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Closing or reorganizing banks

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Firing the manager?

When banks have serious problems (wrt. liquidity or solvency:)

First line of defence: Than bank itself – what can it do?

The Dewatripont-Tirole model investigates whether trouble should give rise to

- Reorganization?
- Closure?

The model

Three periods, \( t = 0, 1, 2 \).

At \( t = 0 \), it uses deposits and equity to finance loans.

Quality of loans depends on manager effort \( e \rightarrow \begin{cases} e_H \\ e_L \end{cases} \) cost: \( h(e) \).

At date \( t = 1 \), first repayment \( \tilde{v} \) of loan and signal \( \tilde{u} \) about final repayment.

The two random variables \( \tilde{v} \) and \( \tilde{u} \) are independent, but depend on \( e \), densities \( h(v|e), g(u|e) \). At \( t = 2 \), final repayment \( \tilde{v} + \tilde{\eta} \). Manager gets bonus \( B \).
Close down at $t = 1$?

Probability of $\eta$ given $u$ is $F_d(\eta|u)$, $d = 1$ (continue) or $d = 0$ (stop).

$$\Pi(u) = \begin{cases} \int_0^\infty \eta \ dF_1(\eta|u) - \int_0^\infty \eta \ dF_0(\eta|u) & \text{if cont.} \\ \int_0^\infty [F_0(\eta|u) - F_1(\eta|u)] \ d\eta, & \text{if stop} \end{cases}$$

where using integration by parts,

$$\int_0^\infty \eta \ dF_d(\eta|u) = [\eta F_d(\eta|u)]_0^\infty - \int_0^\infty F_d(\eta|u) \ d\eta,$$

$d = 1$ is best if $\Pi(u) \geq 0$.

If $\Pi(u)$ is increasing in $u$, then there is $\hat{u}$ so that bank continues if $u > \hat{u}$.
With manager incentives

Decision rule \( x(u, v) \) (probability of continuing). Expected profit is now

\[
\int_{-\infty}^{\infty} \int_{-\infty}^{\infty} x(u, v) \Pi(u) g(u|e_H) h(v|e_H) \, du \, dv
\]

under constraint

\[
B \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} x(u, v) [g(u|e_H) h(v|e_H) - g(u|e_L) h(v|e_L)] \, du \, dv \geq h(e_H) - h(e_L).
\]

The Lagrangian is (except for a constant)

\[
\int_{-\infty}^{\infty} \int_{-\infty}^{\infty} x(u, v) \left[ \left( \Pi(u) + \mu B \right) g(u|e_H) h(v|e_H) - \mu B g(u|e_L) h(v|e_L) \right] \, du \, dv,
\]

and maximum is attained by

\[
x(u, v) = 1 \text{ if } \Pi(u) + \mu B \geq \frac{g(u|e_H) h(v|e_H)}{g(u|e_L) h(v|e_L)},
\]
\[
x(u, v) = 0 \text{ otherwise.}
\]

Characterizing the optimum

Continuation is optimal if

\[
\frac{g(u|e_H)}{g(u|e_L)} \left[ 1 + \frac{\Pi(u)}{\mu B} \right] \geq \frac{h(v|e_L)}{h(u|e_H)}.
\]

If equality, then \( u \) is an implicit function \( u^0 \) of \( v \).

We let \( \tilde{v} \) be the value of \( v \) such that \( \hat{u} = u^0(\tilde{v}) \).

If we assume:

\[
\frac{g(\cdot|e_H)}{g(\cdot|e_L)} \cdot \frac{h(\cdot|e_H)}{h(\cdot|e_L)}
\]

are increasing functions, then:

\( u^0(v) \) is decreasing in \( v \).
Closing banks
Reorganization – Dewatripont-Tirole

Who should close the bank

When it is no longer enough to reorganize:

Who should decide?

- Central bank?
- Deposit insurer?

... and what is best for society?
The Repullo model

The model

Bank obtains deposits 1 at $t = 0$, invested over two periods.

At $t = 1$, two signals are received:

- $v$: withdrawals of depositors at $t = 1$
- $u$: probability of success of the investment

Investment has random payoff

$$\tilde{R} = \begin{cases} R & \text{with probability } u, \\ 0 & \text{with probability } 1 - u. \end{cases}$$

Liquidation value is $L < 1$ liquidation cost $c$.

Society’s point of view

The bank should be liquidated when value of continuing

$$uR - (1 - u)c$$

is smaller than the value if liquidated,

$$L - c.$$

Gives a threshold value

$$u^* = \frac{L}{R + c}$$

for liquidation.
Central bank

Central bank covers only the fraction $\beta$ of the liquidation costs.

Then will offer a loan $\nu$, if expected values of losses is $\leq$ loss from liquidating now:

$$(1 - u)(\nu + \beta c) \leq \beta c.$$ 

Threshold for $u$ now depends on $\nu$:

$$\hat{u}(\nu) = \frac{\nu}{\nu + \beta c},$$

if $u < \hat{u}(\nu)$ the central bank will close down the bank.

Deposit insurance

Deposit insurer covers fraction $\gamma$ of the liquidation cost

It will close down if costs of closing now are smaller than cost of continuing:

$$\gamma c + 1 - L \leq (1 - u)(1 + \gamma c).$$

This gives threshold value

$$\bar{u} = \frac{L}{1 + \gamma c},$$

below which the deposit insurer will liquidate the bank.
Closing banks

The Repullo model

Decision maker depends on signal

For large $v$ deposit insurer is closer to social optimum than central bank.

For small $v$ the central bank is closer than the deposit insurer.

The competence to close a bank should therefore depend on $v$!
Why are regulators reluctant to close banks?

In many cases, banks should have been closed down but remain open.

This may be caused by the high cost of closing a bank.

If banks know this, they may get away with acting in a way which would otherwise lead to closure.

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The model

There are two rounds with start $t = 0$, $t = 1$.

Bank receives deposit 1 and invests in project, either

- safe ($G$) with payoff $1 + r$ with certainty, or
- risky ($B$), with random payoff $1 + \tilde{\rho}$, where

$$f + \tilde{\rho} = \begin{cases} 
\rho & \text{with probability } p, \\
0 & \text{otherwise},
\end{cases}$$

$\rho > r$ but $p(1 + \rho) < 1 + r$.

Banks prefer $B$: $p \rho > r$.

Once the investment has been chosen, regular observes type and decide between closing the bank ($C$) or leaving it open ($O$).

Regulator must reimburse losses to the creditors of the bank pay the cost $C$ of liquidation.
Closing banks  The Mailath-Mester model

Game tree

Payoffs in game tree

(1) there is a gain \( r \) to the bank and a cost \( C \) to the regulator.

(2) payoff to the bank is \( p\rho \) and \( \xi \) cost to the regulator \( C + (1 - p) \).

(3) payoff to bank is \( 2r \) and cost to regulator 0.

(4) payoff to bank is \( p(\rho + r) \), cost to regulator \( (1 - p)[C + (1 - r)] \).

(5) payoff is \( p^2(2\rho) \) and cost is \( (1 - \rho^2)C + (1 - p)^22 + 2p(1 - p)[1 - \rho] \).
Closing banks  The Mailath-Mester model

Equilibrium I

Case 1. Bank prefers one risky and one safe to two risky:

\[ p(\rho + r) > 2\rho^2 \rho \text{ or } p < \frac{\rho + r}{2\rho} \]

If bank has chosen \( B \), then kept open it will choose \( G \), and then better to keep the bank open.

If the bank has chosen \( G \), then again cost is bigger if closing down now than if waiting, so bank is kept open.

Equilibrium II

Case 2: Bank prefers two risky to one risky and one safe.

Bank chooses \( B \) if it gets to the second round. If first choice was \( B \), then better to close only if

\[ C + (1 - p) < C(1 - p^2) + 2(1 - p)^2 + 2p(1 - p)(1 - \rho) \]

or, equivalently, if \( C < \frac{(1-p)(1-2p\rho)}{p^2} \).

If bank chooses \( G \) initially, then regulator will keep the bank open unless

\[ C < C(1 - p) + (1 - p)(1 - r), \]

which can also be stated as \( C < \frac{1-p}{p}(1 - r) \).
Equilibrium III

- When Bank: BG, R: O, BB > BG
- Bank: B, R: C, D
- Society prefers B

The Mailath-Mester model

Closing banks