Banking on Resolution: Portfolio Effects of Bail-in vs. Bailout

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Bail-ins vs. Bailouts

- The main resolution tools: bail-in & bailout
- Despite promoting bail-ins, supervisors still lean towards bailouts

Bail-in regimes will not eradicate the need for injection of public funds where there is a threat of systemic collapse, [...], or in the event of the failure of a large complex cross-border bank, unless the failure was clearly idiosyncratic.
(Avgouleas and Goodhart, 2015)

This paper: a theoretical model on the ex-ante impact of resolution on the banks' portfolio choice and default outcome in the presence of idiosyncratic and systematic shocks

Two-Period Model

- Two-period model in which banks choose their portfolio composition
- Funding structure
  - exogenous mix of long-term and short-term debt
  - long-term debt is fairly priced, short-term debt is insured
- Assets
  - short-term asset with idiosyncratic risk
  - long-term common asset
- Supervisor can prevent second-period defaults
  - creditor bailout: insure long-term debt
  - bail-in: convert long-term debt into equity

Key Findings: Impact of Bail-ins and Bailouts

- Creditor bailouts:
  - ex-ante reducing funding costs
  - ex-ante preventing defaults

- Bail-ins:
  - ex-ante reducing funding costs
  - ex-ante changing portfolio composition
  - reducing solvency risk but increasing liquidity risk
  - may generate systemic defaults

- Takeaway: a resolution policy with a bail-in pre-condition (e.g. EU) may generate financial instability compared to a policy with bailouts as "systemic exceptions" (e.g. USA)

literature

Model Setup

Model Setup: Banks

- Three dates $t = 0, 1, 2$ and large number of islands
- Single risk-neutral bank in each island
  - collects unit endowment from continuum of consumers
  - invests in an island-specific asset & an asset common across islands
- Banks are identical ex-ante
- Portfolios are opaque $\Rightarrow$ risk-taking is unobservable to the market

Asset Types: Short and Long-Term

- Short-term island-specific asset with return $h(\lambda_i)X_i$ at $t = 1$

$$X_i = \begin{cases} X_\ell, & \text{with probability } \alpha \\ X_h, & \text{with probability } 1-\alpha \end{cases}$$

  X_ℓ: *weak bank*, X_h: **strong bank**
  - assuming decreasing returns: $h(\lambda_i) = \lambda_i - \lambda_i^2/2$

- Long-term asset common across islands with return $(1 - \lambda_i)Z$ at $t = 2$
  - tradable across islands at $t = 1$
  - outside investors' demand $d(p, Z) = (Z - p)/p$

Funding Structure: Short and Long-Term Debt

- A continuum of risk-neutral consumers in each island with unit endowment at $t = 0$

- Two (revealed) types
  - early consumers investing short-term
  - late consumers investing long-term

- Each bank offers
  - insured short-term debt
  - fairly priced long-term debt, subject to default costs

- Consumers have access to a safe asset $\Rightarrow$ zero net-expected return

Bank Default and Supervisory Intervention

- Bank default creates deadweight loss
  - a fraction of asset return is destroyed
  - potential for supervisory intervention

- If a bank defaults at $t = 1$, the supervisor
  - sells bank's long asset (liquidation)
  - repays early consumers as the deposit insurer

- At $t = 1$ the supervisor anticipates a default at $t = 2$ and
  - laissez-faire: does not intervene
  - creditor bailout: promises to repay late consumers
  - bail-in: converts the long-term debt into equity

Timeline of Events

$t = 0$

- Market forms a belief on banks' portfolio risk
- Banks collect unit of funds and choose a portfolio

$t = 1$

- Short asset return realizes & long asset return is observable
- Banks trade long asset
- If default at $t = 1$: liquidation

$t = 2$

- Long asset return realizes
- If default at $t = 2$ under no intervention: the supervisor

bails-in

bails out

anticipation of resolution policy

Key Features of the Model

1. **Portfolio trade-off**
   - balancing solvency risk against liquidity risk
   - $\uparrow$ short-term holding: $\uparrow$ cash-in-the-market price & $\uparrow$ solvency risk

2. **Opaque portfolios**
   - market forms beliefs on bank portfolio composition
   - characterizing market price of long-term asset & gross return on long-term debt

3. **Portfolio risk choice**
   - when multiple portfolio options are available
   - higher funding costs $\rightarrow$ incentivizes riskier portfolio

Equilibrium without Aggregate Risk

market prices of the long-term asset | second-period returns | long-term funding costs

Equilibrium with Idiosyncratic Risk

- $\uparrow$ Expected short-term investment λ
  - $\uparrow$ **price** $p(\lambda)$: larger liquidity at $t = 1$ in the market
  - $\uparrow$ **solvency risk**: $\downarrow$ long-term asset $\rightarrow \downarrow$ second-period return & $\downarrow$ available to sell
- Market expecting $\uparrow$ likelihood of default $\rightarrow$ requiring $\uparrow$ gross return on long-term debt
- Banks maximizing second-period expected profit, trade off
  - *invest* in the long-term asset at $t = 0$, or
  - *buy* the long-term asset at $t = 1$ using the excess short-term liquidity
- Local portfolio options, given λ,
  - safe portfolio: no defaults
  - risky portfolio: defaults following negative short-term shock

Financial Fragility in Laissez-Faire

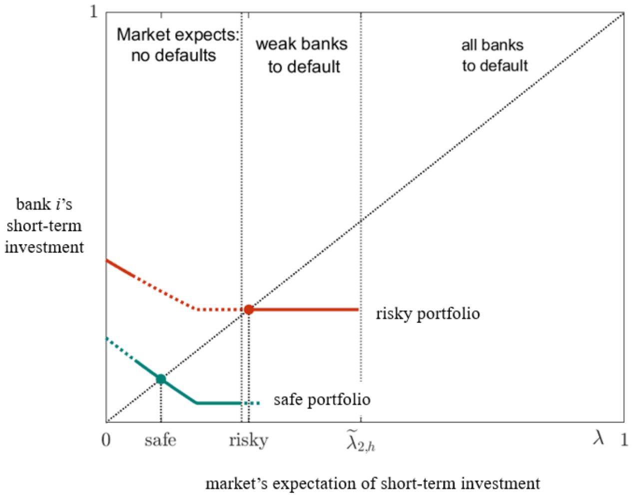
- Portfolio choice depends on consumers' belief on bank risk-taking
  1. optimistic: assuming $\downarrow$ short-term risky investment
     - $\downarrow$ long-term funding costs $\rightarrow$ safe portfolio
  2. pessimistic: assuming $\uparrow$ short-term investment
     - $\uparrow$ long-term funding costs $\rightarrow$ risky portfolio

- Financial fragility: self-fulfilling market beliefs generate multiple equilibria

- How does the anticipation of resolution change financial fragility?

"The purpose of a policy is to [...] restrict the set of possible equilibria, not to move or distort the unique equilibrium." (Dybvig, 2023)

Bank's Response Function Given Market Expectations



back to bailout | back to bail-in

How Bailouts Prevent Idiosyncratic Defaults

Creditor bailout:

- If the bank (with a negative idiosyncratic shock) is going to default at $t = 2$
- The supervisor promises to repay the face value of long-term debt

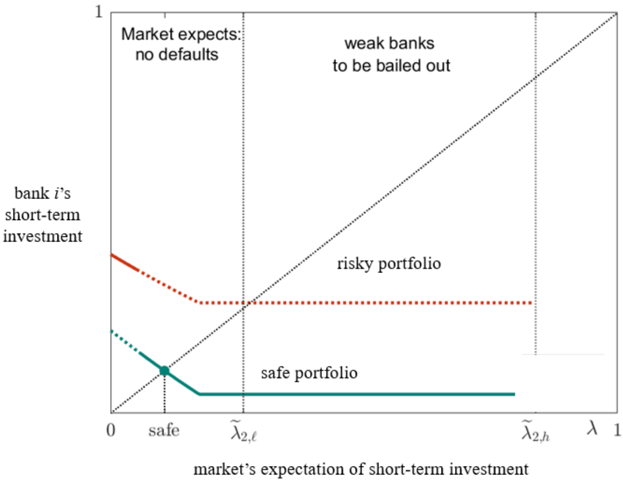
Bailout expectations:

- Creditors will be fully repaid $\Rightarrow \downarrow$ gross return on the long-term debt
- The bank will receive zero payoff $\Rightarrow$ bank's problem at $t = 0$ is unchanged

Equilibrium:

- Banks would have chosen a risky portfolio, but anticipating bailouts, they prefer a safe one
- Creditor bailouts remove the bad equilibrium with defaults

Bank's Response Function Expecting Bailouts



back to laissez-faire back to bail-in

How Bail-ins Can Prevent Idiosyncratic Defaults

Bail-ins:

- If the bank (with a negative idiosyncratic shock) is going to default at $t = 2$
- The supervisor converts the bank's long-term debt into equity
- NCWO principle limiting the conversion rate $\rightarrow$ creditor losses lower than in laissez-faire

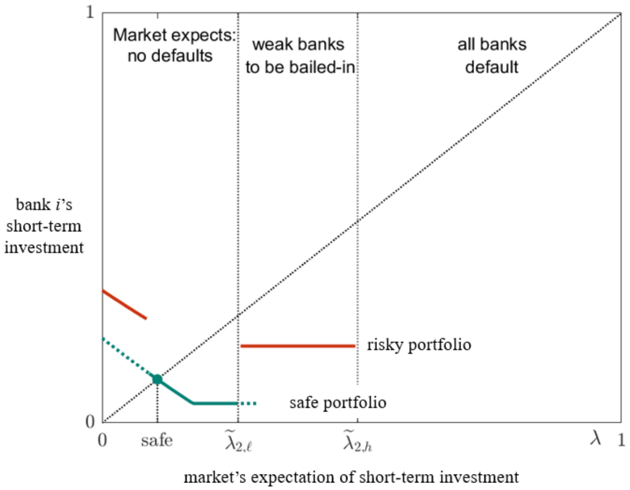
Bail-in expectations:

- Creditors will receive preserved value $\Rightarrow \downarrow$ gross return on the long-term debt
- The bank will receive positive payoff $\Rightarrow \downarrow$ ex-ante risky short-term investment

Equilibrium:

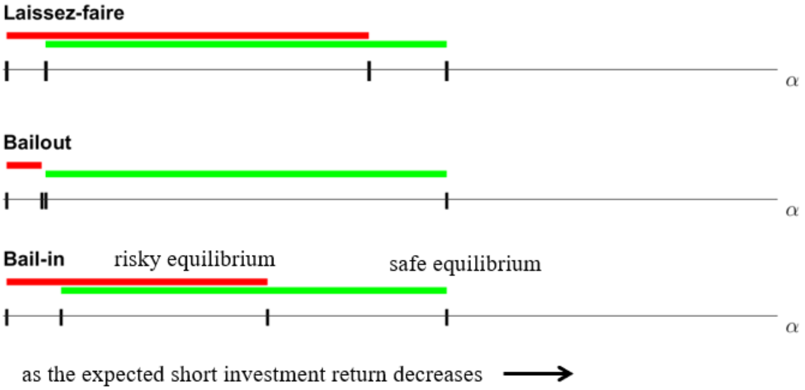
- Banks choose a risky portfolio with lower solvency risk
- Under sufficient risk reduction, bail-ins remove the bad equilibrium with defaults

Bank's Response Function Expecting Bail-ins



back to laissez-faire | back to bailout

Takeaway: idiosyncratic risk



Equilibrium with Aggregate Risk

Assumptions of Aggregate Risk

- The distribution of the long-term return $G(Z)$ is

$$Z_j = \begin{cases} Z_b, & \text{with probability } \beta \\ Z_g, & \text{with probability } 1-\beta \end{cases}$$

Z_g: *good times*, Z_b: *bad times*

- At $t = 1$ long-term asset return is observable $\Rightarrow$ all uncertainty is resolved

- Systemic event: when all banks default at the same time

market price of the long-term asset

How Bailouts Prevent Systemic Bank Defaults

Bailout expectations:

- Creditors will be fully repaid $\Rightarrow \downarrow$ gross return on the long-term debt
- The bank will receive zero payoff $\Rightarrow$ bank's problem at $t = 0$ is unchanged

Equilibrium:

- Banks would choose a safer portfolio relative to laissez-faire
- Creditor bailouts remove the systemic equilibrium
- And reduce financial fragility

details

How Bail-ins May Increase Systemic Default

Bail-in expectations:

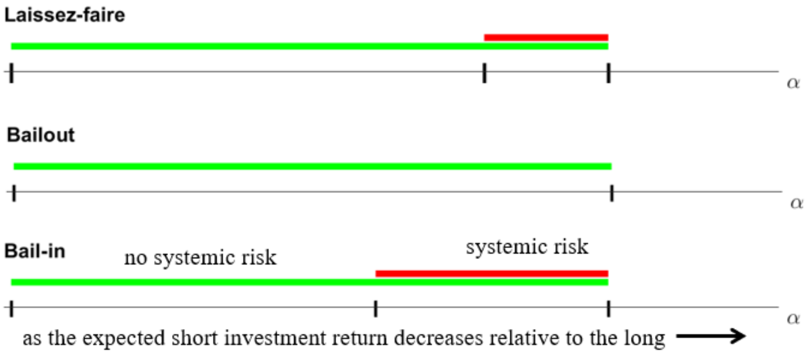
- Creditors will receive preserved value $\Rightarrow \downarrow$ gross return on the long-term debt
- The bank will receive positive payoff $\Rightarrow \downarrow$ ex-ante risky short-term investment

Equilibrium:

- Banks prefer a systemic portfolio
- The systemic portfolio has lower solvency risk, but higher liquidity risk
- $\downarrow$ liquidity at $t = 1 \rightarrow \downarrow$ cash-in-the-market price $\Rightarrow$ fire sales in bad times
- Bail-in may trigger systemic defaults and increase financial fragility

details

Takeaway: Idiosyncratic & Aggregate Risk



Summary: Impact of Bailouts vs. Bail-ins

- Creditor bailouts:
  - **Portfolio composition:** unchanged safe and risky portfolio relative to laissez-faire,
  - **Funding:** lower long-term funding cost
  - ⇒ banks prefer a safe portfolio over a risky one
  - ⇒ removes the bad equilibrium with defaults

- Bail-ins:
  - **Portfolio composition:** risky portfolio with lower short-term asset relative to laissez-faire
  - **Funding:** lower long-term funding cost
  - ⇒ banks prefer a risky portfolio with lower solvency risk
  - ⇒ may remove bad equilibrium with idiosyncratic defaults, but generate systemic defaults

- Final note: results are extendable to asset-managing financial intermediaries

Thank you!

Theoretical Insights: Bailouts vs. Bail-ins

Bailouts:

- Prevent contagion, but raise risk-taking, leverage, or correlation of bank portfolios (Davila and Walther, 2020; Farhi and Tirole, 2012; Lambrecht and Tse, 2023; Leanza et al., 2021)
- Supervisor's lack of commitment to not bail out: "too-big-to-fail" & "too-many-to-fail" (Acharya and Yorulmazer, 2007; Chari and Kehoe, 2016; Keister, 2016; Nosal and Ordoñez, 2016; Philippon and Wang, 2023; Wagner and Zeng, 2023)

Bail-ins:

- Reduce risk-shifting and lead to earlier recapitalization (Berger et al., 2022; Clayton and Schaab, 2022)
- Higher funding costs generate moral hazard (Pandolfi, 2022)
- Negative information disclosure may trigger runs (Walther and White, 2020)
- Bailout expectations distort private efforts for bail-ins (Benoit and Riabi, 2020; Bernard et al., 2022; Colliard and Gomb, 2024; Keister and Mitkov, 2023)

⇒ **Ex-ante portfolio effect**: bailouts prevent defaults, bail-ins generate systemic defaults

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Second-Period Return

- Second-period return in island i

$$R(\lambda_i, X_i, p) = \left[1 - \lambda_i + a(\lambda_i, X_i, p)\right]\overline{Z}$$

- Volume traded ($a > 0$ bought, $a < 0$ sold)

$$a(\lambda_i, X_i, p) = \max\left\{\frac{h(\lambda_i)X_i - \theta}{p(\lambda)}, -(1 - \lambda_i)\right\}$$

- Notation: $R_{\Bbbk}(\lambda_i)$ for $\Bbbk = \{h, \ell\}$ in island i

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Defining Long-Term Funding Costs

The gross return on long-term debt is characterized by late consumers' participation constraint:

- expecting no default $D(\lambda) = 1$
- expecting weak banks to default at $t = 2$:

$$D(\lambda) = \begin{cases} \text{laissez-faire:} & \dfrac{1-\theta-\alpha c R_\ell(\lambda)}{(1-\theta)(1-\alpha)} \\ \text{bailout:} & 1 \\ \text{bail-in:} & \dfrac{1-\theta-\alpha \gamma R_\ell(\lambda)}{(1-\theta)(1-\alpha)} \end{cases}$$

- expecting weak banks to default at $t = 1$: $D(\lambda) = \frac{1}{1-\alpha}$

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Market Price of the Long-Term Asset

Proposition 1

The market price of the long-term asset, given λ, is

$$p(\lambda) = \max\{p^c(\lambda), p^\ell(\lambda)\},$$

where $p^c(\lambda)$ is the continuation price, when no bank defaults at $t = 1$,

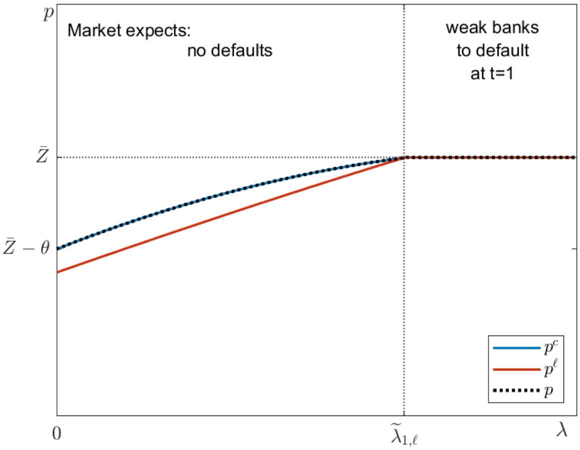
$$p^c(\lambda) = \min\{h(\lambda)\overline{X} + \overline{Z} - \theta, \overline{Z}\},$$

and $p^\ell(\lambda)$ is the liquidation price, when weak banks default at $t = 1$,

$$p^\ell(\lambda) = \min\left\{\frac{(1-\alpha)[h(\lambda)X_h - \theta] + \overline{Z}}{1 + \alpha(1-\lambda)}, \overline{Z}\right\}.$$

Impact of Short-Term Investments on Market Prices

- For large short-term risky investments, weak banks default at $t = 1$



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Market Price of the Long-Term Asset

Proposition 2

The market price of the long-term asset, given λ and Z_j, is

$$p(\lambda, Z_j) = \max\{p^c(\lambda, Z_j), p^\ell(\lambda, Z_j), p^b(\lambda, Z_j)\}\,,$$

where $p^c(\lambda, Z_j)$ is the continuation price, no bank defaults at $t = 1$,

$$p^c(\lambda, Z_j) = \min\{h(\lambda)\overline{X} + Z_j - \theta, Z_j\}\,,$$

$p^\ell(\lambda, Z_j)$ is liquidation price, when weak banks default at $t = 1$,

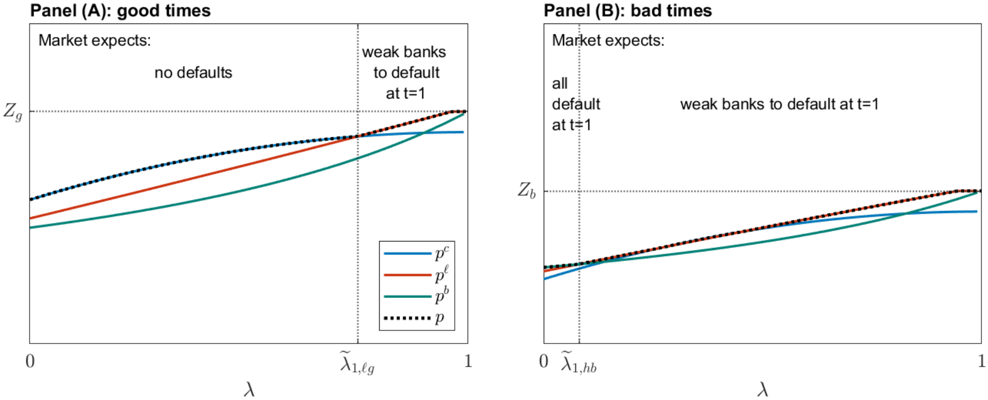
$$p^\ell(\lambda, Z_j) = \min\left\{\frac{(1-\alpha)[h(\lambda)X_h - \theta] + Z_j}{1 + \alpha(1-\lambda)}, Z_j\right\}\,,$$

and $p^b(\lambda, Z_j)$ is the crisis price, when both banks default at $t = 1$,

$$p^b(\lambda, Z_j) = \frac{Z_j}{2-\lambda}\,.$$

Illiquidity versus Insolvency

- For large λ weak banks default due to insolvency in good times
- For low λ all banks default due to illiquidity in bad times



Funding Costs in Laissez-Faire

- Late consumers' anticipated payoff, conditional on the realization of X_i and Z_j,

$$\nu_{ij}(\lambda) = \begin{cases} (1-\theta)D(\lambda), & \text{if } R_{ij}(\lambda) \geq (1-\theta)D(\lambda) \\ c\, R_{ij}(\lambda), & \text{else} \end{cases}$$

- Late consumers' binding participation constraint

$$\sum_{i \in \{\ell, h\}} \sum_{j \in \{b,g\}} \Pr(i)\Pr(j)\nu_{ij}(\lambda) = (1-\theta)\,,$$

- $D(\lambda)$ u-shaped in λ: first liquidity risk decreases, then solvency risk increases

Bank's Problem in Laissez-Faire

- Bank i's profit, conditional on the realization of X_i and Z_j,

$$\pi_{ij}(\lambda_i) = \begin{cases} R_{ij}(\lambda_i) - (1-\theta)D(\lambda), & \text{if } R_{ij}(\lambda_i) \geq (1-\theta)D(\lambda) \\ 0, & \text{else} \end{cases}$$

- Bank i maximizes expected second-period payoffs

$$\sum_{i\in\{\ell,h\}} \sum_{j\in\{b,g\}} \Pr(i)\Pr(j)\pi_{ij}(\lambda_i) \,,$$

- First-order condition

$$\sum_{i\in\{\ell,h\}} \sum_{j\in\{b,g\}} \Pr(i)\Pr(j)\frac{\partial \pi_{ij}(\lambda_i)}{\partial \lambda_i} = 0 \,.$$

Equilibrium under Bailout Expectations

- Late consumers expect weakly higher payoffs $\rightarrow D^{out}(\lambda) \leq D(\lambda)$

$$\nu_{ij}(\lambda) = \begin{cases} (1-\theta)D^{out}(\lambda), & \text{if } R_{ij}(\lambda) > 0 \\ 0, & \text{else} \end{cases}$$

- Banks do not directly benefit from a bailout $\rightarrow$ unchanged maximization problem relative to laissez-faire

- Safer portfolios yield higher profits $\rightarrow$ banks choose less risky portfolio

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Funding Costs under Bail-ins

- Late consumers anticipated payoff, conditional on the realization of X_i and Z_j,

$$\nu_{ij}(\lambda) = \begin{cases} (1-\theta)D^{in}(\lambda), & \text{if } R_{ij}(\lambda) \geq (1-\theta)D^{in}(\lambda) \\ \gamma R_{ij}(\lambda), & \text{if } (1-\theta)D^{in}(\lambda) > R_{ij}(\lambda) > 0 \\ 0, & \text{else} \end{cases}$$

- Late consumers' binding participation constraint

$$\sum_{i\in\{\ell,h\}} \sum_{j\in\{b,g\}} \Pr(i)\Pr(j)\nu_{ij}(\lambda) = (1-\theta)\,.$$

- NCWO principle $\gamma \geq c$
- Late consumers receive preserved value $\rightarrow D^{in}(\lambda) \leq D(\lambda)$

Equilibrium under Bail-in Expectations

- Bank i's profit, conditional on the realization of X_i and Z_j,

$$\pi_{ij}(\lambda_i) = \begin{cases} R_{ij}(\lambda_i) - (1-\theta)D^{in}(\lambda), & \text{if } R_{ij}(\lambda_i) \geq (1-\theta)D^{in}(\lambda) \\ (1-\gamma)R_{ij}(\lambda_i), & \text{if } (1-\theta)D^{in}(\lambda) > R_{ij}(\lambda_i) > 0 \\ 0, & \text{else} \end{cases}$$

- Bank i maximizes expected second-period payoffs

$$\sum_{i\in\{\ell,h\}} \sum_{j\in\{b,g\}} \Pr(i)\Pr(j)\pi_{ij}(\lambda_i)\,,$$

- Banks receiving positive profits following bail-ins
  - lower short-term investment for the systemic portfolio
  - preferring systemic portfolio over safer alternatives

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