Government Guarantees and Financial Stability

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Motivation

- The 2008 financial crisis highlighted the inadequacy of the existing safety net in preventing the crisis and mitigating its negative effects
- Governments had to implement extraordinary emergency measures to preserve financial stability
  - Extension of the coverage and scope of the existing guarantee schemes
  - Introduction of new schemes and generalized guarantees
- Government interventions turned out to be very costly
  - E.g. in Ireland the solvency of the whole country was at risk

Why can the government intervention be costly?

- It eliminates panic runs and it is not costly in Diamond and Dybvig (1983)
- It leads to
  - *Disbursement for the government*: it can also eliminates runs, but it may lead to a disbursement if these are driven by the deterioration of fundamentals rather than pure panics
  - *Moral hazard*: anticipating the intervention, banks have an incentive to over-exploit the guarantee and take excessive risk
  - *Depositors' withdrawal decisions*: the anticipation of the intervention and banks' choice of risk affect depositors' decision of whether to run
- This raises the question of whether government intervention (and eventually which form) is desirable

Our paper

- It analyzes the desirability of government intervention when both panic and fundamental crises are possible, and both banks' behavior and depositors' withdrawal decisions are determined endogenously
  - Not done in the literature so far (e.g., Keister 2012)
- We start with a standard three-date banking model based on Goldstein and Pauzner (2005)
  - Banks invest in risky projects and choose promised consumption to depositors at the intermediate date
  - Depositors receive imperfect information about the project returns at the intermediate date and decide whether to withdraw prematurely
  - Both fundamental and panic runs can occur
- We analyze several guarantee schemes that differ in terms of the time and the size of the intervention

Preview of the results

- Without government intervention, the decentralized solution is inefficient
  - Banks offer too little to early depositors and panic runs occur
- There is scope for government intervention, but this introduces a bank moral hazard
- The severity of the moral hazard problem and the likelihood of runs vary across
  - The time and the size of the government intervention
  - The amount of public resources available in the economy
- The government can contain bank moral hazard by intervening less
  - This leaves panic runs, but it is best when public resources are scarce
- A standard deposit insurance which prevents all runs is better when public resources are ample
- Not all guarantee schemes improve welfare

The basic model I

- Three date $(t = 0, 1, 2)$ economy with a continuum $[0, 1]$ of banks and consumers
- Banks raise one unit of funds from depositors in exchange for a demandable deposit contract and invest in a risky project
- The project returns 1 if liquidated at date 1 and $\widetilde{R}$ at date 2 with

$$\tilde{R} = \begin{cases} R > 1 & \text{w. p. } p(\theta) \\ 0 & \text{w. p. } (1 - p(\theta)) \end{cases}$$

with $\theta \sim U[0, 1]$ and $p\prime(\theta) > 0$.

The basic model II

- Consumers are risk-averse ($RRA > 1$) and endowed with 1 unit at date 0
- Consumers derive utility both from consuming at date 1 or 2 and from enjoying a public good g

$$U(c, g) = u(c) + v(g)$$

with $u'(c) > 0$, $v'(g) > 0$, $u''(c) < 0$, $v''(g) < 0$, $u(0) = v(0) = 0$

- Consumers are ex ante identical but each has probability λ of being early (and consume at date 1) and $1 - \lambda$ of being late
- Banks choose deposit contract $(c_1, \widetilde{c}_2)$ to maximize depositors' expected utility
- The uncertainty over depositors' type is resolved at the beginning of date 1

Depositors' information

- At the beginning of date 1, each depositor receives a private signal x_i regarding the fundamental of the economy θ of the form

$$x_i = \theta + \epsilon_i,$$

  with $\epsilon_i \sim U[-\epsilon, +\epsilon]$ being i.i.d. across agents.
- Based on the signal, depositors update their beliefs about the fundamental θ and the actions of the other depositors
  - Early depositors always withdraw at date 1
  - Late depositors withdraw at date 1 if they receive a low enough signal
- The bank satisfies early withdrawal demands by liquidating its investments. If proceeds are not enough, depositors receive a pro-rata share

The decentralized solution (D): Depositors' withdrawals

Lower dominance		Intermediate			Upper dominance
late depositors withdraw as low θ — fundamental runs	$\underline{\theta}(c_1)$	late depositors withdraw because of θ and n — panics	$\theta^*(c_1)$	$\overline{\theta}(c_1)$	no late depositor withdraws — no runs

where $\underline{\theta}(c_1)$ is the solution to $u(c_1) = p(\theta)u(\frac{1-\lambda c_1}{1-\lambda}R)$ and

$$\theta^*(c_1) = p^{-1}\frac{u(c_1)\left[1-\lambda c_1 + c_1 \log(c_1)\right]}{c_1 \int_{n=\lambda}^{1/c_1} u\left(\frac{1-nc_1}{1-n}R\right) dn}$$

Both thresholds $\underline{\theta}(c_1)$ and $\theta^*(c_1)$ increase with c_1

The decentralized solution (D): The bank's choice

- Given depositors' withdrawal decisions, at date 0 each bank chooses c_1 to maximize

$$\int_0^{\theta^*(c_1)} u(1)\, d\theta + \int_{\theta^*(c_1)}^1 \left[\lambda u(c_1) + (1-\lambda) p(\theta) u\left(\frac{1-\lambda c_1}{1-\lambda} R\right)\right] d\theta$$
$$+ v(g)$$

- The optimal $c_1^D > 1$ trades off better risk sharing with higher probability of runs $\left(\frac{\partial \theta^*(c_1)}{c_1} > 0\right)$ and solves

$$\lambda \int_{\theta^*(c_1)}^1 \left[u'(c_1) - p(\theta^*(c_1)) R u'(c_{2\lambda})\right] d\theta +$$
$$-\frac{\partial \theta^*(c_1)}{\partial c_1} \left[\lambda u(c_1) + (1-\lambda) p(\theta^*(c_1)) u(c_{2\lambda}) - u(1)\right] = 0.$$

- The solution is inefficient relative to a social planner maintaining only fundamental runs

Government intervention

- The government commits to transfer some of the resources g to the banking sector
- The amount and the timing vary across different types of intervention
  - Deposit insurance guaranteeing c_1 to depositors withdrawing early
  - Deposit insurance guaranteeing c_1 to depositors either at date 1 or 2
  - Deposit insurance guaranteeing c_1 at date 1 and $c_{2\lambda}$ at date 2
  - The government transfers public resources to guarantee date 1 repayments after the first $\alpha \in [\lambda, 1]$ depositors withdraw
- In all cases, the cost of intervention is measured in terms of lower provision of the public good g
- Banks do not internalize this cost when they choose c_1, thus leading to moral hazard

Guaranteeing promised consumption only to depositors withdrawing at date 1 (DW)

- All depositors withdrawing at date 1 receive c_1 (irrespective of θ)
  - Late depositors waiting till date 2 obtain $c_{2\lambda} = \frac{1-\lambda c_1}{1-\lambda} R$
- This guarantee scheme removes panic runs while leaving the fundamental runs for $\theta \leqslant \underline{\theta}(c_1)$
- Each bank chooses c_1 at date 0 to maximize

$$\underset{c_1}{Max} \int_0^{\underline{\theta}(c_1)} u\left(c_1\right) d\theta + \int_{\underline{\theta}(c_1)}^{1} \left[\lambda u(c_1) + (1-\lambda) p(\theta) u\left(\frac{1-\lambda c_1}{1-\lambda} R\right)\right] d\theta$$

$$+ \int_0^{\underline{\theta}(c_1^*)} v\left(g - \left(c_1^* - 1\right)\right) d\theta + \int_{\underline{\theta}(c_1^*)}^{1} v\left(g\right) d\theta$$

subject to

$$g - \left(c_1^* - 1\right) \geq 0$$

- Banks do not internalize the cost of the guarantee but they know that in equilibrium the government's disbursement cannot exceed g

Guaranteeing early depositors' consumption at both date 1 and 2 (D1)

- All depositors receive at least c_1 at either date
  - Early depositors receive c_1, while late types receive $c_{2\lambda}$ with prob. $p(\theta)$ and c_1 with prob. $1 - p(\theta)$
- Neither panic nor fundamental runs occur any longer and each bank chooses c_1 at date 0 to maximize

$$\int_0^1 \left[\lambda u(c_1) + (1-\lambda)\left(p(\theta)u\left(\frac{1-\lambda c_1}{1-\lambda}R\right) + (1-p(\theta))u(c_1)\right)\right] d\theta +$$

$$+ \int_0^1 \left[p(\theta)v(g) + (1-p(\theta))v\left(g - (1-\lambda)c_1^*\right)\right] d\theta$$

subject to

$$g - (1-\lambda)c_1^* \geq 0$$

Guaranteeing promised consumption to early and late depositors (D2)

- All depositors receive the promised consumption at either date
  - Early depositors receive c_1, and late types always receive $c_{2\lambda}$
- Again there are no runs, and each bank chooses c_1 at date 0 to maximize

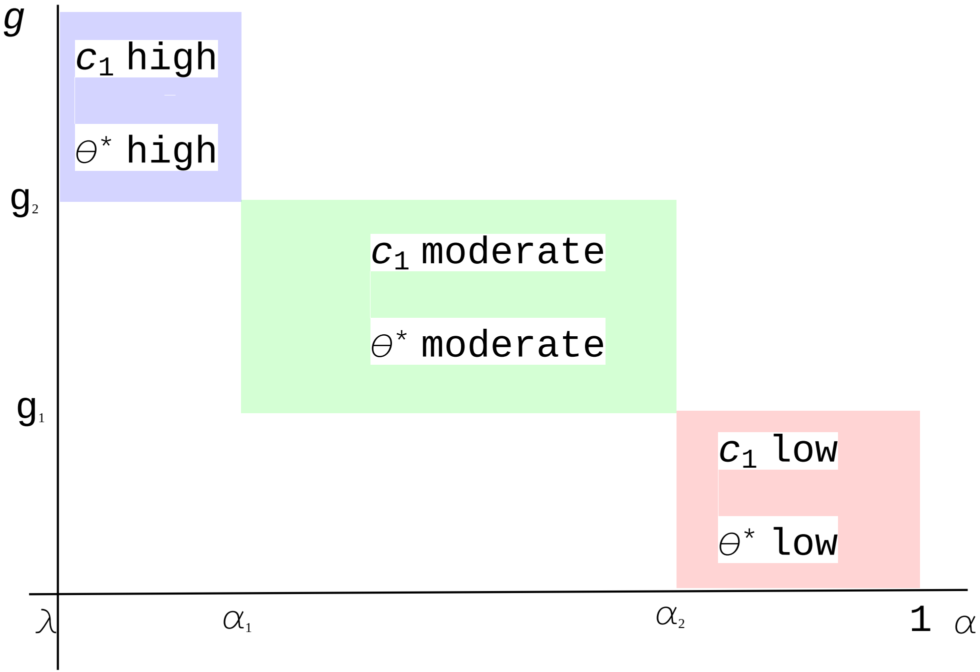
$$\int_0^1 \left[\lambda u(c_1) + (1-\lambda) u\left(\frac{1-\lambda c_1}{1-\lambda} R \right) \right] d\theta$$

subject to

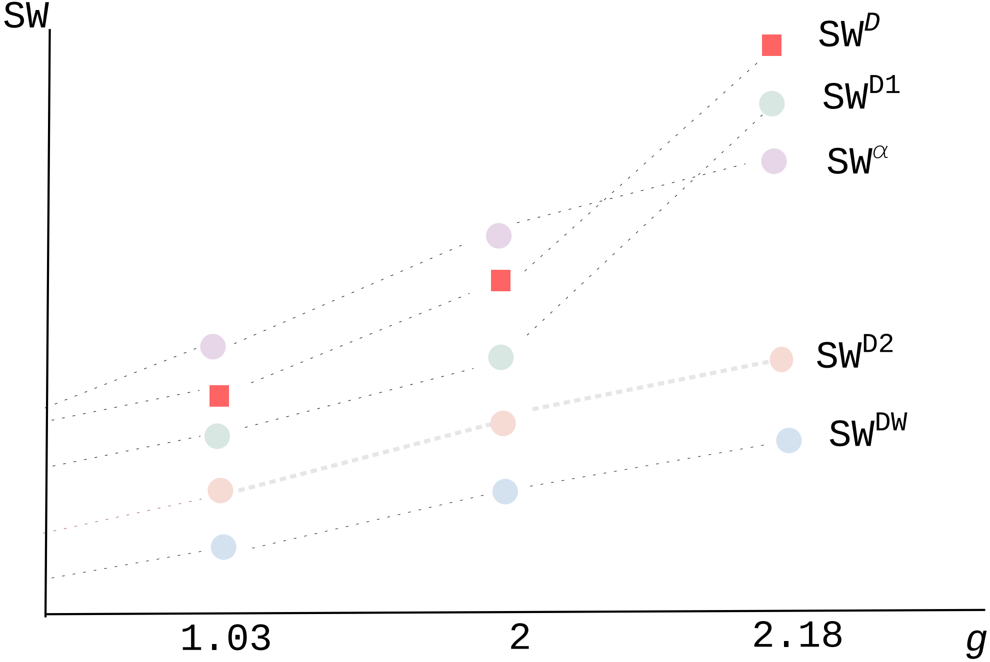
$$g - (1-\lambda) c_{2\lambda}^* \geq 0$$

Government intervention at date 1 (alpha intervention)

- By choosing the size of the intervention, the government can mitigate the moral hazard problem
- In case of a run at date 1, the government chooses to transfer some of the resources g to the banking sector after the first $\alpha \in [\lambda, 1]$ depositors withdraw
- What depositors receive in the case of a run depends on choice of α
  - They receive c_1 (as chosen by the bank) if the government intervenes before the bank exhausts its resources (i.e., $\alpha \leqslant 1/c_1$), while they receive the pro-rata share $\frac{1}{\alpha}$ otherwise (i.e., $\alpha > 1/c_1$)
  - The disbursement for the government is $(c_1 - 1)$ for each of the $n > \alpha$ depositors withdrawing at date 1 if $\alpha \leqslant 1/c_1$ and $\frac{1}{\alpha}$ otherwise



g
c1 high
θ* high
g2
c1 moderate
θ* moderate
g1
c1 low
θ* low
λ
α1
α2
1
α



SW
SW^D
SW^{D1}
SW^α
SW^{D2}
SW^{DW}
1.03
2
2.18
g

Conclusions

- Different government interventions have different effects on limiting the occurrence of runs and bank moral hazard
- The optimality of government intervention depends on the amount of public resources available in the economy
  - With large resources, removing all runs is optimal, even at the expense of a greater bank moral hazard
  - With more limited resources it is optimal to intervene less and limit bank moral hazard
- Determining endogenously both the probability of runs and the deposit contract is crucial