Demandable debt without liquidity insurance

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Traditional deposit contracts

- Deposit contracts at banks have traditionally been *demandable*
  - Subject to redemption by depositors at any time, typically at par or better, including accrued interest
- This feature of deposits exposes banks to the risk of depositor runs and panics
  - Panics arise when depositors rush to withdraw their money not because they think the bank's investments are performing poorly, but rather because they are concerned other depositors may also be withdrawing
  - As a result, instability arises
- Theoretical challenge: Why do banks issue debt (i.e., deposits) that is demandable?
  - Why expose itself to the risk of dis-intermediation?

Why are deposits demandable?

- The common thread in many canonical papers (e.g., Diamond and Dybvig, 1983, and Goldstein and Pauzner, 2005) is that:
    1. If depositors are risk averse, and …
    2. They face liquidity shocks and may need to withdraw early, and …
    3. Banks have as their objective to maximize depositors' utilities …

- Then, banks will provide liquidity to depositors as a way of sharing risk and improving allocations
    - They do so by making debt claims (i.e., deposits) demandable
    - They also offer a strictly positive return to depositors that withdraw early

- The cost of this is that, from time to time, panics arise and depositors run on the bank, leading to its collapse

So what do we do in this paper?

- We start with a standard model of bank runs based on "global games," but:
  1. Depositors are risk neutral
  2. No depositor is subject to a liquidity shock, so that no one actually needs to withdraw early
  3. The bank's objective is to maximize its own profits (i.e., shareholder value maximization)

- We show that, even without any of the "classical" assumptions, banks still find it optimal to issue debt that is demandable (and thus subject to runs)
  - Moreover, they will offer depositors a strictly positive return if the bank has any equity capital
  - The promised return will be higher the more capital the bank has

Model

- Economy with three dates ($t = 0, 1, 2$), banks, and a large number of risk-neutral investors/depositors
  - Each investor has one unit of endowment

- Banks can make loans at interest rate R to firms with projects that require 1 unit of investment and deliver:
  - At $t = 1$: $L \leq 1$ if liquidated early
  - At $t = 2$: $\begin{cases} R\theta & \text{with prob } q \\ 0 & \text{with prob } 1 - q \end{cases}$

- $\theta \sim U[0,1]$ represents the economy's "fundamentals"

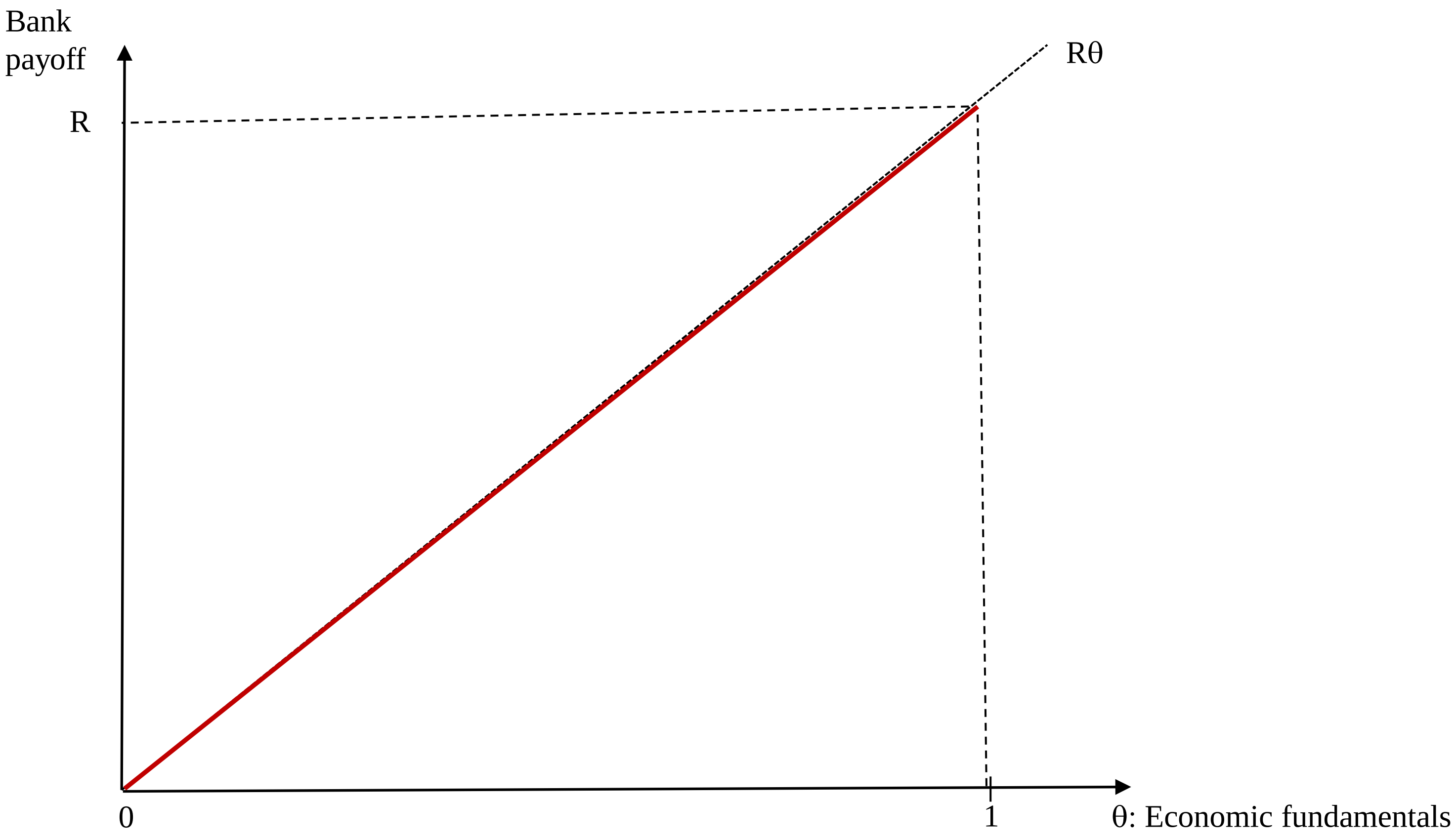
- q is monitoring/underwriting effort and is costly for the bank
  - In this talk, I will take q to be fixed (we endogenize it in the paper)

Model, continued

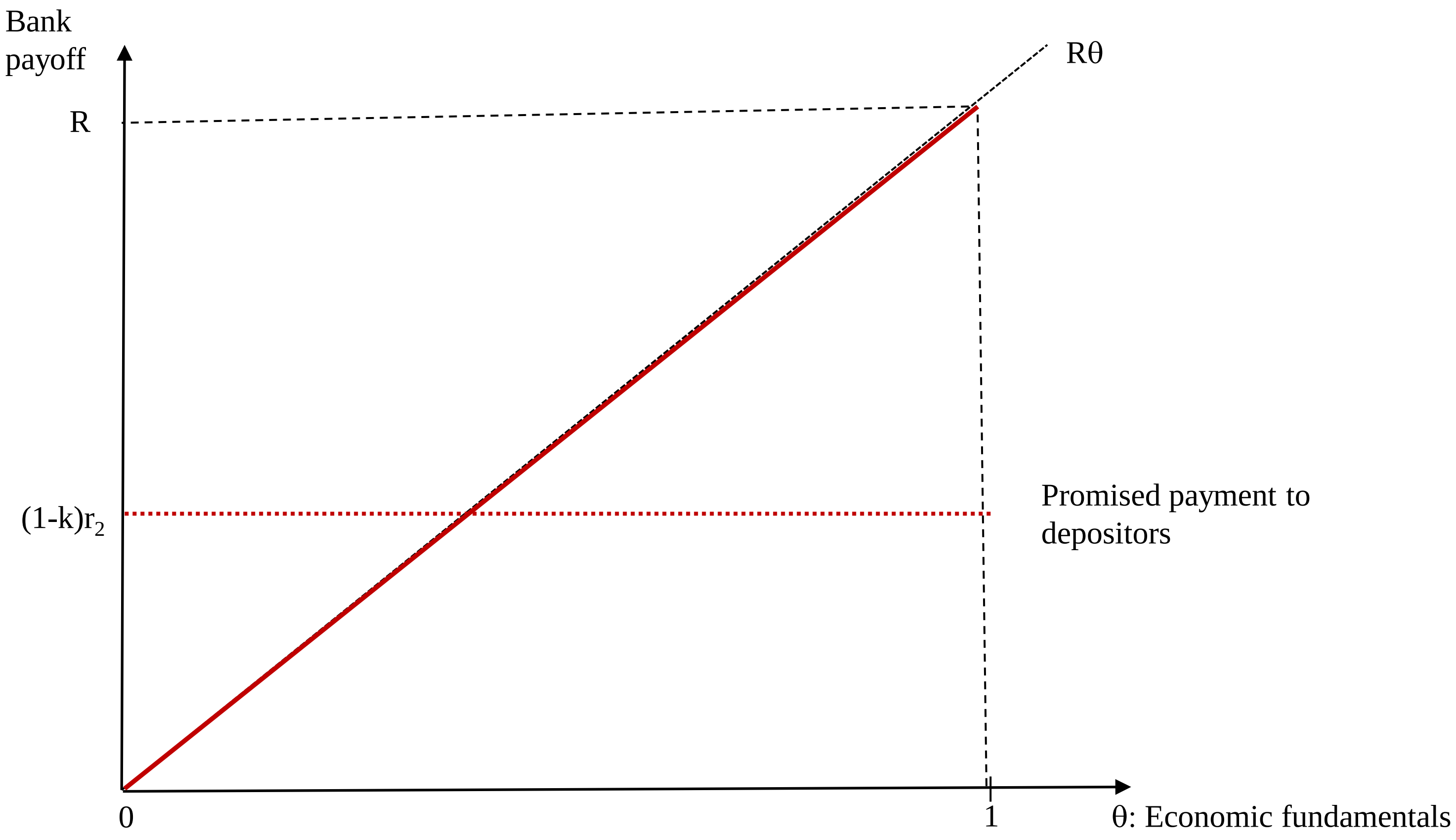
- Each bank has equity capital $0 \leq k < 1$. The remainder, $1 – k$, is raised as debt (i.e., deposits)
  - Depositors can withdraw at $r_1 \geq 0$ at $t = 1$
  - Otherwise, depositors are promised $r_2 \geq 1$ if they wait until $t = 2$
  - Both r_1 and r_2 are chosen optimally by the bank

- θ is realized at $t = 1$ but not publicly observed until $t = 2$
  - At $t = 1$ each depositor *i* receives a private signal $s_i = \theta + \varepsilon_i$
  - ε_i is uniformly distributed in $[-\varepsilon, \varepsilon]$, and we focus on case where $\varepsilon \to 0$

Bank investments and payoffs



Bank investments and payoffs



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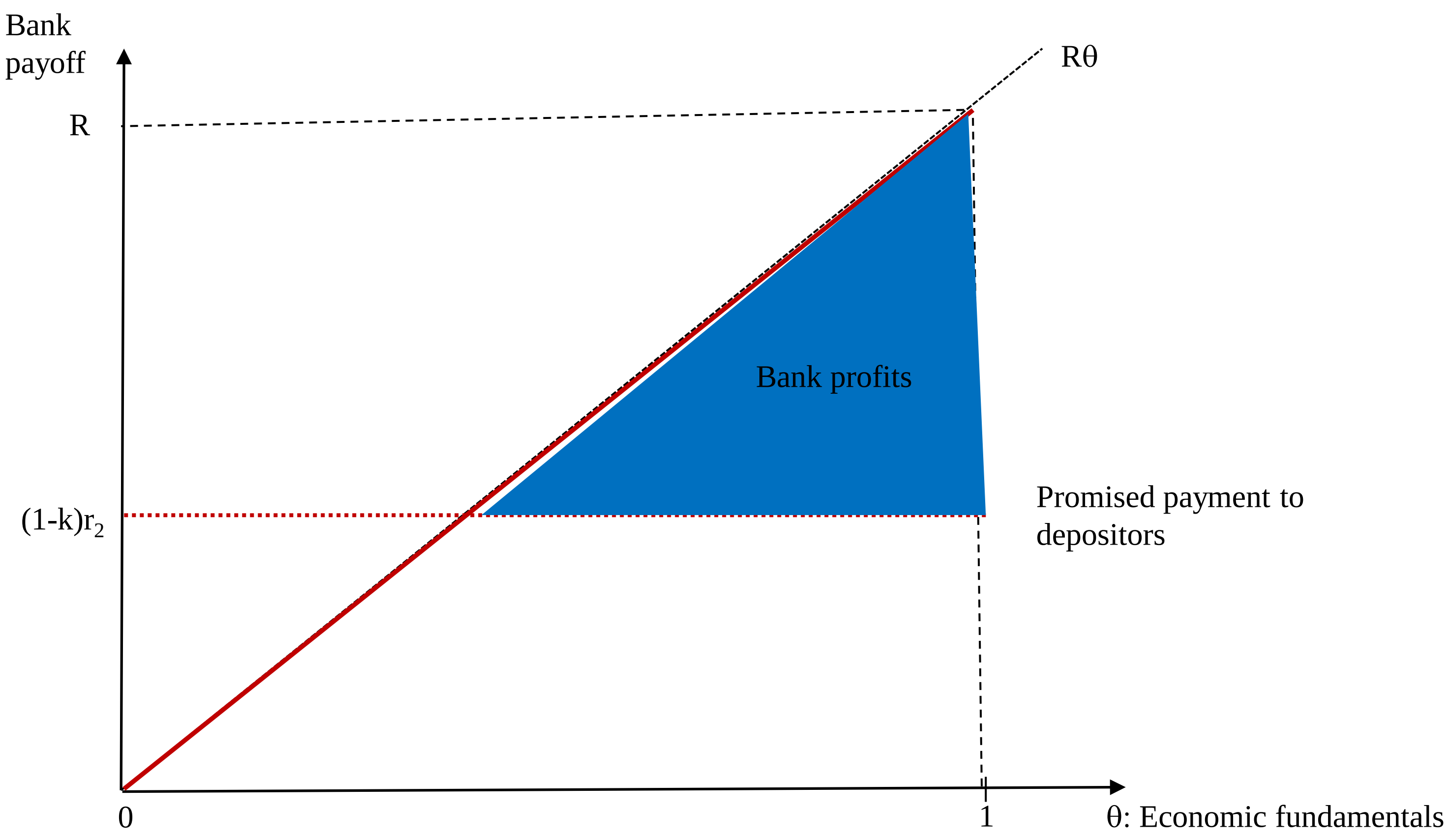

When do runs occur?

- When fundamentals, θ, are sufficiently bad, depositors will want to get their money at t = 1 no matter what they think other depositors are doing
  - Formally: If $\theta < \underline{\theta}$, *all* depositors will run, for some $\underline{\theta} > 0$
  - The threshold $\underline{\theta}$ is increasing in r_1

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- At the other extreme, when fundamentals are sufficiently good depositors always prefer to wait to get their money at t = 2
  - Formally: If $\theta > \overline{\theta}$, no depositors will run, for some $\overline{\theta} \leq 1$

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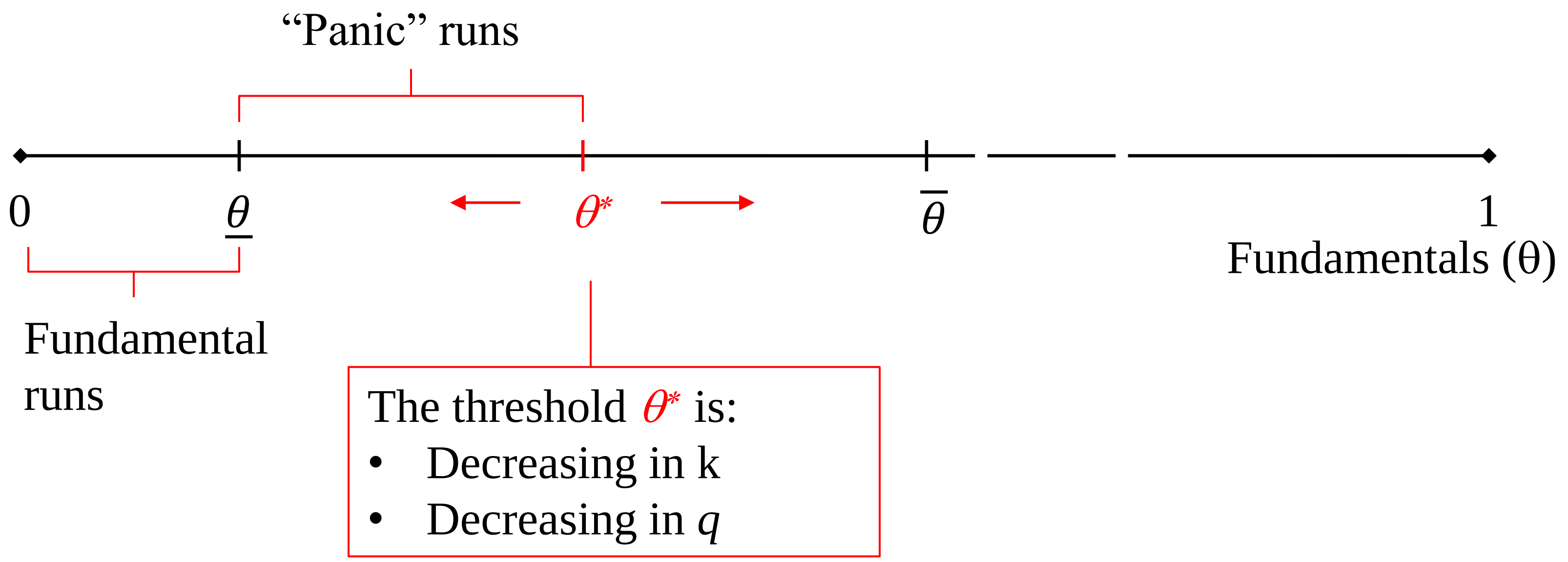
- Panic runs occur for $\theta < \theta^*$, for some $\theta^* > \underline{\theta}$
  - The threshold θ^* comes from the indifference condition for depositors between running at t = 1 and waiting until t = 2 to receive r_2
  - Panics can arise only if $(1 - k)r_1 > L$
  - Otherwise, depositors know that the bank will have enough resources from liquidating (L) to cover all possible withdrawals, $(1 - k)r_1$. Hence, no reason to run

Graphically



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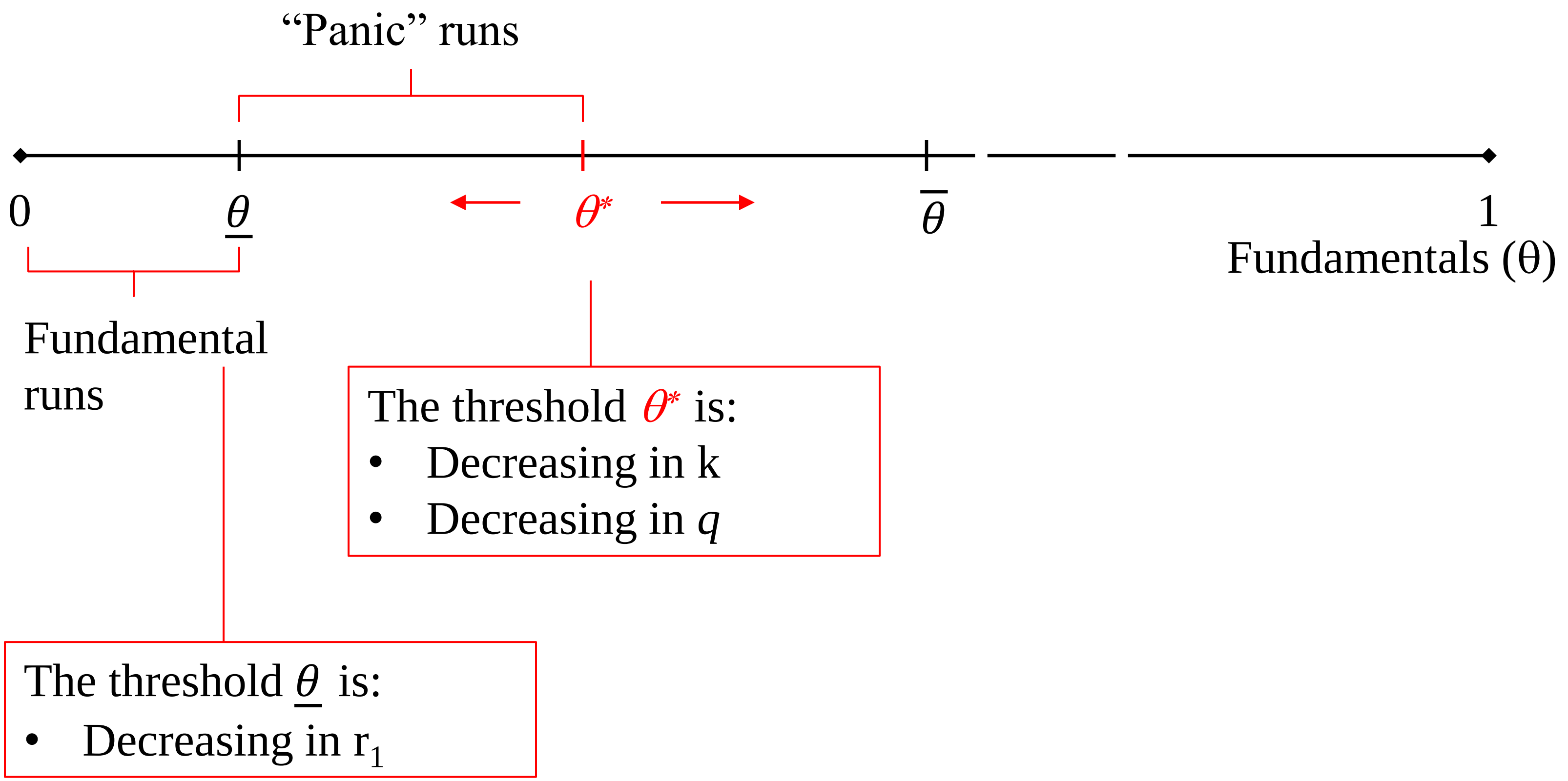
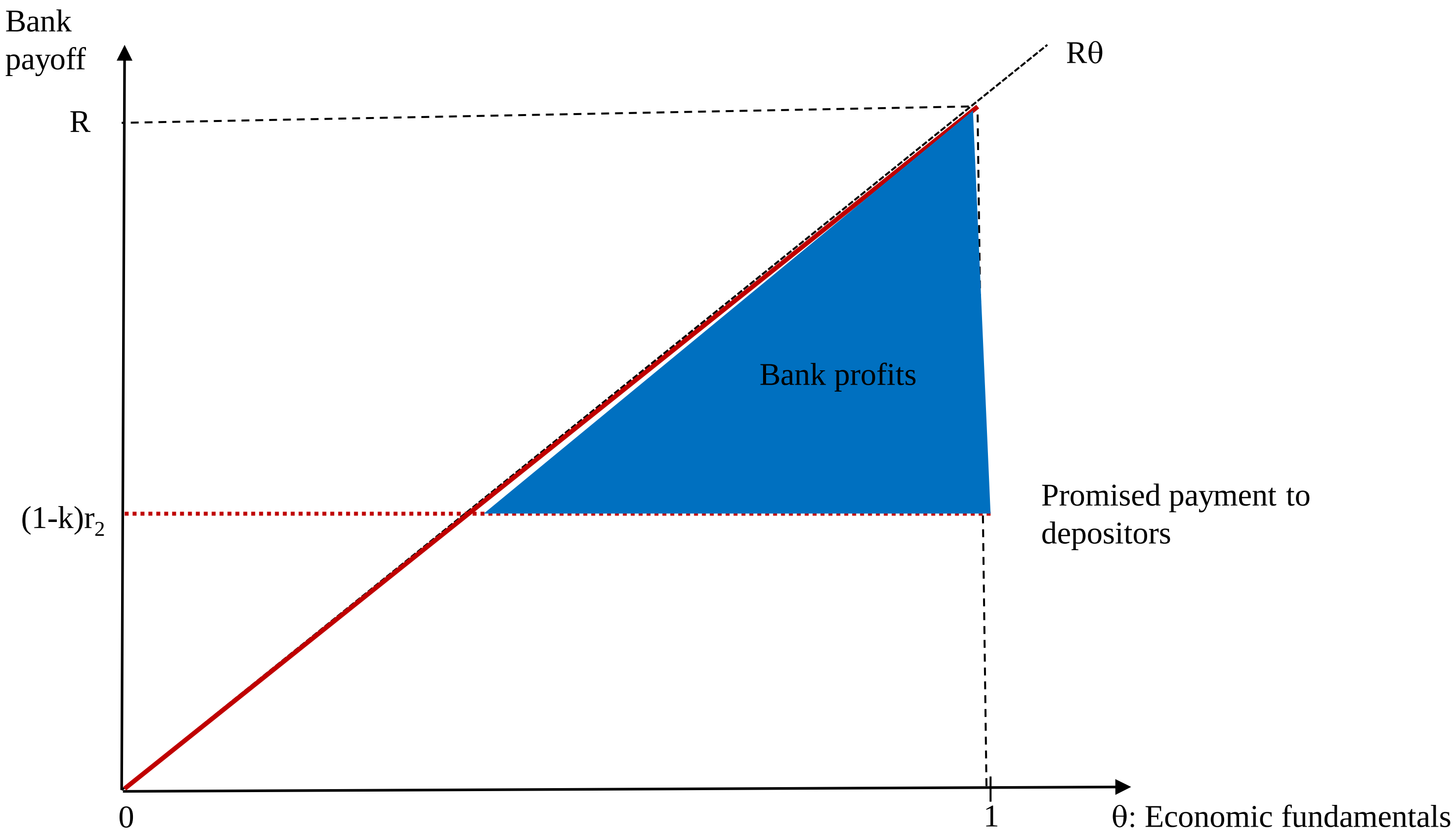


Bank expected profits



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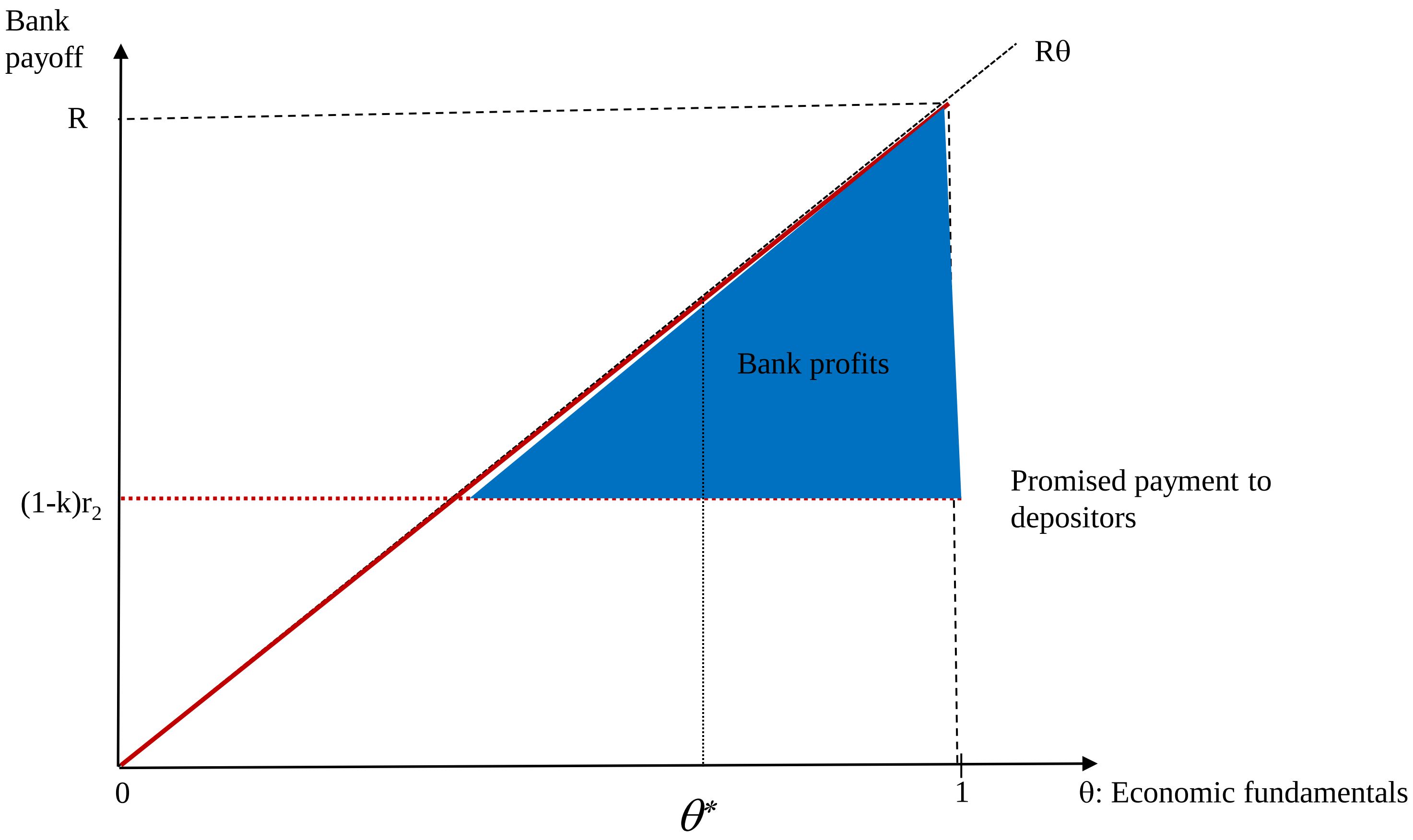

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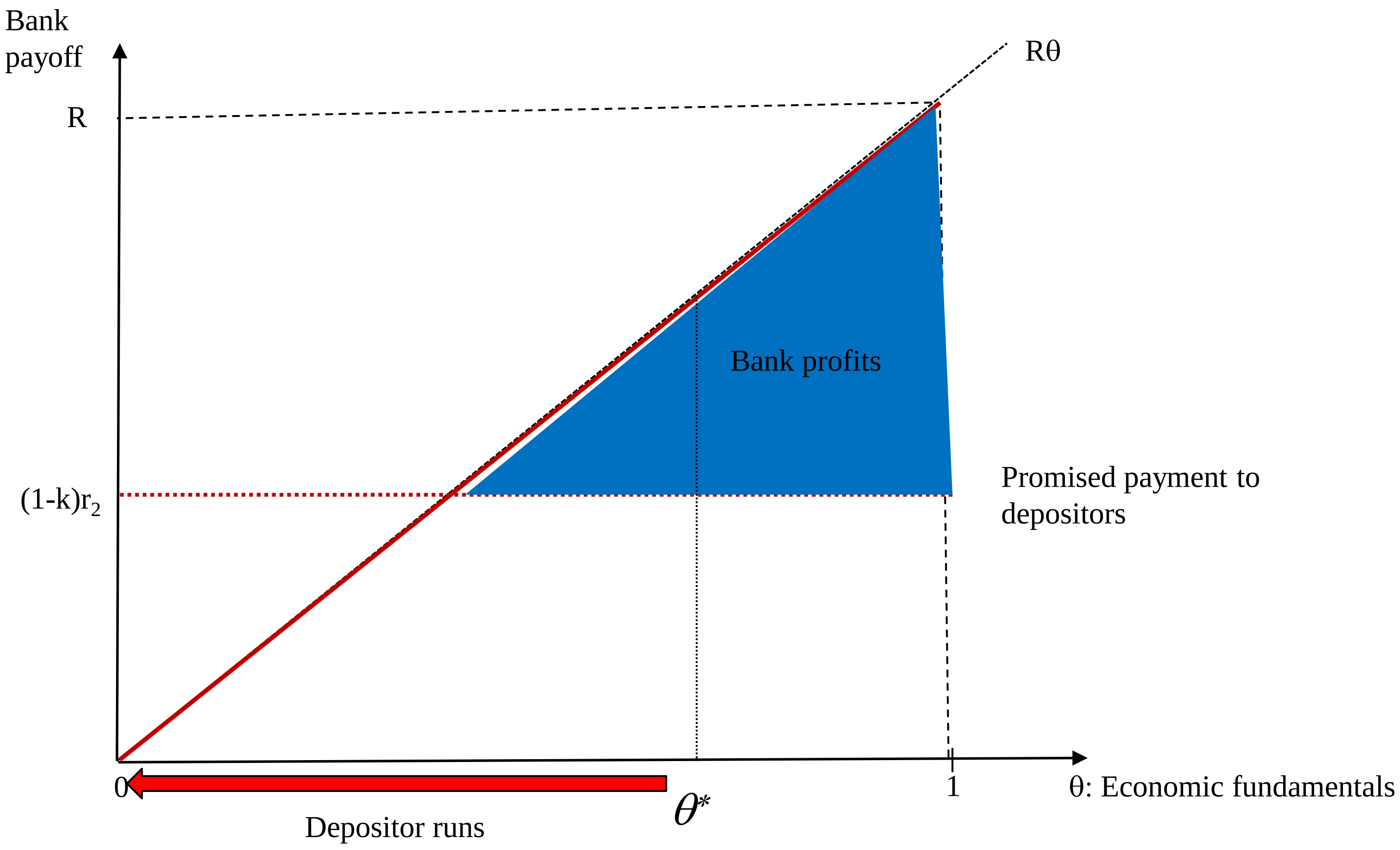

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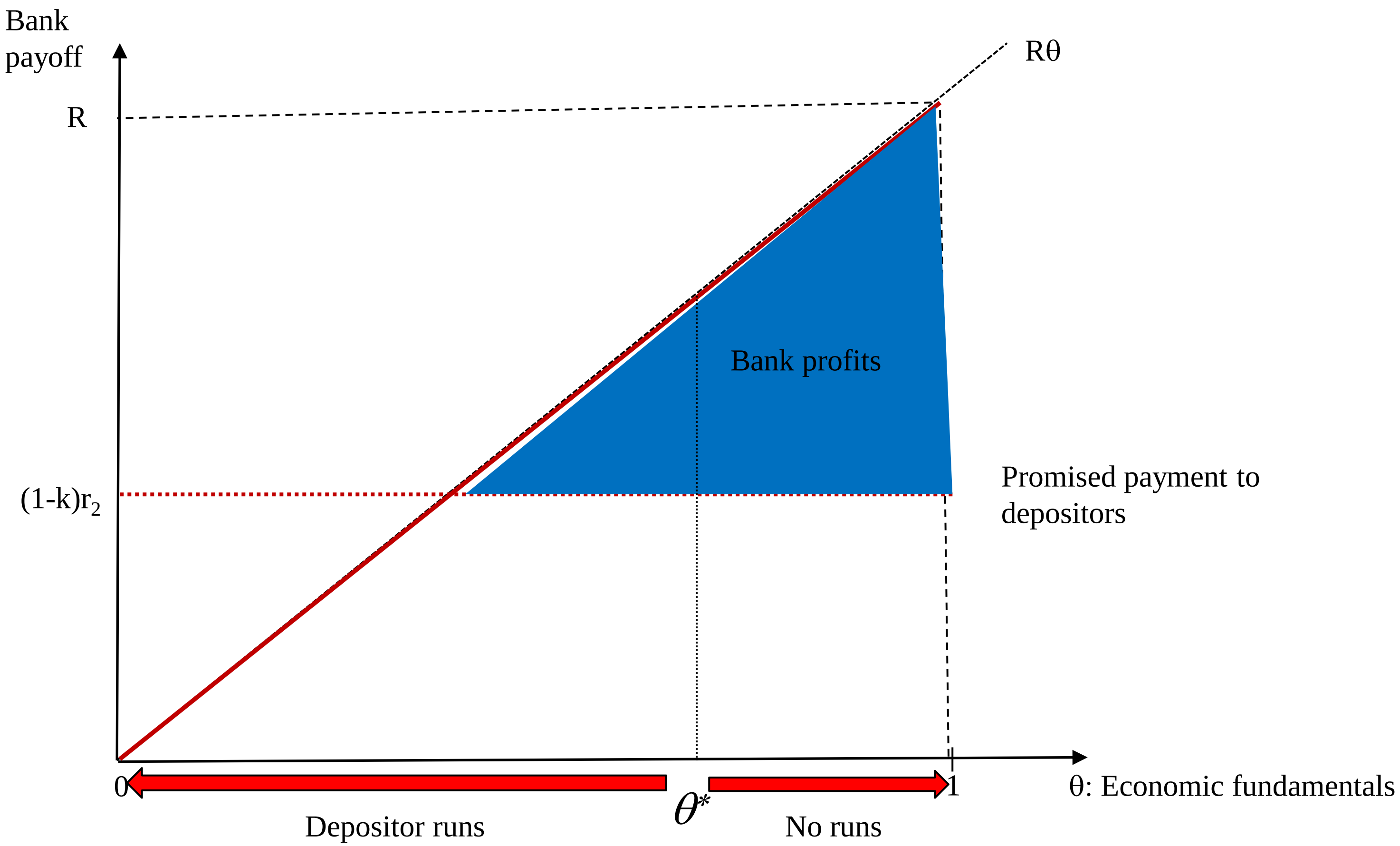

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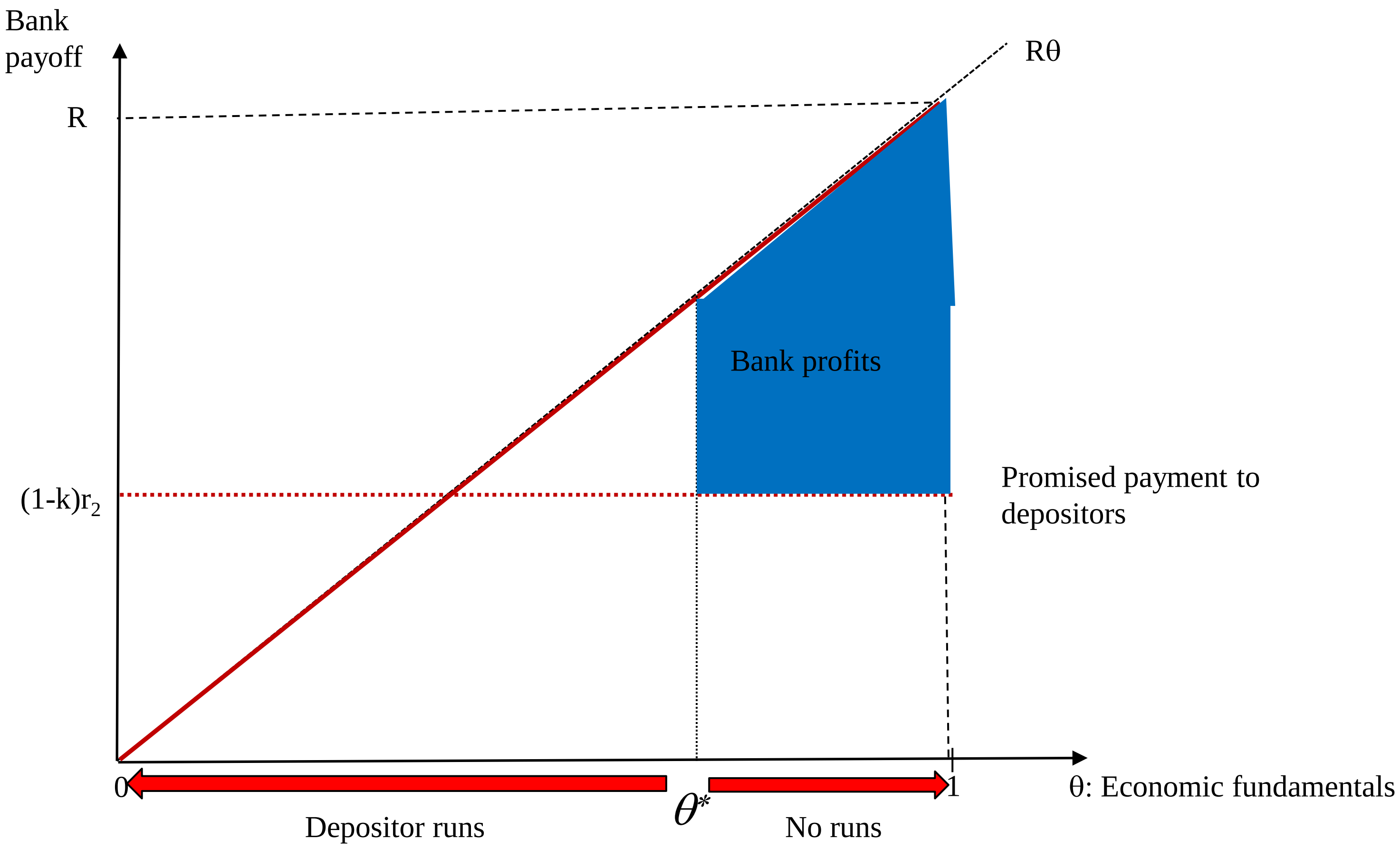

Bank's objective function

- The bank wants to maximize its expected profits:

$$\max_{r_1, r_2} \Pi = \underbrace{\int_0^{\theta^*} q \max\left\{R\theta\left(1 - \frac{(1-k)\, r_1}{L}\right), 0\right\} d\theta}_{\text{Profits when there is a run}} + \underbrace{\int_{\theta^*}^{1} q\left[R\theta - (1-k)\, r_2\right] d\theta}_{\text{Profits when there is no run}}$$

- Subject to depositors being willing to participate:

$$\int_0^{\theta^*} \min\left\{\frac{L}{(1-k)}, r_1\right\} d\theta + \int_{\theta^*}^{1} q r_2 d\theta \geq u$$

where u is the reservation utility for depositors

Optimal choice of deposit rate

- **Result:** The bank optimally chooses $r_1 = \frac{L}{1-k} > 0$
  - By choosing $r_1 > 0$, the bank makes the debt demandable (i.e., subject to early withdrawal)
  - The bank *could* set $r_1 = 0$ and have no runs, but chooses not to do so

- **Intuition:** The bank is the residual claimant on the long term (i.e., t = 2) payoff from the project, $R\theta$
  - As a result, it wants to minimize what it has to repay at time 2, r_2
  - It achieves this by raising r_1 as high as possible and allowing the project to be liquidated when returns are expected to be relatively low

The provision of "liquidity"

- **Remark 1:** If there are no inefficiencies in liquidation (i.e., if $L = 1$), then $r_1 > 1$
  - In other words, the bank always provides liquidity to depositors, even though there is no demand for liquidity, and no need to provide liquidity insurance to depositors

- **Remark 2:** If early liquidation is inefficient (i.e., if $L < 1$), the bank may still set $r_1 > 1$ if it has enough capital

Bank capital structure

- So far, I haven't said anything about the bank's capital structure
  - I have treated k (capital) and 1 – k (deposits) as exogenous

- In the paper, we endogenize bank capital by allowing the bank to maximize its profit with respect to k

- **Result:** As long as the marginal cost of capital, ρ, relative to deposits, u, is not too large, the bank optimally chooses $k^* > 0$

Conclusion

- Banks routinely issue demandable debt as part of their capital structure
  - Demand deposits
- Given banks are in business of maturity intermediation, issuing demandable deposits exposes them to the risk of runs
- We show that demandable debt can arise as an optimal instrument for profit maximizing banks even if there is no need to provide "insurance" to depositors
  - The key is that, as residual claimant on its long-term loans, the bank wants to reduce what it has to repay depositors at the final date