US: redesign of program mid-crisis
  - EMU: how is DI financed?
  - China: 1980s and current regulations
  - bailouts of non-bank intermediaries in many countries
- Question: in the absence of commitment, will DI (an *ex post* bailout) be provided?

Study Using

- Diamond-Dybvig model
- heterogeneity in endowments across households
- Wall St. vs. Main St. tension through claims on entire financial system
- redistribution through the provision of deposit insurance relative to tax contributions
- steps of analysis
  - characterize optimal deposit contract (planner and decentralized)
  - ask if there is a *expectations driven* bank-run (systemic or not) under the optimal allocation
  - if yes, determine if deposit insurance will be provided *ex post*
  - study this for progressively less flexible taxation systems

Households

- $t = 0, 1, 2.$
- type α^0 endowment of single good: $(\alpha^0, \bar{\alpha}, 0)$
- $f(\cdot)$ is pdf, $F(\cdot)$ is cdf
- preferences
  - early consumer: $u(c^0) + v(c^E)$
  - late consumer: $u(c^0) + v(c^L)$
  - $u(\cdot)$ and $v(\cdot)$ are strictly increasing and strictly concave
  - $\pi \in (0, 1)$: fraction early, independent of endowment type

Technology

- one period technology: return of 1
- two-period technology:
  - return of $R > 1$
  - return of ε if liquidated early

Table: Technology

	period 0	period 1	period 2
liquid	-1	1	1
illiquid	-1	ε	R

Optimal Allocation

- endowment types are known, tastes are not
- choose: $(d(\alpha^0), x^E(\alpha^0), x^L(\alpha^0))$ and ϕ
- objective function:

$$\int \omega(\alpha^0)[u(\alpha^0 - d(\alpha^0)) + \pi v(\bar{\alpha} + x^E(\alpha^0)) + (1-\pi) v(\bar{\alpha} + x^L(\alpha^0))] f(\alpha^0) d\alpha^0. \tag{1}$$

- resource constraints

$$\phi D = \pi \int x^E(\alpha^0) f(\alpha^0) d\alpha^0 \tag{2}$$

$$(1-\phi) DR = (1-\pi) \int x^L(\alpha^0) f(\alpha^0) d\alpha^0 \tag{3}$$

- welfare weights: $\omega(\alpha^0)$
- ignore prospect of run

FOCs: insurance and redistribution

$$\omega(\alpha^0)u'(\alpha^0 - d(\alpha^0)) = \lambda \tag{4}$$

$$v'(\bar{\alpha} + x^E(\alpha^0)) = Rv'(\bar{\alpha} + x^L(\alpha^0)) \tag{5}$$

and

$$v'(\bar{\alpha} + x^E(\alpha^0)) = u'(\alpha^0 - d(\alpha^0)) \tag{6}$$

for all α^0.

Runs

- truth-telling is a Nash Equilibrium: $c^L(\alpha^0) > c^E(\alpha^0)$
- bank run is an equilibrium too:
  - $\pi < 1$ is sufficient if ε is near 0
  - $\phi D = \pi \int x^E(\alpha^0) f(\alpha^0) d\alpha^0 < \int x^E(\alpha^0) f(\alpha^0) d\alpha^0$
  - not enough resources to meet demands for all households
  - some households served, others are not
    $\zeta v(\bar{\alpha} + x^E(\alpha^0)) + (1-\zeta) v(\bar{\alpha})$
- how does the planner respond to a run?

Runs

- truth-telling is a Nash Equilibrium: $c^L(\alpha^0) > c^E(\alpha^0)$
- bank run is an equilibrium too:
  - $\pi < 1$ is sufficient if ε is near 0
  - $\phi D = \pi \int x^E(\alpha^0) f(\alpha^0) d\alpha^0 < \int x^E(\alpha^0) f(\alpha^0) d\alpha^0$
  - not enough resources to meet demands for all households
  - some households served, others are not $\zeta v(\bar{\alpha} + x^E(\alpha^0)) + (1-\zeta) v(\bar{\alpha})$
- how does the planner respond to a run?

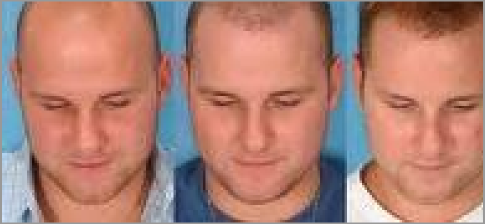

Figure: Responding to a Run

Responses to a Run: Haircut

Proposition

Given a bank run, the planner has an incentive to reallocate consumption relative to the outcome under sequential service.

- Objective:

$$\int \omega(\alpha^0)[\pi+\nu(\alpha^0)(1-\pi)][v(\bar{\alpha}+\tilde{x}^E(\alpha^0))]f(\alpha^0)d\alpha^0+\int \omega(\alpha^0)[(1-\nu(\alpha^0))(1-\pi)][v(\bar{\alpha}+\tilde{x}^L(\alpha^0))]f(\alpha^0)d\alpha^0 \tag{7}$$

where $\nu(\alpha^0)$ of type α^0 late consumers announce early

- period 1 resource constraint:

$$\int [\pi+\nu(\alpha^0)(1-\pi)]\tilde{x}^E(\alpha^0)f(\alpha^0)d\alpha^0 = \phi D - S + \epsilon L. \tag{8}$$

- period 2 resource constraint:

$$((1-\pi)\int (1-\nu(\alpha^0))\tilde{x}^L(\alpha^0)f(\alpha^0)d\alpha^0 = (\phi D - L)R + S. \tag{9}$$

- $S = 0$ and $L \geq 0$ imply

$$v'(\bar{\alpha}+\tilde{x}^E(\alpha^0)) = \frac{R}{\epsilon}v'(\bar{\alpha}+\tilde{x}^L(\alpha^0)). \tag{10}$$

- risk sharing and reallocation across types, dominates sequential service

Does this intervention prevent a run?

Corollary

In the allocation characterized in Proposition 1, there is no bank run.

- $c^L(\alpha^0) > c^E(\alpha^0)$
- illiquid investment remains intact to fund late consumers
- commitment not needed
- but not quite deposit insurance

Optimal Contract

- banks: max HH utility st feasibility and zero expected profit
- contract is α^0 specific
- Household optimization

$$max_d u(\alpha^0 - d) + \pi v(\bar{\alpha} + r^1(\alpha^0)d) + (1-\pi)v(\bar{\alpha} + r^2(\alpha^0)d) \tag{11}$$

- Bank constraints for all α^0

$$r^1(\alpha^0)\pi d(\alpha^0) + r^2(\alpha^0)(1-\pi)d(\alpha^0) = \phi(\alpha^0)d(\alpha^0) + (1-\phi(\alpha^0))d(\alpha^0)R; \tag{12}$$

and

$$\phi(\alpha^0)d(\alpha^0) \geq r^1(\alpha^0)d(\alpha^0)\pi, \qquad (1-\phi(\alpha^0))d(\alpha^0)R \geq r^2(\alpha^0)(1-\pi)d(\alpha^0). \tag{13}$$

Timing

- sequential service of households in period 1
- bank exhausts liquid assets
- ε is near zero
- contacts government: will you provide DI?
- look at expected utilities with and without DI
- discuss prevention of runs below

- welfare with DI

$$W^{DI} = \int \omega(\alpha^0)v(\bar{\alpha} + \chi(\alpha^0) - T(\alpha^0))f(\alpha^0)d\alpha^0 \tag{14}$$

- welfare without DI

$$W^{NI} = \int \omega(\alpha^0)[\zeta v(\bar{\alpha} + \chi(\alpha^0)) + (1-\zeta)v(\bar{\alpha})]f(\alpha^0)d\alpha^0 \tag{15}$$

- $\chi(\alpha^0) \equiv r^1(\alpha^0)d(\alpha^0)$ is total owed under deposit contract
- ζ is the probability of getting served
- $T(\alpha^0)$ is type specific tax
- when is $\Delta \equiv W^{DI} - W^{NI}$ positive?

$$\Delta = \int \omega(\alpha^0) \underbrace{[v(\chi(\alpha^0) + \bar{\alpha} - T(\alpha^0)) - v(\chi(\alpha^0) + \bar{\alpha} - \bar{T})] f(\alpha^0) d\alpha^0}_{\text{Redistribution through taxes}} +$$

$$\int \omega(\alpha^0) \underbrace{[v(\chi(\alpha^0) + \bar{\alpha} - \bar{T}) - v(\zeta\chi(\alpha^0) + \bar{\alpha})] f(\alpha^0) d(\alpha^0)}_{\text{Redistribution through Deposit Insurance}} +$$

$$\int \omega(\alpha^0) \underbrace{[v(\zeta\chi(\alpha^0) + \bar{\alpha}) - \zeta v(\chi(\alpha^0) + \bar{\alpha}) - (1-\zeta) v(\bar{\alpha})] f(\alpha^0) d\alpha^0}_{\text{Insurance gains to DI}}$$

where $\bar{T} = \int T(\alpha^0) f(\alpha^0) d\alpha^0$.

Role of Heterogeneity

Proposition

If $F(\alpha^0)$ is degenerate, $v(c)$ is strictly concave, then the government **will** *have an incentive to provide deposit insurance.*

Note:

- Diamond-Dybvig case
- $F(\alpha^0)$ degenerate could reflect optimal reallocation in period 0

Study Effects of Heterogeneity by:

- *ex post* optimal taxes
- *ex ante* taxes
- progressively weaken optimality of tax system to study redistribution costs

Role of Heterogeneity

Proposition

If $F(\alpha^0)$ is degenerate, $v(c)$ is strictly concave, then the government **will** *have an incentive to provide deposit insurance.*

Note:

- Diamond-Dybvig case
- $F(\alpha^0)$ degenerate could reflect optimal reallocation in period 0

Study Effects of Heterogeneity by:

- *ex post* optimal taxes
- *ex ante* taxes
- progressively weaken optimality of tax system to study redistribution costs

Ex Post Optimal Taxes

W^{DI} as the solution to an optimal tax problem:

$$W^{DI} = max_{T(\alpha^0)} \int \omega(\alpha^0)v(\chi(\alpha^0) + \bar{\alpha} - T(\alpha^0))f(\alpha^0)d\alpha^0 \quad (16)$$

Proposition

If $T(\alpha^0)$ solves the optimization problem (16), then deposit insurance is always provided.

- with optimal reallocation, no conflict with insurance provision
- like the optimal haircut of the planner
- set tax structure to fund DI along with its provision

Ex Ante Lump Sum Taxes: Example

- two types
- $\alpha^0 = 3$ for poor, $\alpha^0 = 5$ for rich
- 50% rich
- solve for equilibrium
- check if DI will be provided ex post
- depends on: risk aversion, welfare weight, distribution of endowments

Risk Aversion as a Basis for Commitment

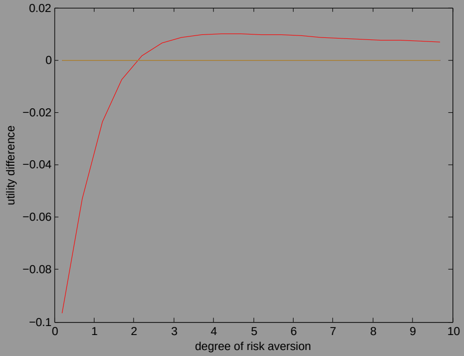

Figure: Effects of Risk Aversion

Endowment MPS Reduces Commitment Value

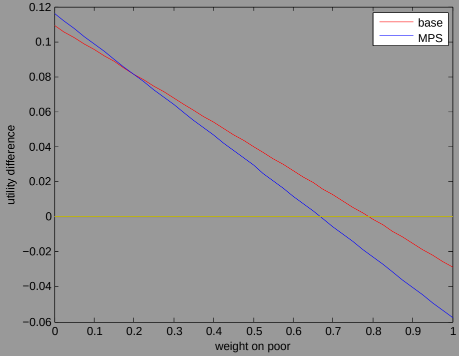

Figure: MPS on Endowment Distribution

Restricted Contract

$r^1(\alpha^0) = r, r^2(\alpha^0) = r^2$

Proposition

If households are not too risk averse and $\omega(\alpha^0)$ is strictly decreasing in α^0, then a government **will not** *have an incentive to provide deposit insurance.*

KEY: explore limit of risk neutrality where redistribution is costly when weights are declining.

Ex ante Taxes

- redistribution through DI reflects deposit claims and tax liabilities
- all else the same, a tax schedule which redistributes more, reduces welfare

Proposition

Compare two tax schedules, $T(\cdot)$ and $\tilde{T}(\cdot)$. If $\tilde{T}(\cdot)$ induces a MPS on consumption relative to $T(\cdot)$ then Δ falls when we replace $T(\cdot)$ with $\tilde{T}(\cdot)$.

Ex ante Taxes

- $c(\alpha^0) = (\bar{\alpha} + \chi(\alpha^0))^{(1-\tau)}\,\bar{T}^{\tau}$
- $\bar{T}^{\tau}$ balances the budget

Proposition

Compare two tax rates, τ^L and τ^H with $\tau^H > \tau^L > 0$, then Δ is higher under the tax rate τ^H compared to τ^L.

Bank Specific Runs

- a fraction n of the households run on multiple symmetric banks
- probability of run is independent of type
- DI redistributes across types and groups (run, no run)

$$\begin{aligned}\Delta &= \int \omega(\alpha^0)\{n[v(c^E(\alpha^0) - \bar{T}) - \zeta v(\bar{\alpha} + \chi(\alpha^0)) - (1-\zeta)v(\bar{\alpha})] + \\ &\quad (1-n)[v(c^E(\alpha^0) - \bar{T}) - v(c^E(\alpha^0))]\}f(\alpha^0)d\alpha^0. \qquad (17)\end{aligned}$$

- first term captures insurance gain plus redistribution to those at failed banks (Wall St.)
- second term captures tax obligation of those at surviving banks (Main St.)

Proposition

If $F(\alpha^0)$ is degenerate, then the gains from deposit insurance are positive for any n.

If $F(\alpha^0)$ is not degenerate, two forms of redistribution interact.

Proposition

If $F(\alpha^0)$ is degenerate, then the gains from deposit insurance are positive for any n.

If $F(\alpha^0)$ is not degenerate, two forms of redistribution interact.

Computed Example: Partial Runs

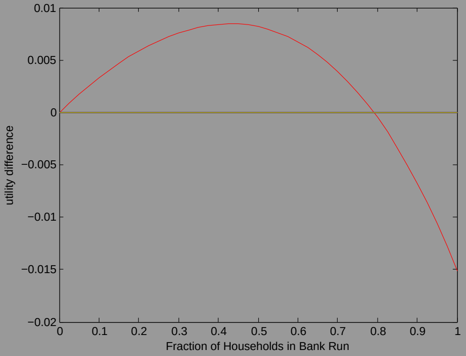

Figure: Partial Runs

Does DI Prevent Runs?

NO

- bank liquidates to meet depositor demands
- DI redistributes what is left to "early consumers"

YES

- provision of DI involves optimal liquidation
- implement haircut allocation of planner
- late consumption exceeds early consumption: no incentive to run

Does DI Prevent Runs?

NO

- bank liquidates to meet depositor demands
- DI redistributes what is left to "early consumers"

YES

- provision of DI involves optimal liquidation
- implement haircut allocation of planner
- late consumption exceeds early consumption: no incentive to run

Conclusions

- DI will be provided *ex post* if insurance gains dominate
- DI will not be provided if it redistributes consumption away from favored types
- To consider:
  - cap on DI: effects on monitoring, is it credible?
  - interbank loans
  - too big to fail
  - monetary financing of DI
  - DI in a MU
  - reputation effects of bailout
  - model of political pressure