# Theory and evidence on moral hazard in banking

## The roles of deposit insurance, bail-out and bail-in

Dr. Silvio Petriconi, Bocconi
Probevorlesung IWH Halle & FSU Jena
29. Mai 2020 (updated: 2020-05-25)

# Deposit Insurance and Bail-outs

- Reminder: Why Deposit Insurance?
- The Problem of Moral Hazard
- Bail-outs

# Reminder: Why Deposit Insurance?

Last class we discussed the bank run model of Diamond and Dybvig (1983). Quick reminder:

- Consumers were ex-ante uncertain whether they prefer to consume *early* (t=1) or *late* (t=2).
- Restricted asset space:
  - (liquid) *short asset*: matures every period, zero return
  - (illiquid) *long asset*: matures in t=2, positive return but early liquidation only at loss relative to purchase price
- In autarky, no consumer would hold the long asset.
- Banks offer consumers liquidity insurance:
  - issue demand deposits, redeemable anytime
  - invest in a mix of short and long asset
  - depositors share surplus from long asset investment
  - Pareto improvement!

# Reminder: Why Deposit Insurance?

What was the problem?

**Bank runs!** Model has multiple equilibria:

1. *"Good equilibrium"*: If depositors expect everyone to withdraw according to their type, late types don't withdraw early and the Pareto optimum is attained.
2. *"Run equilibrium"*: If depositors expect some late consumers to withdraw "early" in t=1, banks' costly premature liquidation of the long asset will inflict losses on whoever withdraws late!
   ⇒ Late consumers will want to withdraw early
   ⇒ *Bank run*
   ⇒ Inefficient liquidation of long asset. Pareto inferior.

Remedy: **Deposit insurance**

# Deposit Insurance

To break the logic of panic-based runs in Diamond-Dybvig (1983), deposit insurance can help:

- Insured depositors always get paid in full:
  insurance covers eventual shortfall if bank can't pay.
- No incentive for late consumers to withdraw early, even if they think that other late consumers will withdraw in t=1.
- Eliminates Pareto-inferior bank run equilibrium completely!

Indeed bank runs, once a common phenomenon all over the U.S., have practically disappeared following the introduction of deposit insurance:

- FDIC: 1933 Banking Act,
- NCUA: 1934 Federal Credit Union Act.

# Moral Hazard: Risk Shifting

But we shouldn't conclude that there's just upsides: deposit insurance opens up a severe channel of moral hazard as depositors no longer demand compensation commensurate to bank risk. **This encourages lenders to take on more risk.**

Consider a bank that runs for one period, zero interest on deposits, liquidates fully in t=1:

**t=0**

| Assets | Liabilities |
|---|---|
| Loans L | Deposits D |
| Insurance Premiums P | Equity E |

**t=1**

| Assets | Liabilities |
|---|---|
| Loans $\tilde{L}$ | Deposits D |
| Insurance Payments $\tilde{S}$ | Liq. value $\tilde{V}$ |

# Moral Hazard: Risk Shifting

- At date 1, insurance pays $\tilde{S} = \max(0, D - \tilde{L})$
- The liqidation value of bank is therefore $\tilde{V} = \tilde{L} - D + \tilde{S}$
- Combining the two, we have

$$\tilde{V} = \tilde{L} - D + \tilde{S} = \tilde{L} - D + \max(0, D - \tilde{L})$$

- From balance sheet identity $D = L + P - E$, so

$$\tilde{V} = E + (\tilde{L} - L) - P + \max(0, D - \tilde{L})$$

We interpret this that the banks' liquidation value is initial equity plus value gain $\tilde{L} - L$ in loans plus a term

$$\max(0, D - \tilde{L}) - P$$

$\Rightarrow$ reads like a put option on bank assets $\tilde{L}$ at strike $D$!

# The Classic Risk Shifting Problem

For simplicity, assume that $\tilde{L}$ can only have two values: $X$ with probability $\theta$, or 0 with probability $1-\theta$, so $\mathrm{E}[X] = \theta X$, and deposit insurance pays out in expectation $(1-\theta)D$.

Then shareholders make an expected gain of

$$\mathrm{E}[\tilde{V}] - E = (\theta X - L) + ((1-\theta)D - P)$$

- First term is the NPV of the loan.
- Second term is deposit insurance system net subsidy, which should endogenously adjust to be zero if insurance is fairly priced.
- So far, nothing troubling here.

# Risk Shifting in Action

**Moral Hazard:**

But let's now give the bank the opportunity to execute a hidden action to increase asset risk:

Imagine that in interim period $t = 1/2$, after the insurance premium P is already paid & sunk, the bank can secretly substitute the risky asset with an even more risky asset.

Say the new asset has same expected NPV of

$$\hat{\theta}\hat{X} - L = \theta X - L$$

but risk is higher in the sense that $\hat{\theta} < \theta$.

Is this attractive to do?

# Risk Shifting in Action

Absolutely! Compare

$$\mathrm{E}[\tilde{V}] - E = (\theta X - L) + ((1-\theta)D - P)$$

versus

$$\mathrm{E}[\tilde{V}] - E = (\hat{\theta}\hat{X} - L) + ((1-\hat{\theta})D - P)$$

Since P is constant, and the first bracket NPV term is also the same for both equations, smaller $\theta$ (more risk) just increases the second deposit insurance transfer term, leading to higher profits. $\Rightarrow$ **Risk Shifting**

**Remark:** This equivalence between deposit insurance and a put option on bank assets was first recognized in a seminal paper by Merton (1977).

# Cross Country Evidence

Demirgüç-Kunt and Detragiache (2002) present a cross-country empirical study of deposit insurance moral hazard:

- gradual introduction of deposit insurance in 61 countries over the time period 1980-1997
- around half of the 898 observations fall into periods in which deposit insurance is available

They ask:

- With deposit insurance, are there more or fewer banking crises?
- Does banking crisis probability depend on specific deposit insurance design features, e.g. government involvement, funding status, coinsurance, coverage limits?
- In all this, does quality of (legal) institutions matter?

# Cross Country Evidence (cont.)

**Key Findings:**

- Detrimental effect of explicit deposit insurance on banking stability
- Effect more pronounced where institutions are weak
- Higher coverage caps, more credible pre-funding of deposit insurance and presence of government in deposit insurance scheme increase the risk of crisis.

Their results speak to the view that without strict financial oversight (in countries with strong institutions), deposit insurance can become a driver of risk!

There's a large strand of literature that largely agrees that more risk taking emerges as the consequence of deposit insurance / implicit guarantees, e.g. Dam and Koetter (2012).

# Bail-Outs and Moral Hazard

Expectation that a bank's creditors can expect a bail-out generates similar moral hazard as deposit insurance. However, there are important differences:

- Whilst all banks have deposit insurance by law, bail-outs are mostly discretionary.
- Receiving a bail-out may depend on political connections, systemic relevance of the institution.
- Asymmetric coverage by bail-out implies that competitors of banks that are under the umbrella of bail-out are left standing in the rain, facing fiercer competition for depositors, market share. This damages their charter value!
- Prediction (Hakenes and Schnabel, 2010): bail-outs increase riskiness of unprotected competitors!!
- Empirically true, see Hakenes, Schnabel and Gropp (2010).

# Promise vs. Reality of Bail-ins

# Bail-in as a solution?

**"Bail-in: Reverse bail-outs that let creditors pay the bill!"**

- Bail-in regimes give regulators the power to declare at their discretion the bail-in of some (typically subordinated) debt. The debt is written off / converted to equity to relieve the ailing financial institution.
- In theory, these risky debt claims are thought to impose discipline on institutions because their risk *is* priced.
- In reality,use of this instrument complicated, much to be learned:
  - banks use misselling of bail-in debt to particularly vulnerable groups as to force bail-out
  - Cyprus bail-in gave equity (and thus control) into hands of people who (due to Kremlin links) would never have been granted a banking license.

# References

**Dam, L. and Koetter, M.** (2012), "Bank Bailouts and Moral Hazard: Evidence from Germany", *The Review of Financial Studies* 25(8), pp. 2343–2380 [link]

**Demirgüç-Kunt, A. and Detragiache, E.** (2002), "Does deposit insurance increase banking system stability? An empirical investigation", *Journal of Monetary Economics* 49, pp. 1373–1406 [link]

**Diamond, D. and Dybvig, P.** (1983), "Bank Runs, Deposit Insurance, and Liquidity", *Journal of Political Economy* 91 (3), pp. 401-419 [link]

# References

**Gropp, R., Hakenes, H. and Schnabel, I.** (2011), "Competition, Risk-shifting, and Public Bail-out Policies", *Review of Financial Studies* 24(6), pp. 2084–2120 [link]

**Hakenes, H. and Schnabel, I.** (2010), "Banks without parachutes: Competitive effects of government bail-out policies", *Journal of Financial Stability* 6 (3), pp. 156-168 [link]

**Merton, R.** (1977), "An analytic derivation of the cost of deposit insurance and loan guarantees: An application of modern option pricing theory", *Journal of Banking and Finance* 1 (1), pp. 3-11 [link]