MULTISTAGE FINANCING

- LIQUIDITY RATIOS
- SOFT BUDGET CONSTRAINT
- FREE CASH FLOW
- RISK MANAGEMENT

2th set of transparencies

Tunis, May 2005

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CORPORATE LIQUIDITY DEMAND

HOARDING OF LIQUIDITY

Asset side : – *securities*

– *credit lines and loan commitments*

Future promises to lend

(maximum amount, lending terms, duration, commitment fee, option to convert into term loan at maturity?,…)

Liability side : – *long term debt and equity*

WHY?

Concern about refinancing.

CORPORATE RISK MANAGEMENT

- TECHNIQUES
  - forward/futures markets (raw materials, agricultural products),
  - swap → FX
  - → interest rate,
  - securitization,
  - insurance against theft, fire, death of key employee,
  - trade credit insurance,
  - geographical plant diversification.

  …

  •Yet limited hedging (Culp-Miller). Large companies make much greater use of derivatives.

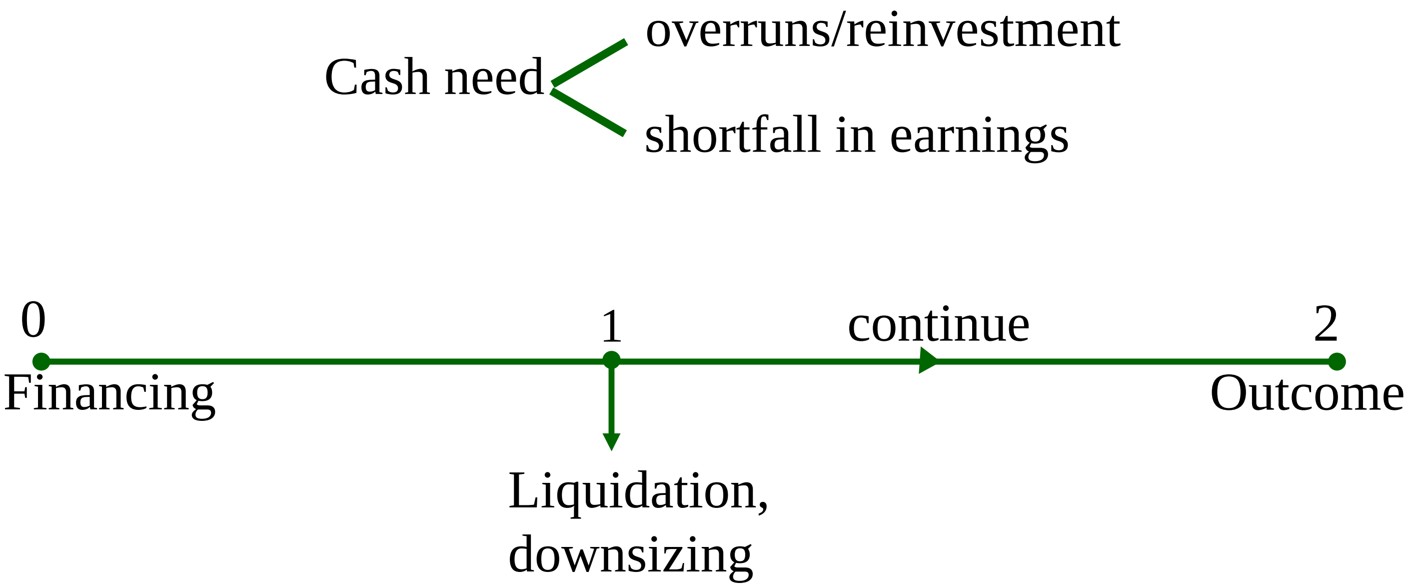
- WHY?
  - reduction in volatility for claimholders : No!
  - cut tax bill? (Stulz),
  - insure managers by filtering out exogenous noise (Stulz, Fite-Pfleiderer)?

    Alternative : virtual hedging.
  - reduce probability of bankruptcy?

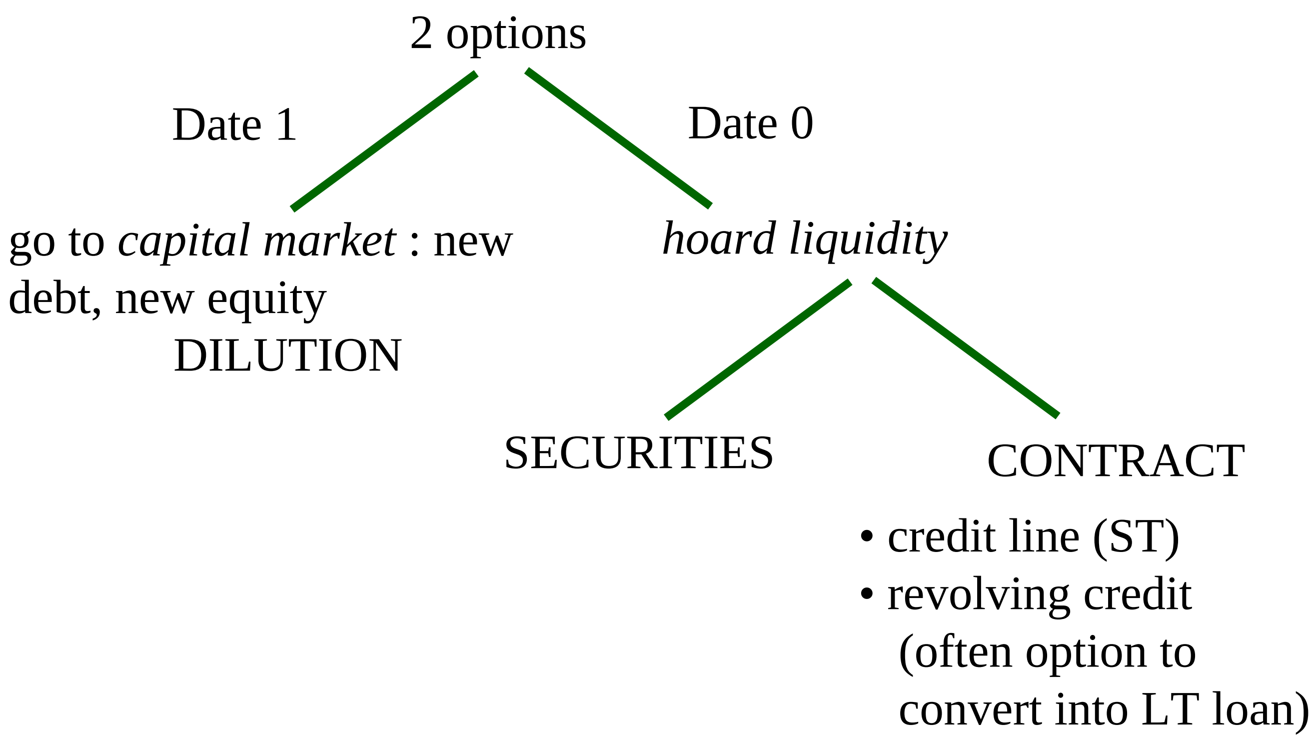
  AGENCY BASED EXPLANATIONS
  - unability to get funds when one needs them,
  - avoid ancillary damages such as gambling behavior.

CORPORATE LIQUIDITY DEMAND

"Cash poor firm"



• How to meet these needs?



- BASIC INSIGHT:LOGIC OF CREDIT RATIONING APPLIES AT DATE 1 AS WELL ⇒ WANT TO HOARD LIQUIDITY

- CASH RICH FIRM: flip side of same coin.

Jensen 1986	ST debt	pump out money
Easterbrook 1984	Dividend	

steel, tobacco, chemical, broadcasting,...

- Security design also regulates liquidity

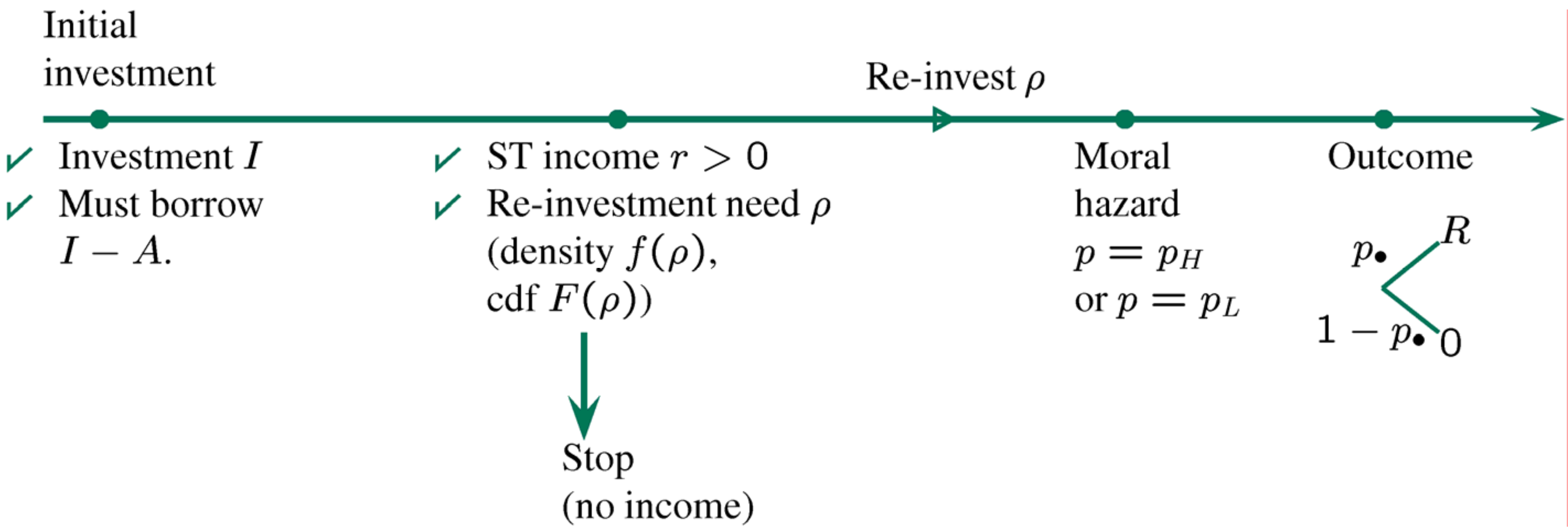
  Equity, LT debt: little cash draining

  ST debt: drains cash

  Preferred stocks...

I. LIQUIDITY RATIO AND CORPORATE RISK MANAGEMENT

I. FIXED INVESTMENT VERSION

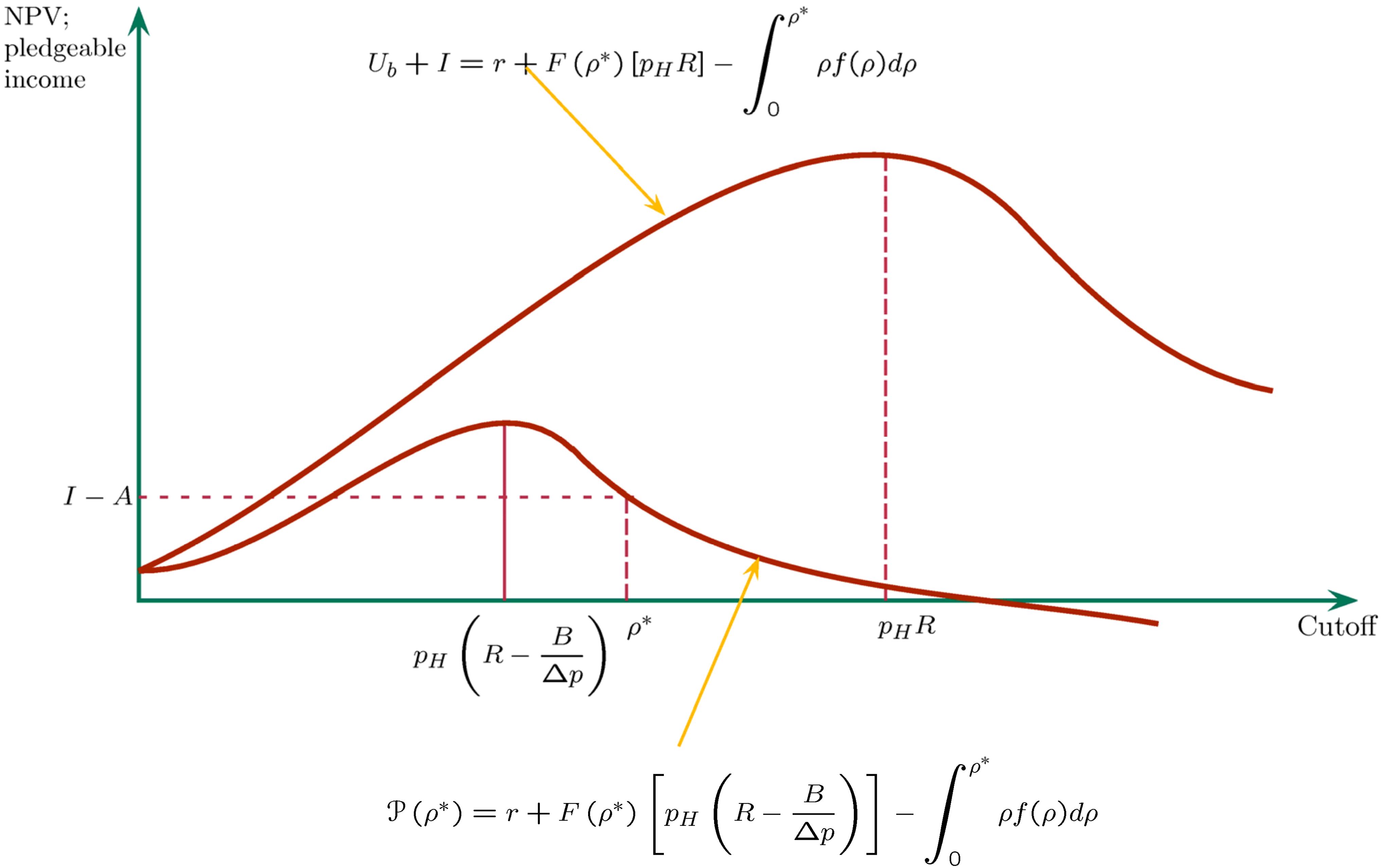


Optimal policy: continue iff $\rho \leq \rho^*$ for some ρ^*.

- $$U_b(\rho^*) = \text{NPV}$$
$$= [r + F(\rho^*)\, p_H R] - \left[I + \int_0^{\rho^*} \rho f(\rho) d\rho\right]$$

- (IC) $(\Delta p)\, R_b \geq B$

$$\mathcal{P}(\rho^*) - [I - A] = \left[r + F(\rho^*)\, p_H \left(R - \frac{B}{\Delta p}\right)\right]$$
$$- \left[I + \int_0^{\rho^*} \rho f(\rho) d\rho\right]$$


NPV;
pledgeable
income
$U_b + I = r + F(\rho^*)[p_H R] - \int_0^{\rho^*} \rho f(\rho) d\rho$
$I - A$
$p_H\left(R - \frac{B}{\Delta p}\right)$
ρ^*
$p_H R$
Cutoff
$\mathcal{P}(\rho^*) = r + F(\rho^*)\left[p_H\left(R - \frac{B}{\Delta p}\right)\right] - \int_0^{\rho^*} \rho f(\rho) d\rho$

- (i) $\mathcal{P}(p_H R) \geq I - A$

$$\Longrightarrow \quad \rho^* = p_H R \qquad \text{(first best)}$$

- (ii) $\mathcal{P}(p_H R) < I - A \leq \mathcal{P}\left(p_H\left(R - \frac{B}{\Delta p}\right)\right)$

Then

$$\boxed{\rho_0 < \rho^* < \rho_1}$$

[Third case (iii) $\mathcal{P}\left(p_H\left(R - \frac{B}{\Delta p}\right)\right) < I - A \Longrightarrow$ no funding]

CASH-RICH FIRM: $r > \rho^*$

ST debt	$d = r - \rho^*$
LT debt	$D = R - \dfrac{B}{\Delta p}$

Theory of maturity structure

(a) *Weak balance sheet* $(A \searrow) \Longrightarrow \rho^* \searrow \Longrightarrow d \nearrow$

$\Longrightarrow$ *short maturity structure.*

(b) Highly indebted firms ($\Rightarrow$ weak balance sheet) more likely to borrow on a ST basis.

Reinterpretation: growth prospects

- No liquidation.
- Rather: if ρ: p becomes $p+\tau$ (with $\tau > 0$ and $p = p_H$ or p_L).

Incentive constraint:

$$(p_H+\tau)\,R_b \geq (p_L+\tau)\,R_b + B \quad \Longleftrightarrow \quad (\Delta p)\,R_b \geq B.$$

$$\boxed{\tau\left(R - \frac{B}{\Delta p}\right) \leq \rho^* < \tau R.}$$

ST debt: $d = r - \rho^*$.

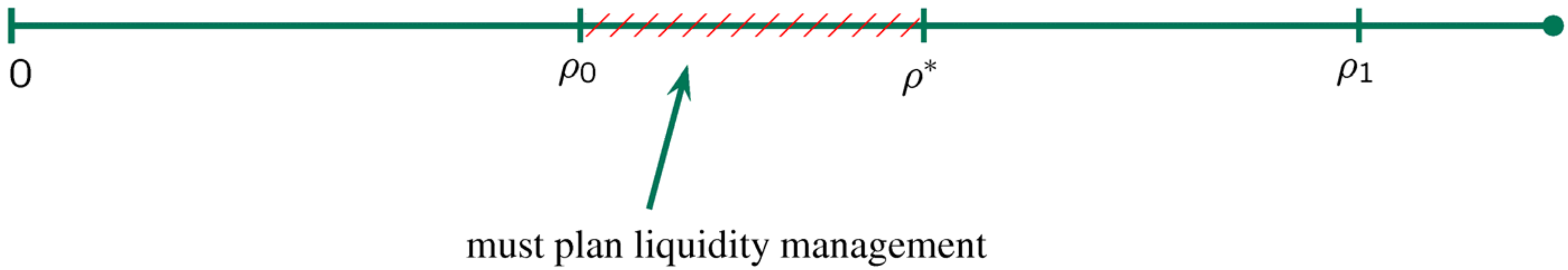
$$\frac{d(d)}{d\tau} < 0 \quad \Longrightarrow$$

firms with better growth opportunities should select longer maturities.

CASH-POOR FIRM:

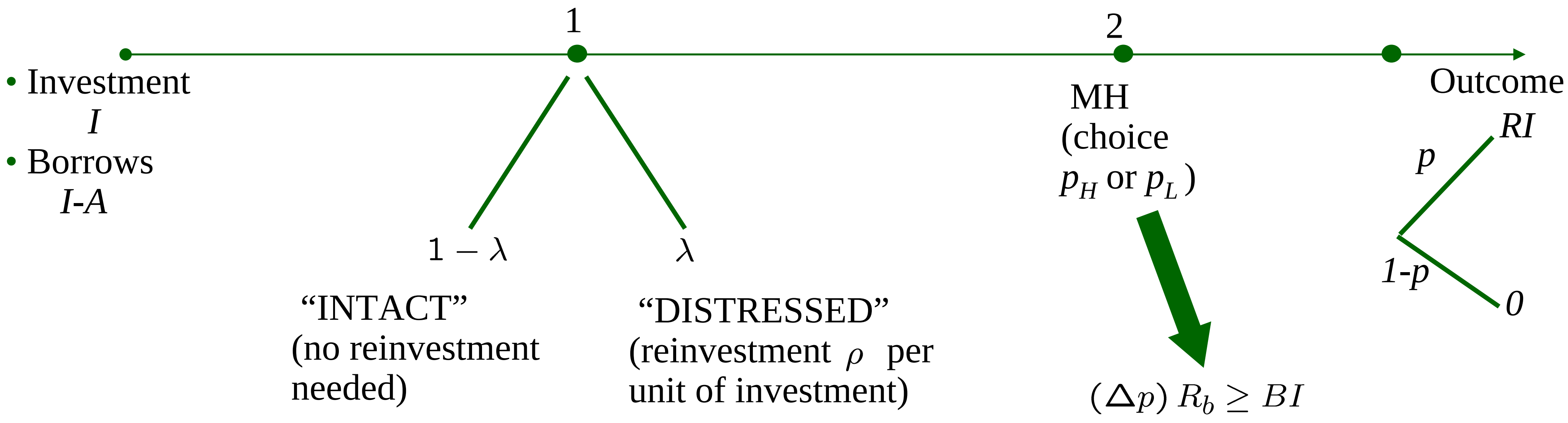
Example: $r = 0$.

- "Wait-and-see" policy suboptimal



TWO-SHOCK CASE AND VARIABLE INVESTMENT SCALE

Timing



Assumptions

(1) There exists store of value (1 $\longrightarrow$ 1)

(2) $\rho_0 < \rho < \rho_1$

$$\left(\text{remember } \rho_1 = p_H R \qquad \rho_0 = p_H \left(R - \frac{B}{\Delta p} \right) \right)$$

(3) $\rho_0 < \min \left\{ 1 + \lambda\rho \, , \, \frac{1}{1-\lambda} \right\} < \rho_1$

Interpretation

Policy #1 : abandon in case of distress

$$(1-\lambda)\,\rho_0 I = I - A \Rightarrow I = \frac{A}{1-(1-\lambda)\rho_0}$$

$$\Longrightarrow \quad U_b = [\rho_1(1-\lambda)-1]\,I = \frac{\rho_1(1-\lambda)-1}{1-(1-\lambda)\rho_0}A$$

$$= \frac{\rho_1 - \dfrac{1}{1-\lambda}}{\dfrac{1}{1-\lambda}-\rho_0}A$$

Policy #2: pursue project in case of distress

$$(1+\lambda\rho)\,I - A = \rho_0 I \;\Rightarrow\; I = \frac{A}{(1+\lambda\rho)-\rho_0}$$

$$U_b = [\rho_1 - (1+\lambda\rho)]\,I$$

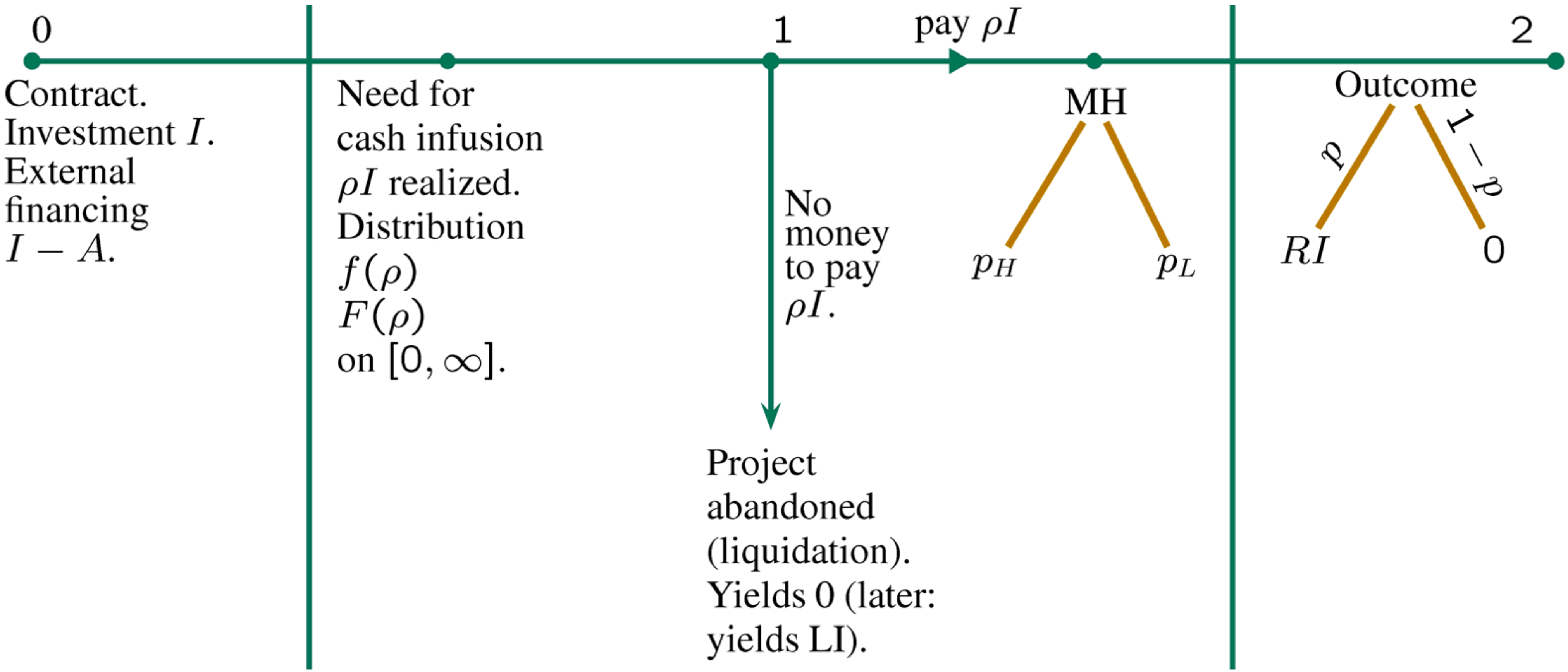
$$= \frac{\rho_1 - (1+\lambda\rho)}{(1+\lambda\rho)-\rho_0}\,A$$

Minimize cost : $c = \min\left\{1+\lambda\rho\,,\ \frac{1}{1-\lambda}\right\}$

policy #2 $\Leftrightarrow$ $(1-\lambda)\rho \le 1$

Policy #2 when $\begin{cases} \rho \text{ low} \\ \lambda \text{ high} \end{cases}$

CONTINUUM OF SHOCKS



a) OPTIMAL CONTRACT (later: implementation)

- Only investors can cover ρI. Suppose for the moment one can contract on continuation rule.

  - Optimum:

    - $\rho \leq \rho^*$: continue: needs $R_b \geq \frac{BI}{\Delta p}$
    - $\rho > \rho^*$: liquidate (nothing for entrepreneur)

Pledgeable income after continuation

$$\rho_0 I \quad \left(= p_H \left(R - \frac{B}{\Delta p}\right) I\right)$$

$(IR)_\ell$

$$F(\rho^*)\,\rho_0 I \geq I - A + \left[\int_0^{\rho^*} \rho f(\rho) d\rho\right] I$$

$\Longrightarrow$ multiplier $I = k\,A$

$$\kappa(\rho^*) = \frac{1}{1 + \int_0^{\rho^*} \rho f(\rho) d\rho - F(\rho^*)\,\rho_0}$$

Maximized at $\rho^* = \rho_0$. Explanation.

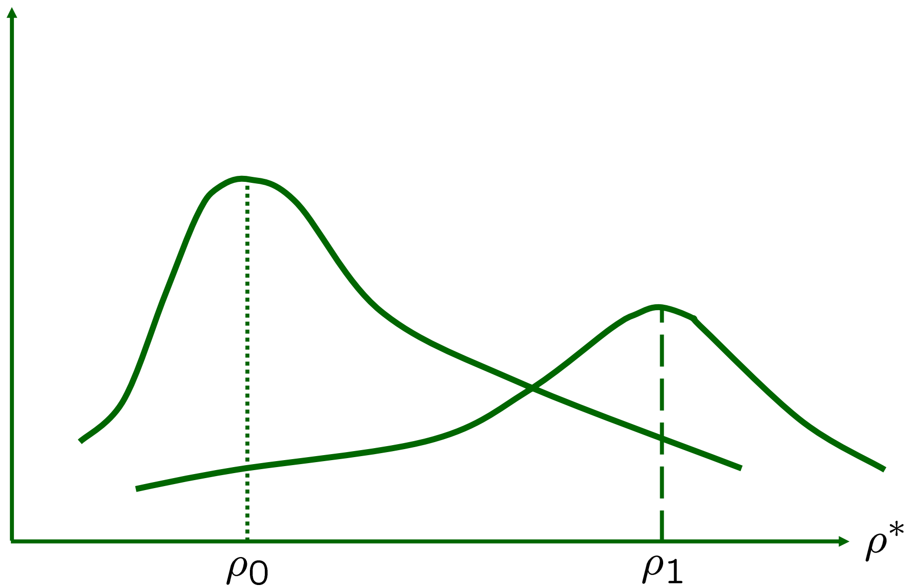
NPV per unit of investment:

$$m(\rho^*) = F(\rho)\,\rho_1 - \left[1 + \int_0^{\rho^*} \rho f(\rho) d\rho\right]$$

maximized at $\rho^* = \rho_1$. Intuition.

➡ Borrower's utility

$$m(\rho^*)\,\kappa(\rho^*)\,A$$



Optimum: $\rho_0 < \rho^* < \rho_1$

Optimal ρ^* :

$$c(\rho^*) \equiv \frac{1 + \int_0^{\rho^*} \rho f(\rho) d\rho}{F(\rho^*)}$$

"expected unit cost of effective investment"

$$\Longrightarrow \quad c(\rho^*) \equiv \rho^* + \frac{1 - \int_0^{\rho^*} F(\rho) d\rho}{F(\rho^*)}$$

Utility: $$U_b = \frac{\rho_1 - c(\rho^*)}{c(\rho^*) - \rho_0} A$$

$$\Longrightarrow \begin{cases} \int_0^{\rho^*} F(\rho) d\rho = 1 \\ c(\rho^*) = \rho^* \\ \text{Utility} = \frac{\rho_1 - \rho^*}{\rho^* - \rho_0} A \end{cases}$$

■ Generalization: *liquidation value* LI :

$$\begin{cases} U_b = \dfrac{(\rho_1 - L) - \rho^*}{\rho^* - (\rho_0 - L)} A \\ \\ \displaystyle\int_0^{\rho^*} F(\rho) d\rho = 1 - L \end{cases} \qquad \frac{d\rho^*}{dL} < 0$$

Intuition.

CORPORATE DEMAND FOR LIQUIDITY

① WAIT-AND-SEE POLICY IS SUBOPTIMAL

→ even with "perfect" financial market, investors won't bring in more than $\rho_0 I$ at date 1.

→ Conversely, $\rho < \rho_0 \Rightarrow$ initial investors willing to have their claims diluted.

Dilution only $\Rightarrow \rho^* = \rho_0$.
(even worse if debt overhang, etc.)

② HOARDING:

* Nonrevocable credit line

$\rho^* I +$ no right to dilute

or $(\rho^* - \rho_0)\, I +$ right to dilute

* Securities: same

CORPORATE RISK MANAGEMENT

Modeling: • "Adverse" shocks $\boldsymbol{\varepsilon I}$ with $E(\varepsilon|\rho) = 0$

(ex: foreign exchange risk).

• Can get insurance at fair rate.

Idea: obtain insurance so that ε does not mess up decision making.

• HEDGING

For an arbitrary ρ^*

$$U_b = \frac{\rho_1 - c(\rho^*)}{c(\rho^*) - \rho_0} A$$

Remark : could be a conditional credit line (less common).

Lemma : H is more convex than F

$$\left(\Longleftrightarrow H = \underbrace{c}_{\text{convex}} \circ F \Longleftrightarrow H \circ F^{-1} \quad \text{convex} \right)$$

Proof : $\left(H \circ F^{-1}\right)''(y) = \left(F^{-1}(y)\right)' > 0$

Arrow-Pratt: $H\left(\overline{\rho}\right) \leq E_{\varepsilon}\left(H\left(\rho^{*} - \varepsilon\right)\right)$

$$\Longrightarrow \quad \widetilde{c}\left(\rho^{*}\right) \geq \frac{1 + H\left(\overline{\rho}\right)}{F\left(\overline{\rho}\right)} = c\left(\overline{\rho}\right).$$

In contrast, manager ex post may or may not hedge if given the choice

$$\left(F\left(\rho^{*}\right) \gtrless E_{\varepsilon}\left[F\left(\rho^{*} - \varepsilon\right)\right]\right)$$

Fir

m $\begin{cases} \text{"risk averse" w.r.t. } \varepsilon \\ \text{"risk loving" w.r.t. } \rho \end{cases}$

Mean preserving spread $F(\rho|\theta) \int_0^{\rho^*} F_\theta d\rho > 0$

$$\Longrightarrow \frac{\partial c}{\partial \theta} = -\frac{\int_0^{\rho^*} F_\theta d\rho}{F(\rho^*)} < 0 \Longrightarrow \text{Firm better off}$$

DIFFERENCE: "unavoidable"; option !

✓ *Alternative transfer risk* (conditional credit line, indexed debt,..).

INCOMPLETE HEDGING AND THE INVESTMENT-CASH FLOW SENSITIVITY

Rationales for incomplete hedging:

✓ *Market power.*

✓ *Serial correlation of profits.*

Example: ST profit *r* random. Date-2 probability of success: $p + \tau(r)$ with $\tau' > 0$.

$\Longrightarrow$ $\rho^*(r)$ increasing in *r*.

On the other hand, $[p_H + \tau(r)] \left[R - \dfrac{B}{\Delta p}\right]$ (amount that can be raised on capital market at date 1) grows with *r*.

Still

$$\boxed{\frac{d\left(d^{*}(r)\right)}{dr} < 1}$$

✓ *Aggregate risk.*

✓ *Asymmetric information.*

✓ *Incentives* (see below).

II. SOFT BUDGET CONSTRAINT

Basic idea: situation in which capital market is *too soft*: refinances when *not ex ante* optimal to do so.

Date 0	Date 1
date 0 moral hazard (or AS) about	signal (or realization) informative about date-0 behavior

- date-1 income r
- continuation parameters
  - ρ
  - L
  - 2nd period prospects (R, p_H …)

want to punish if r small, etc.

• KEY: Monetary punishments limited (especially if continuation!)
Often liquidation (interference,…) only punishment or at least complementary punishment.

• *EXAMPLE*: *r endogenous*

Perhaps even deterministic

$$\begin{cases} \text{Low date-0 effort} \longrightarrow r_L \\ \text{High date-0 effort} \longrightarrow r_H \end{cases}$$

Private benefit B_0I of shirking at date 0.

State-invariant continuation rule does not provide incentives. Two possibilities:

- monetary rewards (beyond $R_b \geq \frac{BI}{\Delta p}$ in case of continuation)
  expansive

- *state-contingent continuation rule*

$$\left[F\left(\rho_H^*\right) - F\left(\rho_L^*\right)\right] p_H \frac{BI}{\Delta p} \geq B_0 I$$

• very small cost (2nd order) for B_0 small

• not credible if $\rho_L^* < \rho_0 \quad \left(< \rho_H^*\right)$

Investment-cash flow sensitivity

✓ Yes: $\rho^*(r) - \widehat{\rho} = \lambda \ell(r)$

✓ But impact of financial constraints unclear:

F(•) uniform $\Longrightarrow$ $\rho^*(r \mid A) = \widehat{\rho}(A) + \lambda \ell(r)$

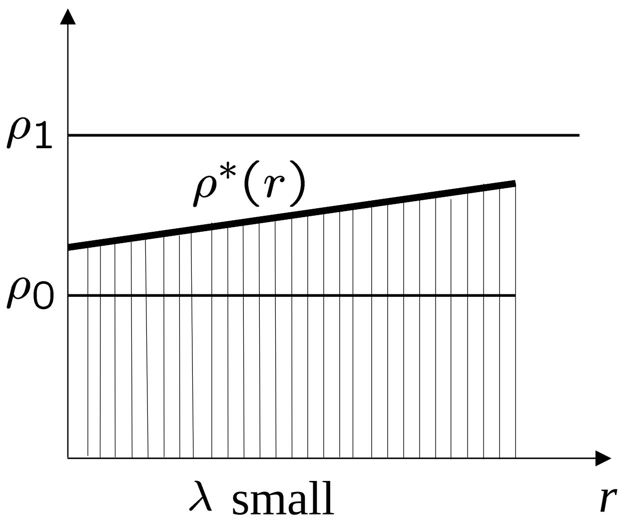
where λ is constant.

Text: $\begin{cases} g(r) & \text{if works} \\ \tilde{g}(r) & \end{cases}$ at date 0

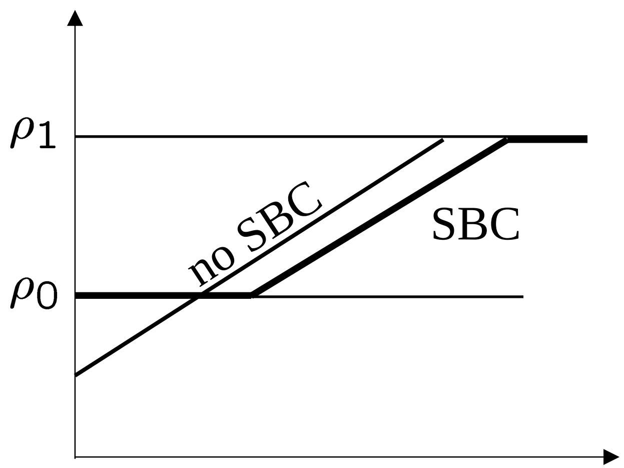
MLRP : $\ell(r) \equiv \dfrac{g(r) - \tilde{g}(r)}{g(r)}$ increasing

Optimal policy: $\rho^*(r) - E_r\left[\rho^*(r)\right] = \lambda \ell(r)$

over "relevant range" (small if B_0 small).



"retained-earnings policy"



Soft Budget Constraint

III. FREE CASH FLOW

Jensen

Easterbrook

- r { exogenous (no SBC issue)
  deterministic safe cash flow (public utilities, banks, mature industries)

- Generalized formulae:

$$k\left(\rho^*\right) = \frac{1}{\left[1 + \int_0^{\rho^*} \rho f(\rho) d\rho\right] - \left[r + F\left(\rho^*\right)\rho_0\right]}$$

$$m\left(\rho^*\right) = \left[r + F\left(\rho^*\right)\rho_1\right] - \left[1 + \int_0^{\rho^*} \rho f(\rho) d\rho\right]$$

Free cash flow assumption: $\boxed{r > \rho^*}$

Payment: $P_1 = (r - \rho)\, I$

→ ST debt

→ dividend (with ceiling)

CRITIQUES

- *Uncertainty* $\Longrightarrow$ not flexible enough, risk of liquidity problem

Ex: $P_1(r) = r - \rho^*$

Rigid (ST debt): $P_1 = \bar{r} - \rho^*$ $\Longrightarrow$ • liquidity risk (see hedging stuff)

P_1 high: good reinvestments not made

P_1 low: free cash flow

• does not respond to news about L, future prospects $\Longrightarrow$ need to make use of market information !

- *Secret reinvestments just before r accrues.*