Allocating Losses: Bail-ins, Bailouts and Bank Regulation

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Bail-ins

- Much recent discussion of "*bailing in*" bank creditors
  - that is, imposing losses on debt holders in a crisis
- Idea can be implemented in different ways
  - examples: withdrawal fees; contingent convertible bonds (CoCos); Orderly Liquidation Authority; Single Resolution Mechanism
- Focus is on tying bail-in to observable, bank-specific triggers
- However, banks will have some (relevant) private info
  - and some discretion over when to recognize losses, etc.

Q: Should regulators wait for observable information to arrive? Or should they act sooner? If so, how?

Literature

- Growing body of work on bail-ins, contingent bank liabilities and bank resolution
  - Flannery (2009), Goodhart & Avgouleas (2014), Sommer (2014), Bolton & Oehmke (2019), Robatto (2017), Dewatripont and Tirole (2018), Walther and White (2019), Bernard et al. (2022), others

- Focus is typically on how a regulator should react to the information it receives

- Older literature on bail-ins begins with Wallace (1988; 1990)
  - "the best arrangement in a [model] with aggregate risk displays something resembling partial suspension" a "bail in"
  - or: bail-ins are necessary to implement efficient allocations
  - see also Green and Lin (2000, 2003), Peck and Shell (2003), Ennis and Keister (2009), Sultanum (2014) and others

- These papers emphasize that investors <u>want</u> bail-in contracts
  - an efficient way of dealing with adverse shocks
  - no need for regulation or supervisory bail-ins in these models
- Role for policy: encourage more state-contingent contracts
- Example: reform to money market mutual funds in the U.S.
  - prior to 2014: must redeem shares on demand at par or close
  - after: funds can impose withdrawal fees and suspend redemptions
    - directed to do so if it is in the best interests of their shareholders
- Older literature suggests this type of reform will be effective
  - but …

Bailouts

- … but what if the bank anticipates being bailed out?
- We study an environment where:
  - banks have the *ability* to bail in their investors
  - government can provide bailouts and lacks commitment

We show:

(i) Bailouts undermine the bank's incentive to bail in investors

- result: equilibrium bail-ins are too small, bailouts are too large

(ii) … but not entirely

- bank may choose to bail in investors to prevent a run
- desire to avoid a run partially offsets the distortion from bailouts

Regulation

(iii) Regulators can use this fact to discipline bank behavior

- In our model, the regulator can mandate a bail-in at any time
  - but observes bank-specific information with a lag
    - does not know if bail-in is warranted, or the appropriate size
    - bank has private information during this period
- Regulator faces a *delegation problem*
  - bank has the relevant information (for determining efficient bail-in)
  - but bank's preferences are *biased* against bailing in
  - regulator gives the bank a choice set
    - decides: how much flexibility to give bank in choosing the bail-in
- We derive the optimal delegation policy

Outline

1) The environment

2) A planner's problem

3) Bail-ins with no regulation

- bailouts undermine the incentive to bail in
- but not entirely

4) Optimal regulation

5) Conclusion

Investors

- $t = 0,1,2$
- Investors: $i \in [0,1]$
  - endowed with 1 at $t = 0$, nothing later
- Utility: $u(c_1 + \omega_i c_2)$ CRRA form
  - where $\omega_i = \begin{Bmatrix} 0 \\ 1 \end{Bmatrix}$ means investor is $\begin{Bmatrix} \text{impatient} \\ \text{patient} \end{Bmatrix}$
- Type ω_i is revealed at $t = 1$, private information
  - π = prob. of being impatient for each investor

    = fraction of impatient investors at $t = 1$

standard Diamond-Dybvig

- Two interpretations:
  - single bank
  - many locations; one bank per location

Bank

- Investment technology yields return $\begin{Bmatrix} 1 \\ R > 1 \end{Bmatrix}$ at $\begin{Bmatrix} t = 1 \\ t = 2 \end{Bmatrix}$
- Endowments are pooled in a *bank*
  - bank is a coalition of investors → no agency problem w/in bank
  - investors' claim is a hybrid of debt and equity
- Two broad states ($t = 0$)
  - normal: bank's assets continue to be worth 1 (per investor)
  - trouble: a fraction λ of bank's assets become worthless
    - λ is drawn from distribution F on $[0, \bar{\lambda}]$ (idiosyncratic)
- Bank decides how much to pay withdrawing investors …
  - after bank and investors observe the realized λ

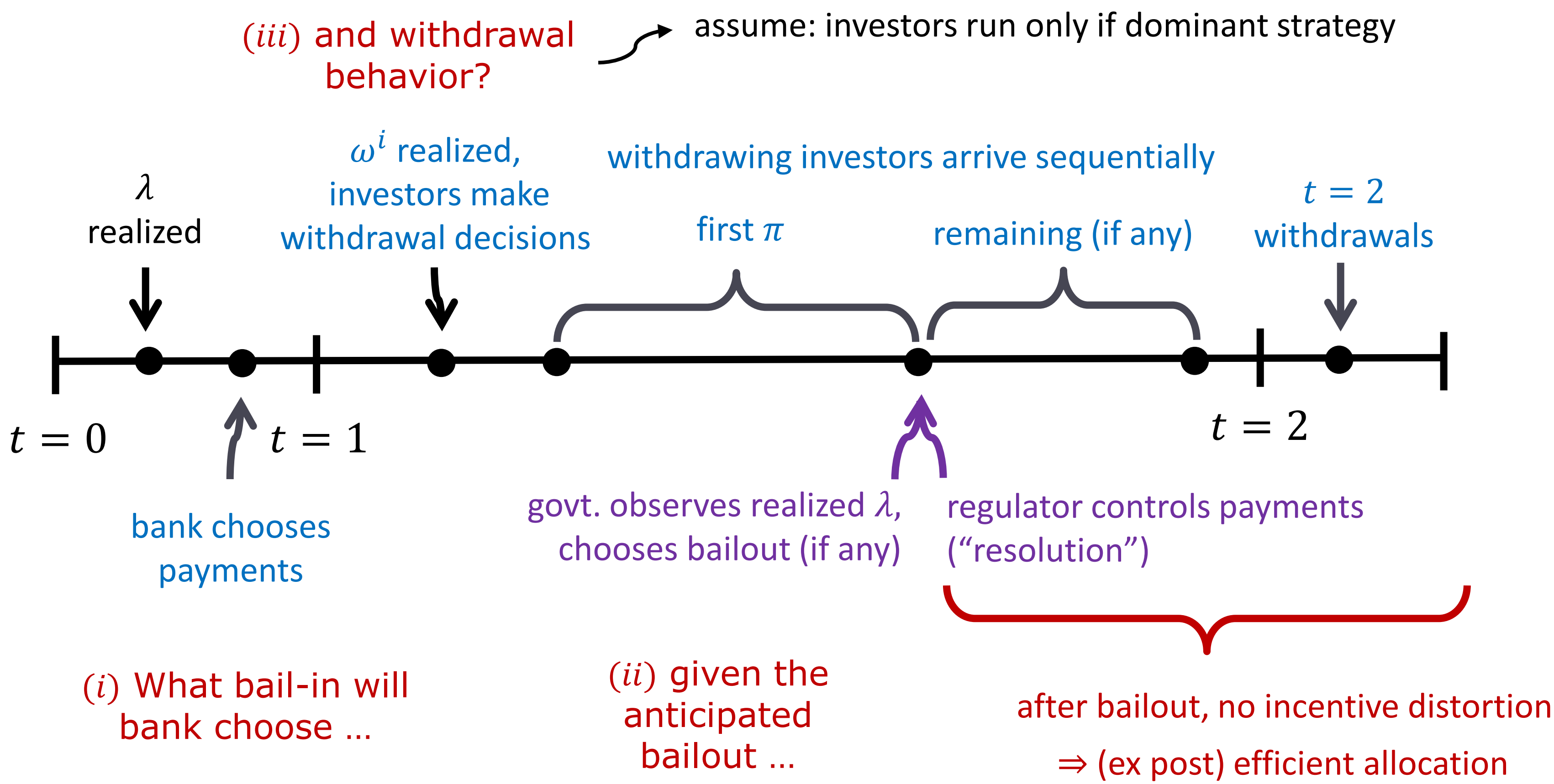
Public sector

- Fiscal authority ("government"):
  - can bail out the bank if it has experienced a loss
  - μ = marginal utility cost of public funds
    - cost of public spending foregone when funds used for bailout
    - or cost of distortions associated with higher taxes
  - bailouts chosen as best response to situation at hand

    (no commitment) $\Rightarrow$ will distort bank's incentives

- Regulator:
  - can limit banks' payouts to investors
  - observes value of bank-specific λ only after $\pi \geq 0$ withdrawals
    - captures the time needed to do detailed examinations

Timeline



- Note: no decisions are made before λ is realized
  - ex ante probabilities of the two broad states do not matter

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Normal times

- In normal times, $\lambda = 0$
- Bank solves a standard Diamond-Dybvig allocation problem:

$$\max \ \pi u(c_1) + (1-\pi)u(c_2)$$

$$s.t. \qquad \pi c_1 + (1-\pi)\frac{c_2}{R} \leq 1$$

solution: (c_1^*, c_2^*)

with $c_1^* < c_2^*$

- Interpretation:
  - (c_1^*, c_2^*) is the "face value" of bank's liabilities to its investors
  - measure bail-ins relative to this face value

Allocating losses

- Now suppose a crisis occurs and λ is drawn from $F\left[0, \bar{\lambda}\right]$

Q: How would a planner *allocate* these losses?

- Objective: $\pi u[c_1(\lambda)] + (1-\pi)u[c_2(\lambda)] - \mu b(\lambda)$

- Feasibility: $\pi c_1(\lambda) + (1-\pi)\dfrac{c_2(\lambda)}{R} \leq 1 - \lambda + b(\lambda)$

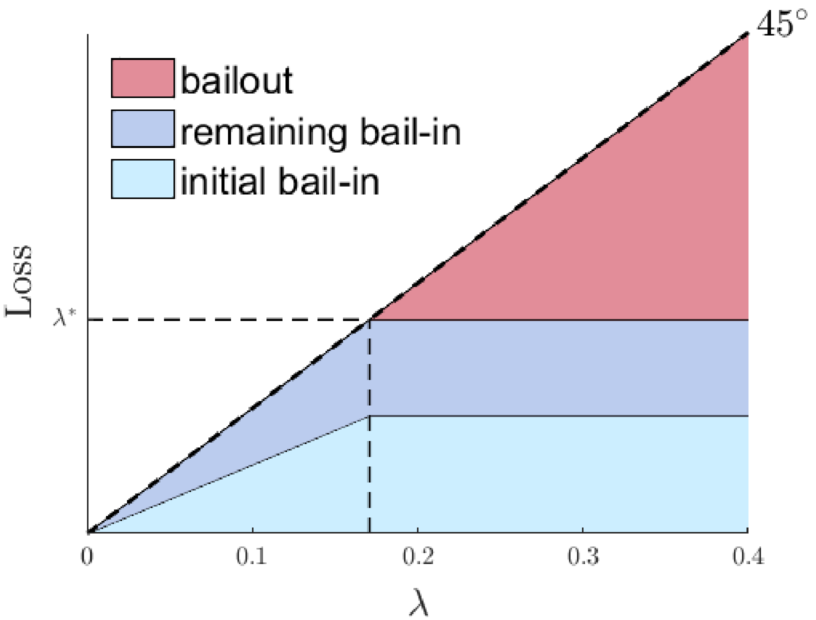
- Planner will set:

$$\left.\begin{aligned} c_1(\lambda) &= \big(1 - h(\lambda)\big)c_1^* \\ c_2(\lambda) &= \big(1 - h(\lambda)\big)c_2^* \end{aligned}\right\} \text{for some } h(\lambda)$$

- Then feasibility is: $h(\lambda) + b(\lambda) = \lambda$

bail-in + bailout = loss

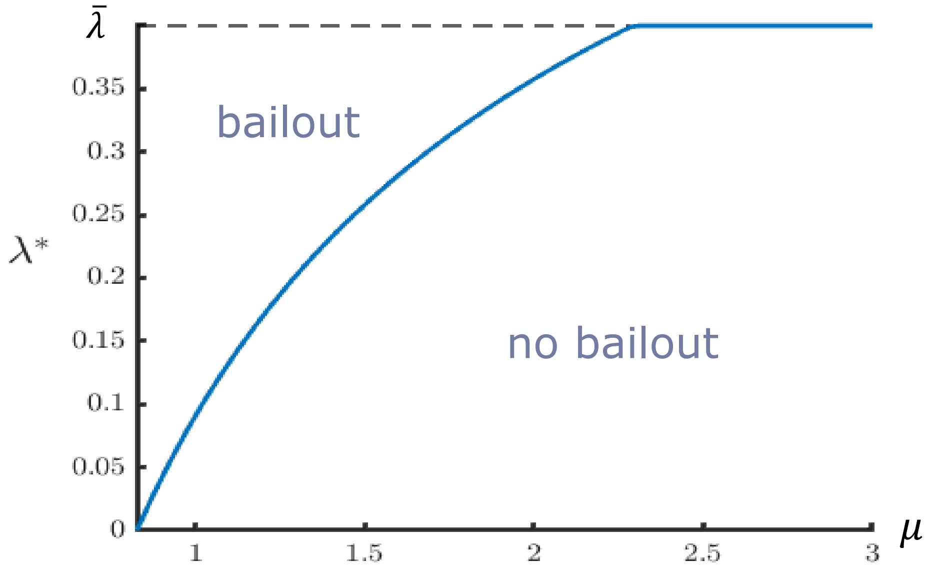
- Solution is characterized by a cutoff λ^*
- If $\lambda \leq \lambda^*$, bank is not bailed out
  - bail-in covers entire loss λ
- If $\lambda > \lambda^*$, bank is bailed out
  - and all investors are bailed in at rate λ^*



- Interpretation: public sector takes the "tail risk"
  - bails out in worst states, but only after a sufficient bail-in

Q: How much tail risk should the public sector take?

- Cutoff λ^* depends on the govt's marginal cost of funds μ



- If μ is sufficiently large, there will be no bailouts
  - when fiscal situation is tight, public sector provides no insurance
- As μ decreases: public sector absorbs more of the tail risk

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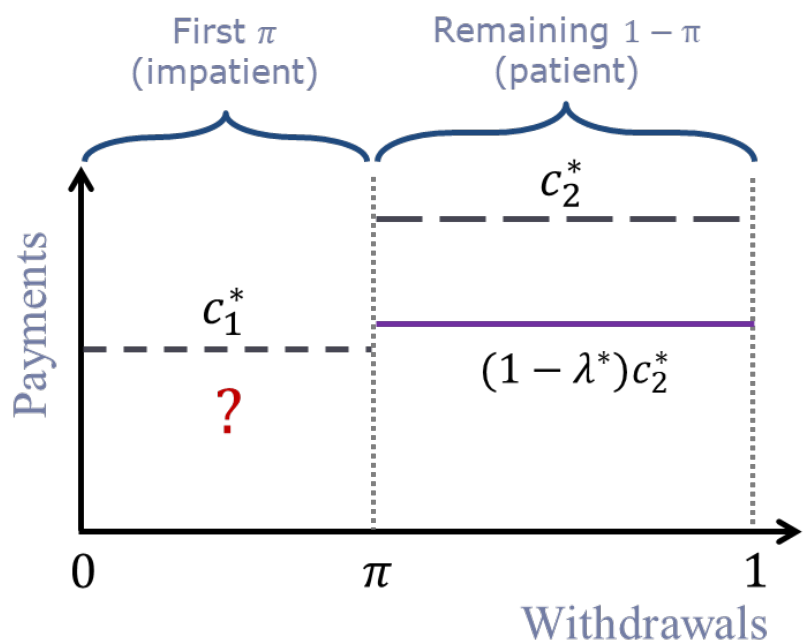
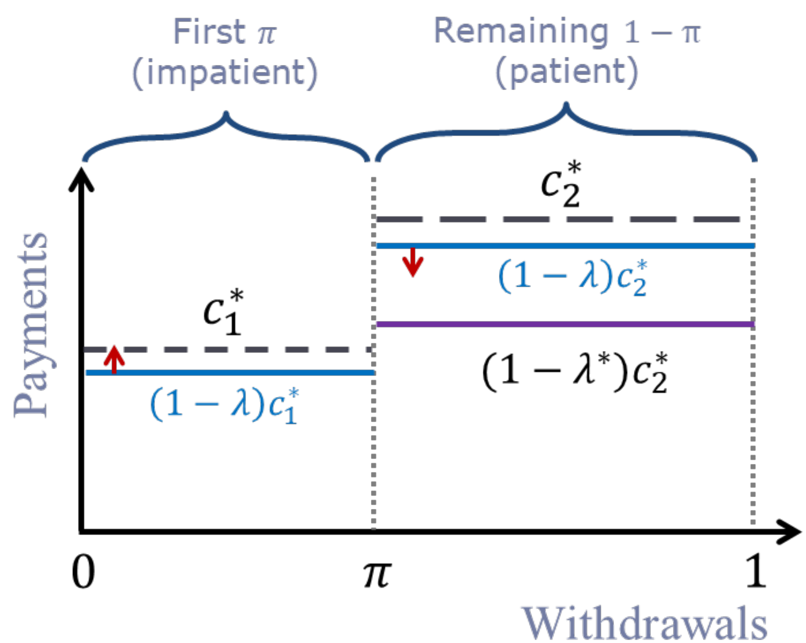
Bail-in incentives

- Suppose bank is free to choose any initial bail-in h
  - what incentives does it face?
- Assume patient investors wait to withdraw (for now)
- If the bank is bailed out:
  - payment at $t = 2$ is determined by cost of public funds μ
  - independent of bank's loss and choice of initial bail-in h
    - that is, bail-in at $t = 2$ is fixed
- How should the bank set its initial bail-in at $t = 1$?



Small loss

- If the bank has a very small loss (λ close to 0):
  - it will not be bailed out, regardless of how it sets bail-in h
- If the bank will not be bailed out:
  - incentives are the same as in the planner's problem
  - will choose same initial bail-in as the planner
    - $h = \lambda$
- Bank could "cheat", set $h = 0$
  - but this lowers consumption of its patient investors



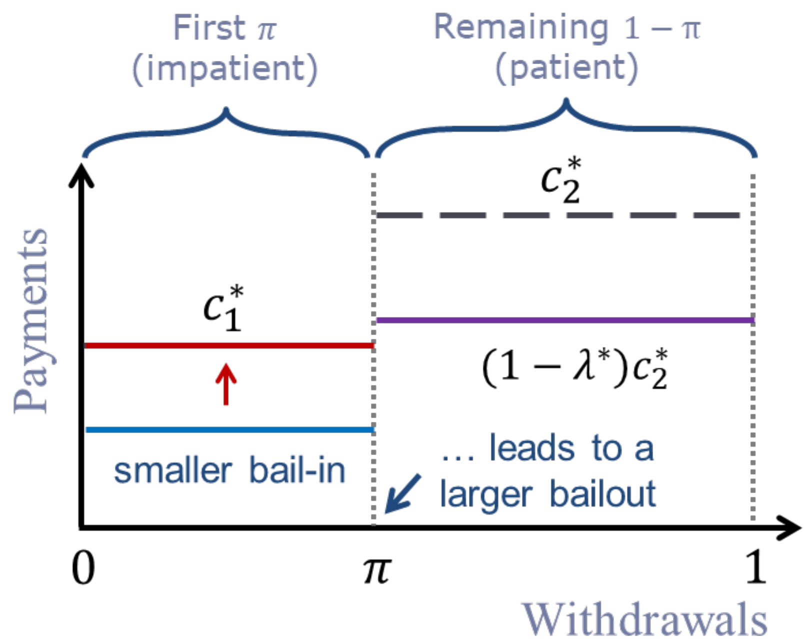
- Result: bail-in is efficient if bank has sufficiently small loss

Larger loss

- Suppose $\lambda = \lambda^*$ (largest value planner would not bail out)

Q: Would the bank choose the planner's initial bail-in?

- If bank sets a smaller bail-in:
  - impatient investors get more
  - patient investors get the same
    - implies: bailout will be larger
- Optimal choice: $h = 0$
- If loss is larger (or slightly smaller), same logic applies



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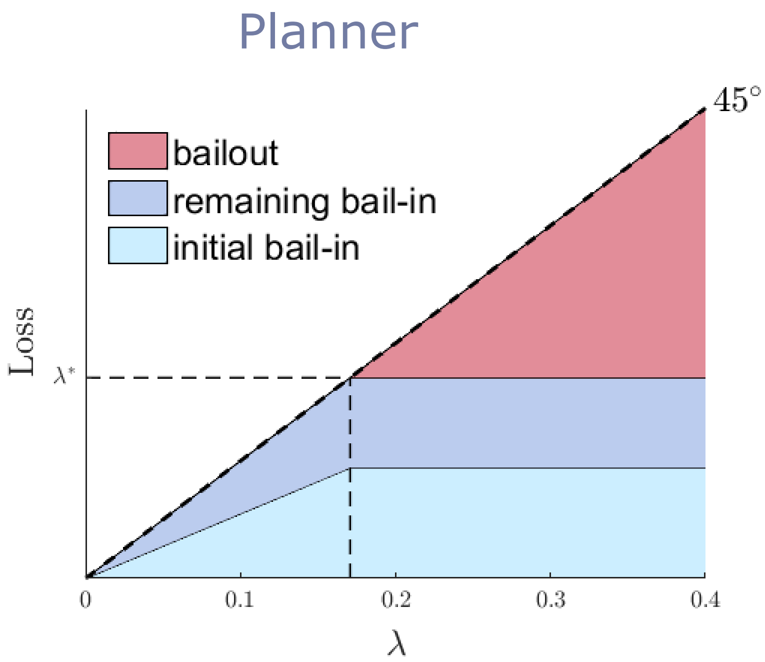
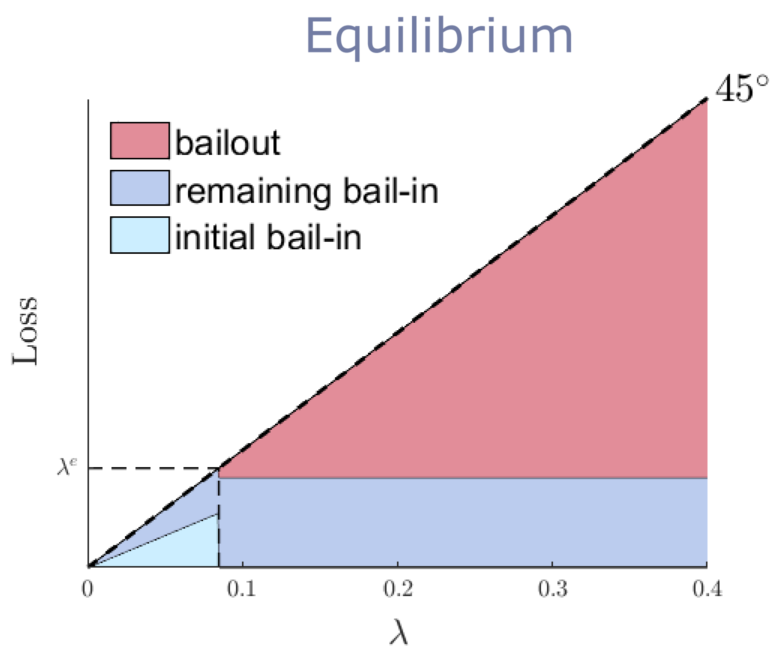
Inefficiency

- Comparing the allocation of losses:





- In equilibrium:
  - bank is bailed out too often (i.e,. for more states λ)
  - bailouts are too large, initial bail-in is too small

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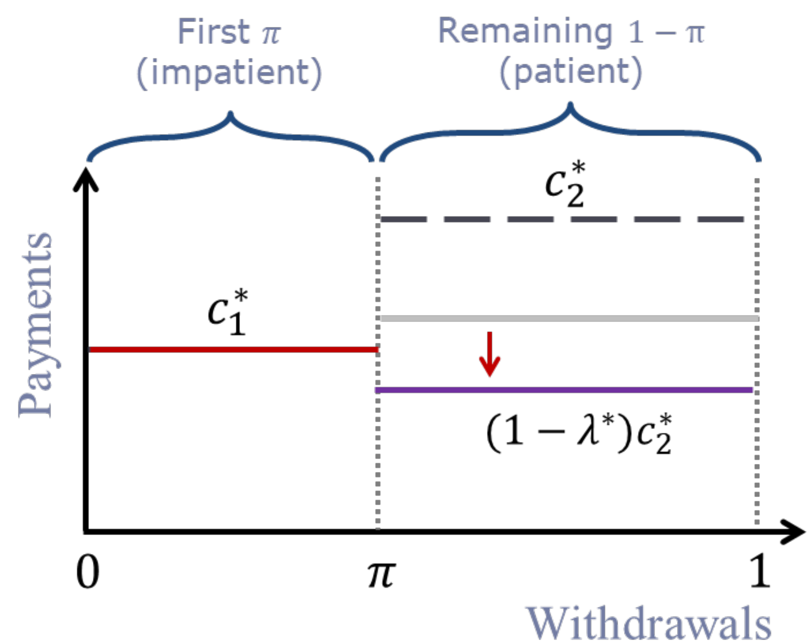
However

- So far: we have assumed $(1-\lambda^*)c_2^* \geq c_1^*$
  - satisfied if marginal cost of funds is sufficiently low ($\mu \leq \mu_1$)
  - which makes bailouts relatively generous

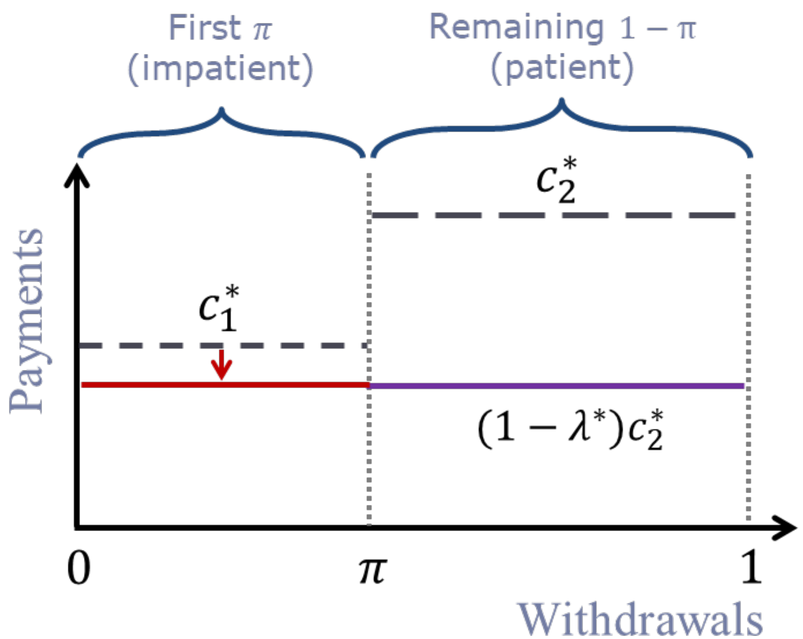
- Now suppose μ is higher (govt has less fiscal capacity)
  - payment at $t = 2$ is lower …
  - … falls below c_1^*
- If bank sets $h = 0$, patient investors will run
  - which is lowers investors' welfare …
  - … even though the bank is being bailed out



- Bank has two options in this case
  - it can set a bail-in $(h > 0)$ that removes incentive to run
  - it can set $h = 0$ and allow the run to happen

We show:

- If $\mu_1 < \mu < \mu_2$: bank sets $h > 0$
  - desire to avoid a run partially offsets incentive distortion
- If $\mu > \mu_2$: bank sets $h = 0$
  - a run occurs, which causes too much liquidation of investment



Result: Threat of a run can *partially* restore bail-in incentive

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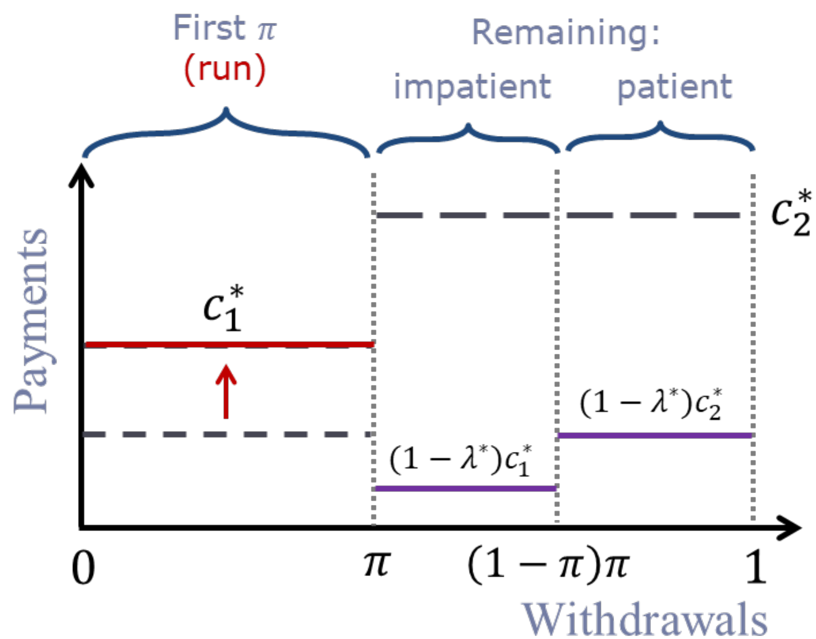

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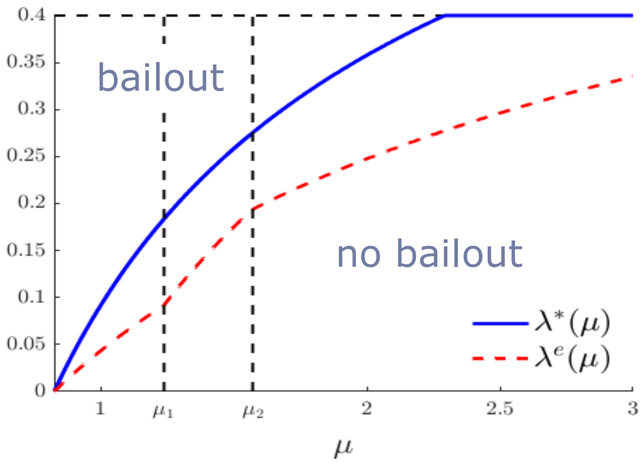
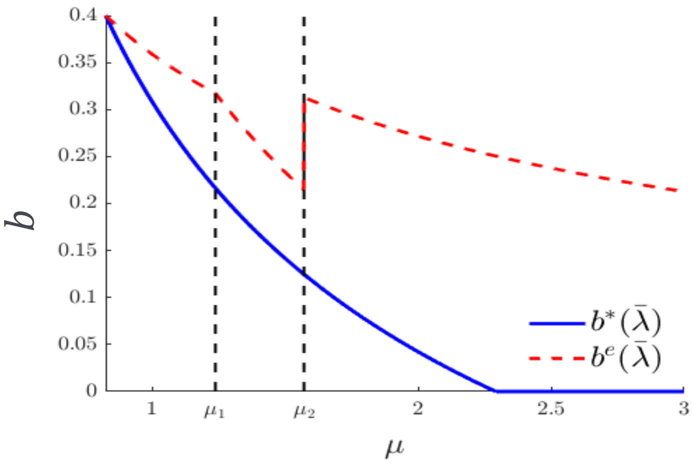
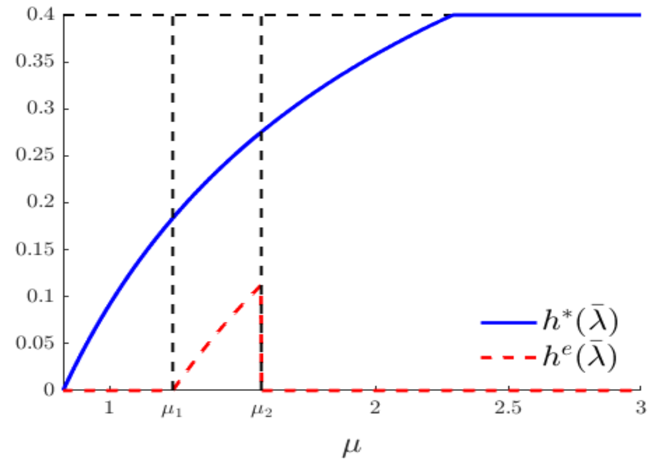
Summary

- Compared to the planner's allocation:







  - bailouts are too frequent
  - bailouts are too large
  - *because* the initial bail-in is too small
    - … but it is not aways zero

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- distorted incentives, inefficient outcomes

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What can a regulator do?

- Regulator can impose a particular bail-in h_R
- Interpretations:
  - writing down debt (including short-term)
  - imposing withdrawal fees
  - restricting dividend payments
    - $\Rightarrow$ anything than prevents resources from flowing out of the bank
- If the regulator observed λ, optimal policy is easy
  - require bank to follow planner's bail-in: $h_R(\lambda) = \min\{\lambda, \lambda^*\}$
- If there were no private information, again fairly easy
  - if both bank and regulator believe $\lambda \sim F$
  - require bank to follow *revised* planner's bail-in (when $\lambda \sim F$)

Delegation

- Private information makes regulation more challenging
  - planner's desired bail-in depends on the realized λ
  - the regulator (initially) does not observe λ
  - the bank knows λ, but has distorted incentives
- A form of *delegation problem*
  - regulator chooses a delegation set $D \subseteq [0,1]$
  - then bank chooses its initial bail-in $h \in D$
- The set D could be a single point (no delegation)
  - or larger (an interval of choices, or more complex)

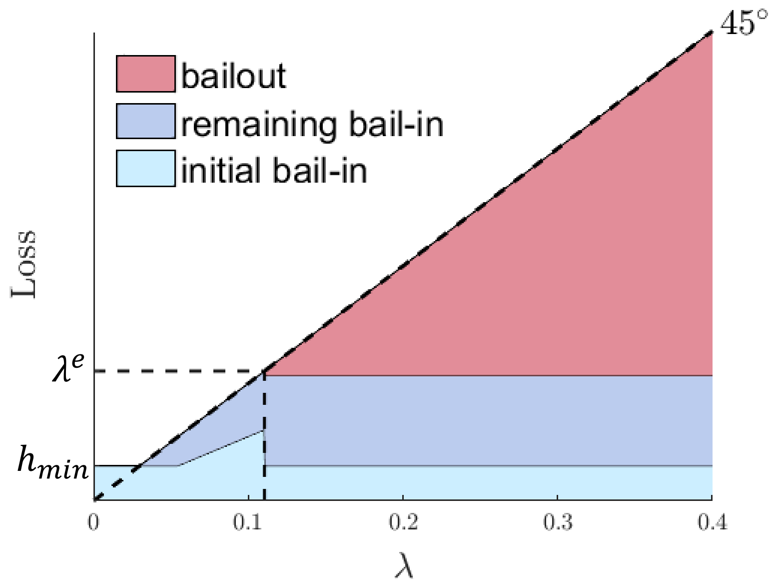
Q: What is the optimal set D?

When μ is small

- If bailouts are sufficiently generous, no threat of a bank run
  - if bank is bailed out, it will choose smallest bail-in allowed

Result: Optimal policy is $D = [h_{min}, 1]$ for some $h_{min} > 0$

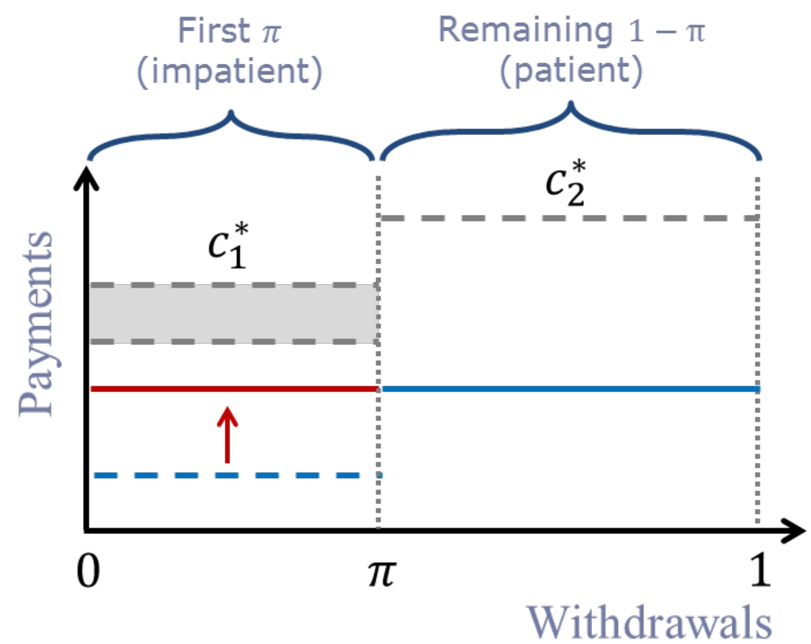
  - a *mandatory minimum bail-in*

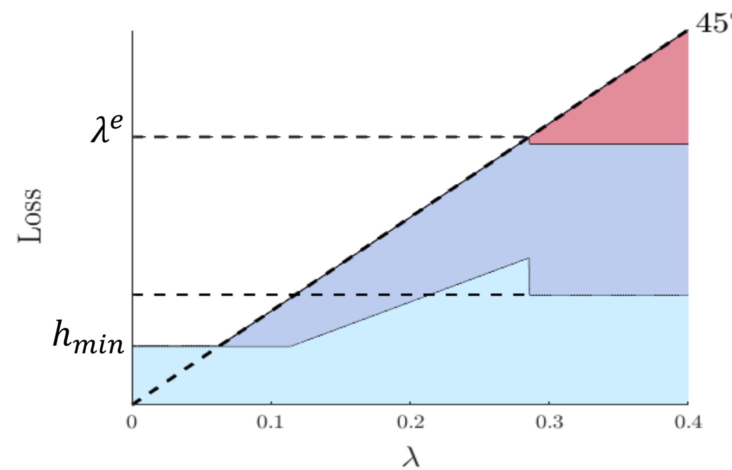


- Bank is *biased* against bail-in
  - optimal policy "caps" this bias
- Optimal h_{min} balances:
  - gain for high λ; cost for low λ
- Notice the value of allowing bail-ins larger than h_{min}
  - an example of *interval delegation*

When μ is larger

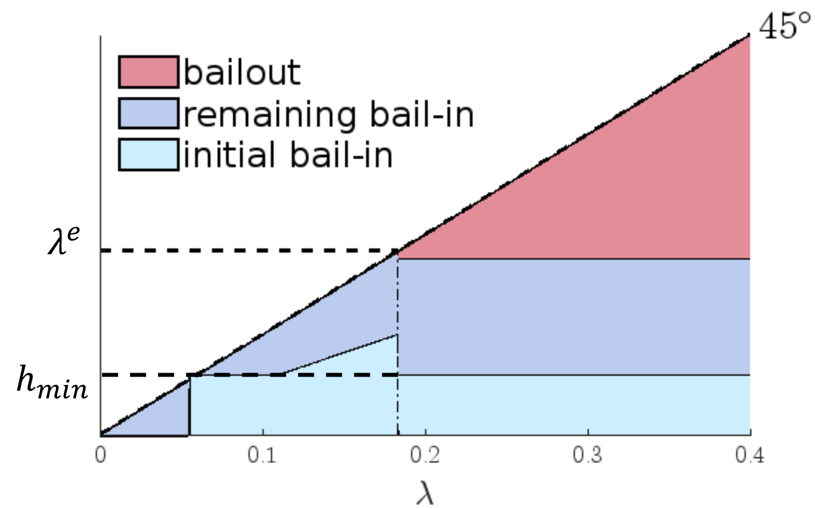
- We saw: a bank may be willing to live with a run
  - if there is a large benefit for the early withdrawers
- Required bail-in limits the benefit of "cheating"
- If chosen appropriately …
  - … bailed-out banks will set bail-in **larger** than the minimum
  - result: no runs occur
  - mandatory bail-in is a *financial stability* tool





Optional bail-ins

- A mandatory minimum bail-in is costly if bank is sound
- In some cases, the following policy is better:
  - bank can either set $h = 0$ or set $h \geq h_{min}$
  - an *optional minimum bail-in*
- Effective if setting $h = 0$ would lead to a run
  - but setting $h = h_{min}$ would not
- Benefit: smaller distortion when bank has little/no loss



- Regulator is using the possibility of a run to its advantage
  - spirit of Calomiris and Kahn (1991), Diamond and Rajan (2001), but applied to regulatory policy

Optimal regulation

We show:

1. When $\mu < \mu_1$, optimal policy sets $D^* = [h_{min}, 1]$
   - with $h_{min} > 0$; a mandatory minimum bail-in

2. When $\mu > \mu_1$, optimal policy takes one of two forms

   (i) $D^* = [h_{min}, 1]$ (mandatory minimum bail-in)

   - or

   (ii) $D^* = [h_0^*, h_1^*] \cup [h_2^*, 1]$

   depending on the distribution F

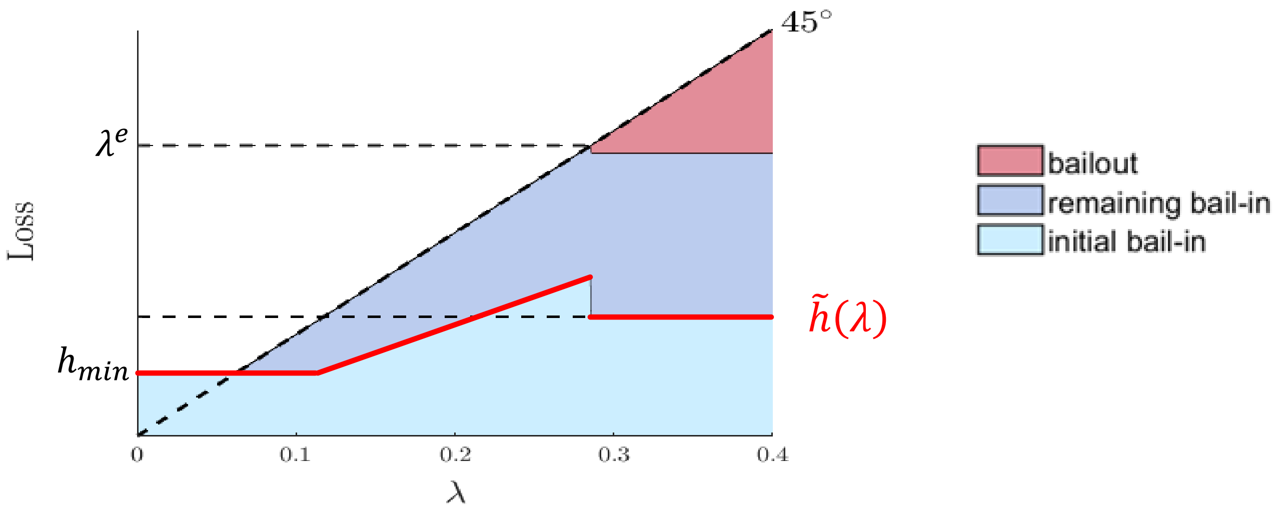
   - generalized optional minimum bail-in
   - design: bank chooses h in lower interval only when loss is small
     - "self-selects" into the appropriate interval
     - an example of non-interval delegation (a "hole" in D^*)

Implementing D^*

Two equivalent approaches:

(i) Bail-ins are chosen at $t = 1$

- regulator announces "trouble", gives bank a menu of options D^*
- bank chooses h from this menu
- generates a mapping of types λ to chosen bail-in $\tilde{h}$



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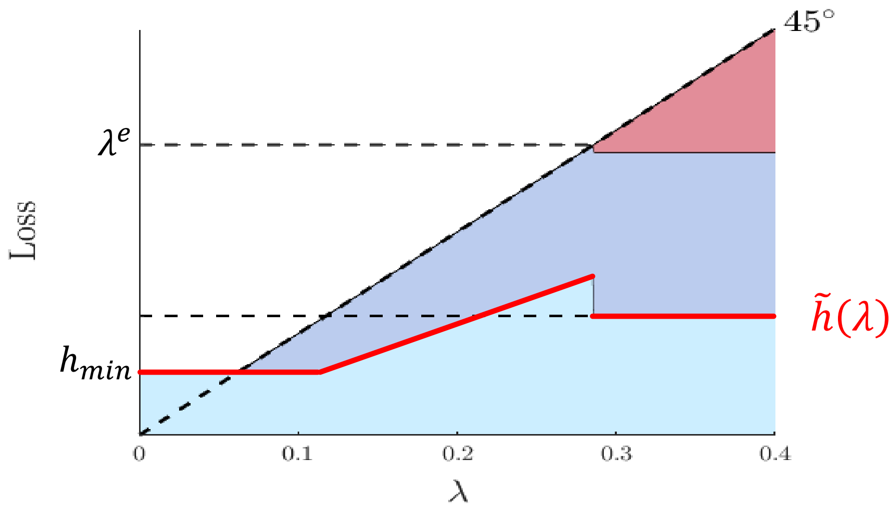

(ii) Bail-in contracts are mandated at $t = 0$

- bank required to include bail-in function $\tilde{h}(\lambda)$ in contract
- when regulator announces "trouble", bank reports λ
  - function $\tilde{h}(\lambda)$ ensures incentive compatibility

- Both approaches lead to the same outcome

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(ii) Bail-in contracts are mandated at $t = 0$
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Takeaways

- Our model captures situations where:
  - regulators know there is a problem, but not how bad it is
  - bank and some investors/creditors have private information
  - bank anticipates being bailed out in some states
- In such situations:
  - bailouts undermine bail-ins, which misallocates resources …
  - … but not completely
- Optimal regulatory policy:
  - needs to consider the possibility of runs by investors …
  - and use this possibility to discipline bank behavior
    - in some cases, a form of *optional* minimum bail-in is best