Bailouts and Financial Fragility

Todd Keister

Federal Reserve Bank of New York
and
European University Institute

Workshop on Industrial Organization and Banking
IESE
March 2010

The views expressed herein are my own and do not necessarily reflect those of the Federal Reserve Bank of New York or the Federal Reserve System.
Motivation

- The crisis has generated a lively discussion of the effects of bailouts
  - “bailout” = transfer of public resources into the financial sector

- Two competing views have received significant attention

1. Bailouts cause moral hazard; distorts ex ante incentives
   - focus on credibly committing to no/limited bailouts

2. A crisis is not the time to worry about moral hazard
   - focus on correcting ex ante distortions through regulation
A related issue has received less attention

- Financial crises are often thought to have an important self-fulfilling component
  - investors withdraw in part because they fear withdrawals by others will exacerbate losses

- In such cases, bailouts also have a *positive* ex ante effect on incentives
  - decrease the incentive for an investor to withdraw
  - has a stabilizing effect on the financial system
  - example: deposit insurance
The question

- What are the effects, \textit{ex ante} and \textit{ex post}, of bailouts?
  - Is it desirable to limit/ban bailouts?
  - Are there other ways of addressing the moral hazard issue?

- Need a well-specified model in which the relevant effects arise
  - I use a modified version of the well known Diamond-Dybvig model
  - add fiscal policy and limited commitment

- Broader research agenda:

  Aim to understand the effects of public intervention on incentives and outcomes in formal models of financial intermediation
Results

- The anticipation of a bailout in times of crisis creates moral hazard
  - financial intermediaries become too illiquid
    (or, perform too much maturity transformation)

- Committing to a no-bailout policy *over-corrects* the problem
  - intermediaries become too liquid (do too little maturity trans.)
  - Plus: makes allocation of resources in a crisis less efficient
  - And: increases financial fragility

- A tax on illiquidity - with no restriction on bailouts - can implement
  the constrained efficient allocation
Outline

• The environment

• The constrained efficient allocation

• Equilibrium and moral hazard

• Committing to a no-bailout policy

• Taxing illiquidity

• Concluding remarks
The environment

- 3 times periods, $t = 0, 1, 2$

- Continuum of investors, $i \in [0, 1]$
  - utility
    \[
    u(c_{1i} + \theta_i c_{2i}) + v(d)
    \]
  - where $\theta_i = \begin{cases} 0 \\ 1 \end{cases}$ if depositor is \begin{cases} impatient \\ patient \end{cases}

  - $c_{ti}$ is private consumption, $d$ is a public good

- Type is revealed at $t = 1$; private information
  - $\pi = \text{probability of being impatient for each investor}$

-7-
Technologies:

- Private investment at $t = 0$ yields $\left\{ \frac{1}{R > 1} \right\}$ at $t = \left\{ \frac{1}{2} \right\}$
  
  – usual incentive to pool resources for insurance purposes

- Public good can be created using private goods as inputs at $t = 1$
  
  – one unit of private good creates one unit of public good
  (for simplicity)

- Endowments can be taxed at $t = 0$
Graphically

- A standard Diamond-Dybvig environment ...

\[ \text{Slope} = \frac{\pi}{1-\pi} R \]
Graphically

- A standard Diamond-Dybvig environment ...

\[
r(1-d) \quad 1(1-d) \quad c_1 \quad c_2
\]

\[
\text{Slope} = \frac{\pi}{1-\pi} R
\]

- ... combined with a simple public-finance problem
Intermediation

- Investors pool funds at $t = 0$, withdraw in either $t = 1$ or $t = 2$
  - institution can be interpreted as a bank or other financial intermediary, repo contract, etc.
  - withdrawals at $t = 1$ subject to sequential service

- Intermediaries’ objective is to maximize investors’ expected utility
  - cannot commit to future actions (as in Ennis & Keister, 2009)

- Investors may condition actions on an extrinsic “sunspot” variable
  - $s \in \{s_1, s_2\}$ with $\text{prob}[s = s_2] = q > 0$
  - realized state is not observed by intermediary or policy maker

-11-
The constrained efficient allocation

• Suppose investors take the following actions in each state:

  \( s_1 \): only impatient investors withdraw early

  \( s_2 \): all investors attempt to withdraw early

• For now, take this profile of actions as given

  – will return to the question of whether this behavior is consistent with equilibrium

Q: What is the best allocation of resources conditional on this behavior?
The fraction of investors attempting to withdraw: \( \left\{ \frac{\pi}{1} \right\} \) in \( \left\{ \frac{s_1}{s_2} \right\} \)

As the first \( \pi \) withdrawals take place, planner cannot make any inference about state

- pays some amount \( c_E \) to each of them ("face value")

If withdrawals stop, remaining resources divided between \( c_L \) and \( d \)

If withdrawals continue past \( \pi \), planner can infer state is \( s_2 \)

- wants to reschedule the remaining liabilities ("partial suspension" as in Wallace, 1990)

- but then ... do investors continue to run?
• Assume: the planner can implement the efficient continuation allocation
  
  – remaining impatient investors receive some amount $c_{EP}$
  
  – remaining patient investors receive $c_{LP}$ at $t = 2$
  
  – provides level of public good $d_{P}$

• Could be implemented in one of several ways
  
  – screening of investor types (Ennis & Keister, 2009)
  
  – an equilibrium of a continuation game (Ennis & Keister, 2010)
The constrained efficient allocation maximizes

\[ \pi u(c_E) + (1 - q) [(1 - \pi) u(c_L) + v(d)] + \]

\[ q [(1 - \pi) [\pi u(c_{EP}) + (1 - \pi) u(c_{LP})] + v(d_P)] \]

subject to

\[ (1 - \pi) \frac{c_L}{R} + d \leq 1 - \pi c_E \quad \text{(for } s_1 \text{)} \]

\[ (1 - \pi) \left( \pi c_{EP} + (1 - \pi) \frac{c_{LP}}{R} \right) + d_P \leq 1 - \pi c_E \quad \text{(for } s_2 \text{)} \]

\[ c_E \leq c_L \quad \text{and} \quad c_{EP} \leq c_{LP} \quad \text{(IC)} \]
• The solution is characterized by ex ante efficiency ...

\[ u'(c_E) = (1 - q) Ru'(c_L) + q Ru'(c_{LP}) \]

• ... and ex post efficiency

\[ Ru'(c_L) = v'(d) \quad \text{(for } s_1) \]

\[ V_P'(c_{EP}, c_{LP}) = v'(d_P) \quad \text{(for } s_2) \]

• Define the degree of illiquidity as \( \rho^* \equiv \frac{c^*_E}{1 - d^*} \)

• Result: \( \rho^* > 1 \) implies \( d^*_P < d^* \) \( \Rightarrow \) a “bailout” in \( s_2 \)

– emphasize: this is a property of the efficient allocation
Equilibrium and moral hazard

• In period 0:
  – policy maker collects taxes; intermediaries take deposits

• In period 1:
  – investors observe type; make withdrawal decisions
  – after $\pi$ withdrawals, intermediary and policy maker infer state

• If a run has occurred:
  – intermediaries distribute remaining resources efficiently
  – policy maker can transfer goods to intermediaries
  – chooses ex post efficient transfers (limited commitment)
• The efficient bailout policy equalizes consumption across investors
  ⇒ an intermediary with fewer resources receives a larger bailout
  – this is the source of the moral hazard problem

• The equilibrium deposit contract will maximize

\[ \pi u(c_E) + (1 - q) [(1 - \pi)u(c_L) + v(\tau)] + q(V_{run}) \]

• Solution is characterized by

\[ u'(c_E) = (1 - q) R u'(c_L) \]
• **Result:** For any $q > 0$, $\rho$ is higher than in the efficient allocation
  
  – moreover, $\rho$ is strictly increasing in $q$
  
  – result of the moral hazard problem: too much illiquidity

• Note that moral hazard only arises if $q > 0$
  
  – the “unexpected shock” approach would miss this effect

• **Definition:** The economy is *fragile* if $c_E < c_{LP}$ for some $q > 0$
  
  – there exists an equilibrium in which all investors run in $s_2$

• **Result:** For some parameter values, the economy is fragile
A no-bailouts policy

- Suppose policy maker can commit to $b = 0$ in all states
  - coarse policy instrument; example: a constitutional amendment

- In the event of a run, intermediaries still reschedule liabilities
  - implement the efficient allocation of remaining *private* consump.
  - but now all tax revenue must go into public good

- Equilibrium deposit contract will maximize

$$\pi u(c_E) + (1 - q)[(1 - \pi) u(c_L) + v(\tau)] + q \left[ V_P \left( \frac{1 - \tau - \pi c_E}{1 - \pi} \right) + v(\tau) \right]$$
• **Result:** For any $q > 0$, $\rho$ is *lower* than in the efficient allocation
  – the policy over-corrects the moral hazard problem

• **Result:** In state $s_2$, we have $V_P'(c_{EP}, c_{LP}) > v'(\tau)$
  – an ex post inefficiency in resource allocation

• **Result:** The economy is fragile for a *larger* set of parameter values
  – the insurance effect of the bailout policy is lost

• **Result:** The no bailout policy may raise or lower welfare, depending on parameter values
Taxing illiquidity

- Now suppose the policy maker places a tax on illiquidity $\rho$
  - intermediary $j$ must pay a fee
    
    $$
    \text{fee}_j = \eta \rho_j \pi \left( \text{deposits}_j \right)
    $$
  - can also interpret as a tax on short-term debt ($c_E$)

- No restrictions on bailout policy

- The equilibrium deposit contract will satisfy

  $$
  u'(c_E) = (1 + \eta)(1 - q) R u'(c_L)
  $$

• Result: The tax rate

$$\eta = \frac{q}{1 - q \cdot u'(c^*_{LP})}$$

implements the constrained efficient allocation

• With no restrictions on bailouts

  ⇒ allows efficient allocation of remaining resources in state $s_2$

• Efficient tax rate exactly offsets the moral hazard problem

  – treats the symptom, rather than the underlying cause
Concluding remarks

- Bailouts here represent the *efficient* reallocation of resources during a crisis
  - not clear that the actions we observe in reality fit this criterion
  - inefficient or arbitrary bailouts are bad both ex ante and ex post

- The point: efficiency requires some reallocation of resources
  - agents anticipate this fact, which distorts ex ante incentives

- How should this be addressed?
  - commitment to a no-bailout policy cannot solve the problem
  - instead, correct the distortion through taxation/regulation
Caveats

- The model abstracts from distributional concerns
  - “Wall Street vs. Main Street” (see Cooper and Kempf, 2010)

- The probability of a crisis is essentially exogenous here
  - model offers no theory of what determines \( q \)
  - ... or how \( q \) might be affected by public policy

Q: How do policy interventions affect the \textit{probability} of a crisis?
  - important issue for much of the policy debate
  - need a (somewhat) different model to address this question