DETERMINANTS OF DEBT CAPACITY

1st set of transparencies

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I. INTRODUCTION

Adam Smith (1776) - Berle-Means (1932)

Agency problem

Principal outsiders/investors/lenders

Agent insiders/managers/entrepreneur

1. Insufficient ‘‘effort’’ (oversight, cost cutting, competing tasks)
2. Inefficient investment
3. Entrenchment strategies (type of investment, creative accounting, risk attitudes, takeovers)
4. Private benefits (perks, successor, other activities, self-dealing/tunneling)

Good governance: (1) selects most able managers
(2) makes them accountable to investors

✓ *Incentives*

- monetary: shares vs options.
- implicit: poor performance $\Rightarrow$ increase in managerial turnover; tighter relationship if tight external monitoring / less complacent board.
- monitoring: active (boards: watchdogs or lapdogs?, VC, large shareholders,...) passive (speculation, ST debt, ratings, lawsuits).

Roles of:

- product market competition,
- codes of good governance,
- takeovers.

- ✓ *Dysfunctionings & controversies*
  - lack of transparency (compensation & retirement packages, auditors' conflicts of interest,...),
  - runaway compensation,
  - tenuous link between performance and compensation (rewarded for luck, timing of exercise of stock options, golden parachutes),
  - accounting manipulations,
  - tunneling,

  ...

✓ *Debt as a governance mechanism*

Pluses

- reduces free cash flow (ex post),
- threat of illiquidity, bankruptcy or transfer of control to creditors (ex ante),
- (entrepreneurs) managerial team has high-powered incentives.

Minuses

- asset substitution (limited by costly covenants),
- cost of illiquidity,
- cost of bankruptcy.

✓ *International comparisons*

- Protection of shareholders stronger in common law countries (one-share-one-vote, proxy by mail, judicial venues,...)
  Lots of family or private firms in France, Italy, etc..; also: large shareholders.

- Protection of creditors weaker in France than in UK,... (creditors' consent to file for reorganization, treatment of secured creditors, priority rules...)

FINANCING PATTERNS

- ✓ *The Modigliani-Miller puzzle*
  - securities
  - dividends.
- ✓ *Duality on lending side*

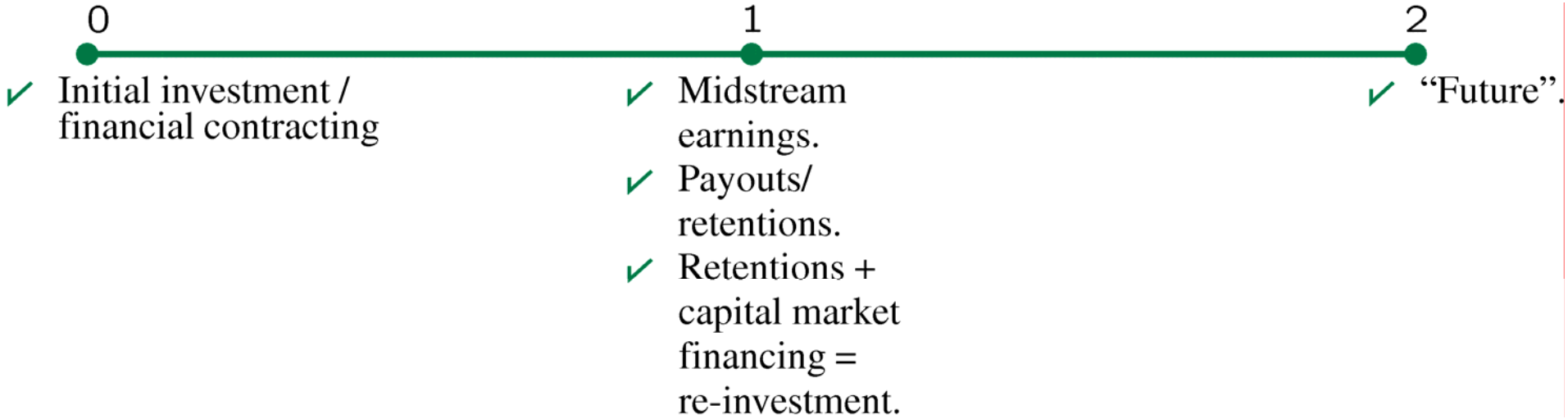
  informed lenders: certification (stock price reaction),...
- ✓ *Duality on borrowing side*

  high-quality borrowers: more LT debt, public debt, suffer less from credit crunch, fewer covenants,...

- ✓ *Sources of corporate finance*

  for mature companies retentions, then loans .

- ✓ *Payout policy*



	Firm should	
	retain more of earnings if	pay out more of earnings if
growth opportunities are	high	low
correlation of date-1 and date-2 profitabilities is	high	low
financial constraint at date 0 is	weak	tight
earnings are	small	large

- ✓ *Determinants of leverage* Average. D/E: about 2, but wide variations.

  High D/E ratios when:

  - safe (utilities before deregulation),
  - collateral,
  - little intangible net worth,...

- ✓ *Investment-cash flow sensitivity*

  (a) firms with more cash on hand invest more, controlling for investment opportunities. Why?

  - reward for good performance,
  - imperfect corporate governance (windfalls, oil price increase,...)

  (b) Controversy about whether investment-cash flow sensitivity higher for financially constrained firm.

- ✓ *Market timing and business cycle sensitivity*
  - Equity issues more frequent in upswings.
  - Smaller negative stock price reaction during upswings.
  - Bank finance countercyclical.
  - Impact of business cycle on small- & medium-size firms.

Equity market timing: during booms:

- marginal productivity increase?
- lower adverse selection?
- bubble?
- irrational market?

OUTLINE

Approach: controlled experiment

Topics:

1. *Micro*

- ✓ Basics: (a) one-stage financing: fixed and variable investment models;
  (b) applications: debt overhang, diversification, collateral pledging, redeployability of assets, investment cash flow sensitivity.
- ✓ Multistage financing: liquidity ratios, soft budget constraint, free cash flow, risk management.
- ✓ Financing under asymmetric information.
- ✓ Exit and voice in corporate governance.
- ✓ Control rights.
- ✓ Takeovers.

2. *Macro*

- ✓ Dual role of assets and multiple equilibria.
- ✓ Credit crunch.
- ✓ Liquidity shortages.
- ✓ Liquidity premia and pricing of assets.
- ✓ Political economy.

II. BASICS OF CREDIT RATIONING: FIXED INVESTMENT MODEL

Lenders / investors /outsider

Entrepreneur / borrower / insider

Project costs I.
Has cash A < I.

Key question: Can lenders recoup their investment?

TYPICAL MODEL

- Risk neutral entrepreneur has one project, needs outside financing.

Project costs I.
Entrepreneur has equity $A < I$; borrows $I - A$; is protected by LL.

Moral hazard

	Pr (success)	Private benefit
Behaves	p_H	0
Misbehaves	p_L	B

Verifiable outcome

R p

0 $1-p$

Want to induce good behavior:

$$NPV = p_H R - I > 0,$$

and

$$[p_L R - I] + B < 0.$$

Contract: Success: $R_b + R_\ell = R$.

Failure: 0 each (optimal).

Reward R_b in case of success

$$(p_H - p_L)\, R_b \geq B$$

Necessary and sufficient condition for financing

$$p_H \left(R - \frac{B}{p_H - p_L} \right) \geq I - A$$

or

PLEDGEABLE INCOME $\geq$ INVESTORS' OUTLAY

Minimum equity:

$$\overline{A} = I - p_H \left(R - \frac{B}{p_H - p_L} \right).$$

Remarks

(1) *Entrepreneur receives NPV*

$$p_H R_b - A = p_H (R - R_\ell) - A = p_H R - I.$$

Will always be the case with competitive financial market.

(2) *Role of courts and legal system*

$\overline{A}$ increases with B.

(3) *Investors' claim: debt or equity?*

(At least) two interpretations:

– inside equity + outside debt (R_ℓ to be reimbursed);

– all-equity firm: shares $\frac{R_b}{R}$ and $\frac{R_\ell}{R}$.

No longer true if leftover value in case of failure. In any case: no need for multiple outside claims.

→ weakness,

→ strength (focus on fundamentals).

DEBT OVERHANG

Definition: (project would always be financed in absence of previous claim).

Example:

A < 0 new investment cannot be financed solely because renegotiation with initial investors infeasible.

Previous claim $D \geq \left(-\overline{A}\right)/p_H$ is *senior*.

Borrower no longer has cash (*A =0*).

a) *Bargaining with initial investors, who have cash*

Noone receives anything if no investment.

Investment: Choose R_b such that $R_b \geq \frac{B}{\Delta p}$

and $p_H (R - R_b) - I \geq 0$.

Feasible since $p_H \left(R - \frac{B}{\Delta p} \right) - I = -\overline{A} > 0$.

b) *Initial investors don't have funds to invest. Bargaining with new investors only.*

Income that can be pledged to new investors:

$$p_H \left(R - D - \frac{B}{\Delta p} \right) < I \quad \text{by assumption.}$$

➡ cannot raise funds.

DEBT OVERHANG

c) *Initial investors don't have funds to invest. Bargaining with new and initial investors.*

Debt forgiveness: $D \to d$, where $0 \leq d \leq \bar{d} = \left(-\overline{A}\right)/p_H$.

That is $p_H \left(R - \bar{d} - \frac{B}{\Delta p} \right) = I$.

When is debt overhang an issue?

– Many creditors. Examples:

✓corporate bonds

(nomination of bond trustee, exchange offers)

✓interbank market/derivatives/guarantees,..

– Asymmetric information (not in this model).

III. BASICS OF CREDIT RATIONING/ VARIABLE INVESTMENT MODEL

1. EQUITY MULTIPLIER / DEBT CAPACITY

Contract:
Investment I.
Sharing rule
$R_b + R_\ell = RI$

Moral hazard

Outcome
0 or RI

	Private benefit	Pr (success)
Behaves	0	p_H
Misbehaves	BI	p_L

Implicit (perfect) correlation hypothesis: specialization, voluntary correlation, macro shocks.

Notation:

$\rho_1 = p_H R$ income per unit of investment

$\rho_0 = p_H\left(R - \frac{B}{\Delta p}\right)$ pledgeable income per unit of investment

Assumption $\boxed{\rho_0 < 1 < \rho_1.}$

First inequality: finite investment

Second inequality: positive NPV (otherwise no investment).

Constraints: $(\Delta p)\, R_b \geq BI$ (IC_b)

and $p_H R_\ell \geq I - A$ (IR_ℓ)

Borrower's utility (=NPV)

$$p_H RI - I = \boxed{(\rho_1 - 1)\, I}$$

→ wants to maximize *I*.

BORROWING CAPACITY

$$p_H\left(RI - \frac{BI}{\Delta p}\right) = I - A$$

$$\Rightarrow \quad I = \frac{A}{1-\rho_0}$$

Utility $\dfrac{\rho_1 - 1}{1-\rho_0} A.$

DEBT OR EQUITY? THE MAXIMAL INCENTIVE PRINCIPLE

Extension: $R^S I$ in case of success

$R^F I$ in case of failure (salvage value of assets)

$$R \equiv R^S - R^F > 0.$$

Generalization of $\rho_1 > 1 > \rho_0$:

$$p_H R + R^F > 1 > p_H \left(R - \frac{B}{\Delta p} \right) + R^F.$$

Optimal sharing rule:

$$\max_{\left\{R_b^S, R_b^F, I\right\}} \left\{p_H R_b^S + (1 - p_H) R_b^F\right\}$$

s.t.

$$(\Delta p)\left(R_b^S - R_b^F\right) \geq BI$$

and

$$p_H \left(R^S I - R_b^S\right) + (1 - p_H)\left(R^F I - R_b^F\right) \geq I - A.$$

Breakeven constraint binding (otherwise $\delta R_b^S = \delta R_b^F > 0$).

➡ $$U_b = \left(p_H R + R^F - 1\right) I$$

➡ wants to maximize *I*.

Incentive constraint binding (otherwise ∞ borrowing capacity)

Suppose $R_b^F > 0$. Then

$$p_H \delta R_b^S + (1 - p_H)\, \delta R_b^F = 0$$
$$+ \qquad\qquad -$$

relaxes incentive constraint.

Outside debt maximizes inside incentives

Generalization: Innes (1990).

Discussion:
- ✓ risk taking,
- ✓ broader notion of insiders,
- ✓ risk aversion.

2. *DIVERSIFICATION*

Diamond (1984)'s diversification argument.

n projects.

Basic idea: IRS due to the possibility of cross-pledging.

TWO IDENTICAL PROJECTS

Rewards R_0 , R_1 , R_2

Risk neutrality ➡ $R_0 = R_1 = 0$.

$$(IC_b)\ \left(p_H^2 - p_L^2\right) R_2 \geq 2B$$

$$\Longleftrightarrow\ (p_H + p_L)\, R_2 \geq \frac{2B}{\Delta p}.$$

Other *IC* constraint is then satisfied

$$p_H(\Delta p) R_2 \geq B.$$

Nonpledgeable income

$$p_H^2 R_2 = 2(1-d_2)\frac{p_H B}{\Delta p}$$

$$0 < d_2 = \frac{p_L}{p_L + p_H} < \frac{1}{2}.$$

Financing condition. Entrepreneur's equity= 2A.

$$p_H\left[R - (1-d_2)\frac{B}{\Delta p}\right] \geq I - A$$

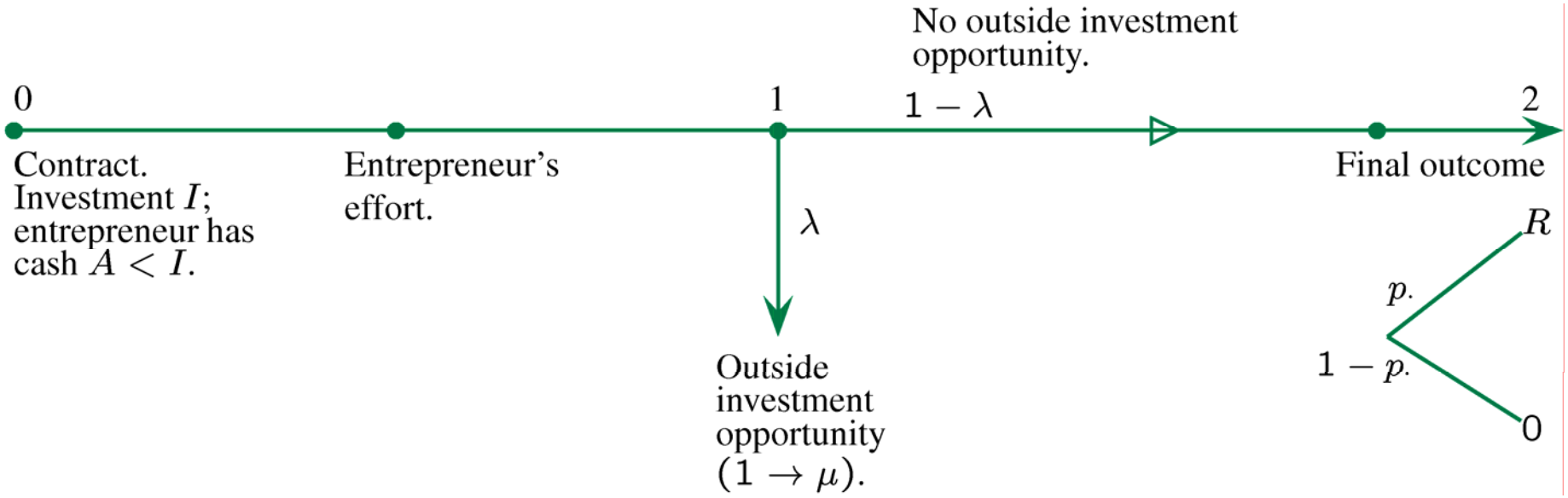
PROJECT FINANCE IS NOT OPTIMAL

LIMITS TO DIVERSIFICATION

- limited attention,
- core competency,
- endogenous correlation (asset substitution, VaR)

$$n = 2 : p_H R_2 > p_H^2 R_2$$

3. LIQUIDITY NEEDS



In case of "liquidity shock", r_b invested yields : $\mu \quad r_b > r_b$ to entrepreneur (none of which is pledgeable to investors).

Two issues:

- imperfect performance measurement at date 1
- strategic exit (if liquidity shock unobservable, 2 dimensions of MH: effort, truthful announcement of liquidity need).

Contract (can show: no loss of generality)

Menu:

- R_b in case of success at date 2, *or*
- r_b at date 1.

Benchmark: Liquidity shock observable

$$(IC) \quad \lambda\mu r_b + (1-\lambda)\, p_H R_b \geq \lambda\mu r_b + (1-\lambda)\, p_L R_b + B,$$

or

$$\boxed{(1-\lambda)\,(\Delta p)\, R_b \geq B} \qquad (1)$$

Independent of r_b!

Pledgeable income (for given r_b) :

$$p_H R - \left\{ \lambda r_b + (1-\lambda) p_H \quad \min_{\{R_b \text{ satisfying } IC\}} R_b \right\}$$

$$= p_H \left(R - \frac{B}{\Delta p} \right) - \lambda r_b.$$

Must exceed *I-A* $\Rightarrow r_b$ cannot be too large!

$$\text{NPV} \quad = p_H R - I + \lambda\,(\mu - 1)\, r_b.$$

Case 2: Possibility of strategic exit

Assume p_L=*0 (*or, more generally, small) $\Rightarrow$ wants to exit if shirks.

$$(Ic) \quad \lambda\mu r_b + (1-\lambda)\, p_H R_b \geq [\lambda\mu + 1 - \lambda]\, r_b + B,$$

or

$$\boxed{(1-\lambda)\,(p_H R_b - r_b) \geq B.} \qquad (2)$$

p_L = *0* $\Rightarrow$ (2) is more constraining than (1).

Must also have $\mu r_b \geq p_H R_b$ (3)

Pledgeable income: (for given r_b)

$$p_H R - \min_{\{IC\}} \{\lambda r_b + (1-\lambda)\, p_H R_b\}$$

$$= p_H\left(R - \frac{B}{\Delta p}\right) - R_b < p_H\left(R - \frac{B}{\Delta p}\right) - \lambda r_b$$

when $r_b > 0$. And: $p_H\left[R - \frac{B}{\Delta p}\right] - r_b = I - A$.

Lower pledgeable income, same NPV. *

* for a given r_b. But r_b is smaller!

Benefit from speculative monitoring at date 1.

Signal: good or bad. Good signal has probability q_H or q_L.

Incentive constraint:

$$\lambda q_H \mu r_b + (1-\lambda)\, p_H R_b \geq B + q_L\, [\lambda\mu + 1 - \lambda]\, r_b.$$

Disciplines entrepreneur.

- ✓Same if active monitor as well.
- ✓ In practice
  - – sale to a buyer,
  - – IPO.

VC exit is carefully planned.

- ✓ Reversed pecking-order logic: want risky claim to encourage speculative monitoring.

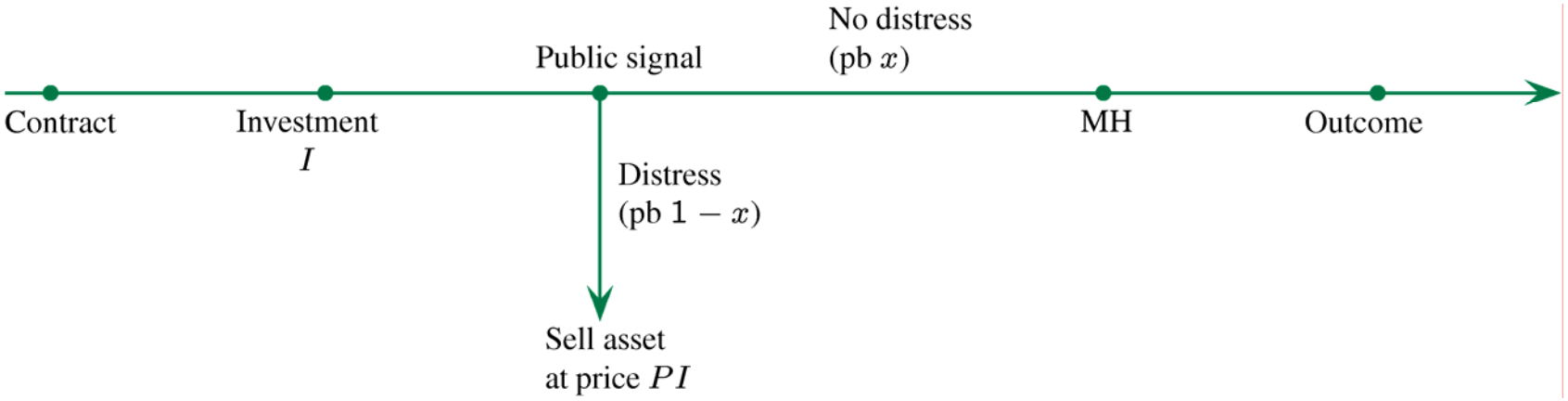
4. COLLATERAL / REDEPLOYABILITY OF ASSETS

✓ *Pledging collateral:*
- increases pledgeable income,
- boosts incentives if state-contingent pledges.

✓ *Cost of collateralization:*
- transaction cost,
- suboptimal maintenance,
- lower value for lender.

✓ *Redeployability of assets boosts debt capacity*

Proper credit analysis:
relevant value of collateral $\neq$ average value:
- low maintenance near distress,
- aggregate shocks.



Assumption: $0 \leq P \leq 1$

Previously: $x = 1$.

- ✓ Positive NPV: $x\rho_1 + (1-x)\,P > 1.$
- ✓ Breakeven condition: $x\rho_0 I + (1-x)\,PI = I - A$

$$I = \frac{A}{1-(1-x)P - x\rho_0}$$

I grows with P.

$$\text{NPV} = \left(x\rho_1 + (1-x)\,P - 1\right)I$$

(grows with P, for two reasons).

5. ENDOGENEIZATION OF P: SHLEIFER-VISHNY (1992)

Idea : P endogenous, depends on existence of other firms able to purchase asset.

Model : 2 firms in industry (do not compete on product market). "Local liquidity": only other firm can buy asset.

Entrepreneur *i :* cash A_i , borrows $I_i - A_i$.

If *j* in distress and i not in distress, *i* (with the help of lender *i*) can buy *j*'s assets.

➡ assets I_1+I_2

potential private benefit $B(I_1 + I_2)$

income in case of success $R(I_1 + I_2)$

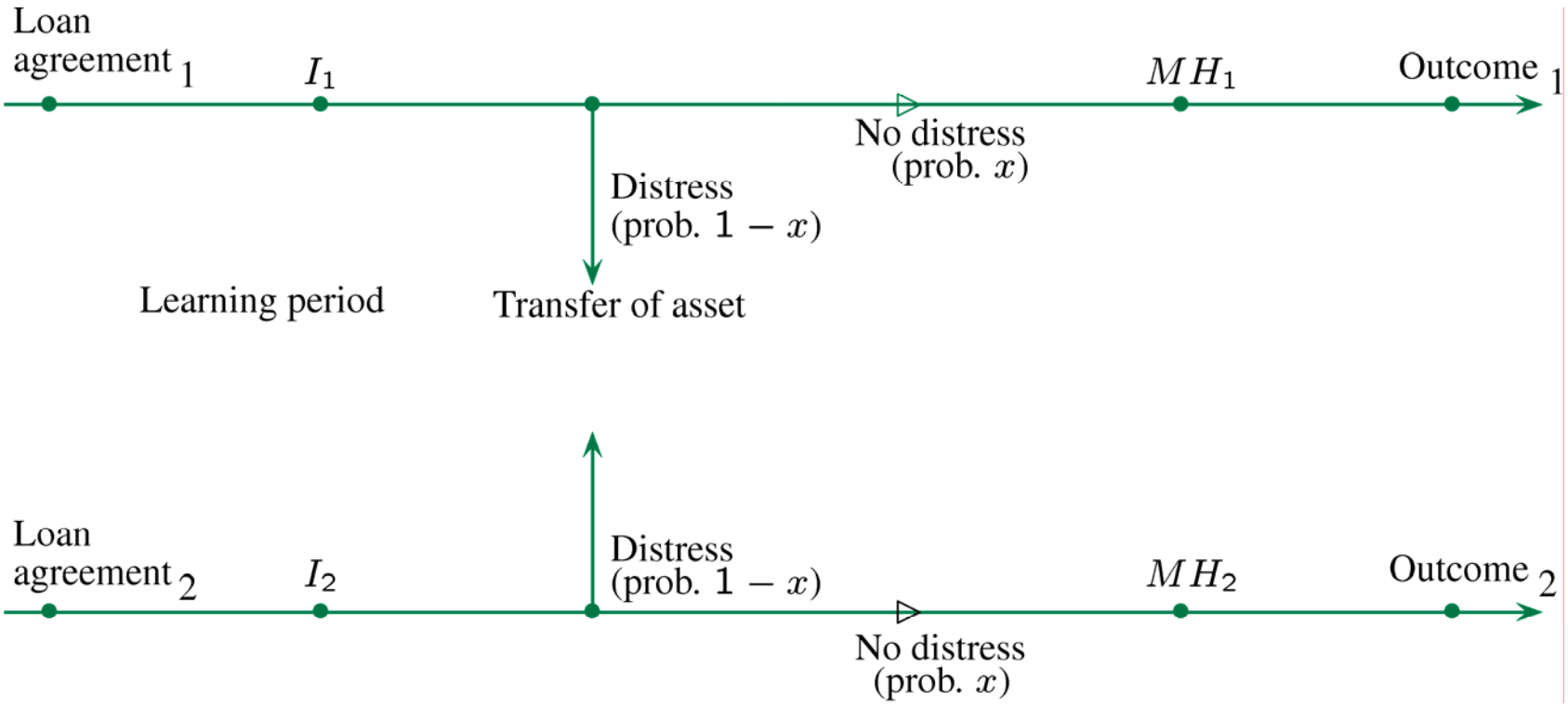
As usual

$$\rho_1 = p_H R > 1 > p_L R + B$$

and

$$\rho_0 = p_H\left(R - \frac{B}{\Delta p}\right) < 1.$$

Lender *i* and entrepreneur *i* sign (secret) loan agreement $\{I_i , R_{bi}\}$,



Conditional probability that firm j is:

		productive	in distress
when firm i is	productive (prob. x)	μ	$1-\mu$
	in distress (prob. $1-x$)	$1-\nu$	ν

LIQUIDATION VALUES

Both firms in distress: no revenue for anyone.

None in distress: standard model.

Firm 1 in distress, firm 2 is not:

Assumption: lender 1 makes take-it-or-leave-it offer to lender 2.

Lender 2 must adjust incentive scheme:

$$(\Delta p) R_{b2} = B I_2$$

becomes

➡ $$(\Delta p) R'_{b2} = B(I_1 + I_2)$$

$$P I_1 = p_H \left(R - \frac{B}{\Delta p} \right) I_1 = \rho_0 I_1$$

Discount since $\rho_0 < 1$.

Extra rent for entrepreneur 2: $p_H \dfrac{B}{\Delta p} I_1 = \big(\rho_1 - \rho_0\big) I_1$.

Entrepreneur's expected utility:

$$U_{b1} = \Big[x\rho_1 - 1\Big]I_1 + x\big(1-\mu\big)\big(\rho_1 - \rho_0\big)I_2$$
$$+\big(1-x\big)\big(1-\nu\big)\rho_0 I_1.$$

$$\boxed{U_{bi} = \alpha I_i + \beta I_j}$$

where $\alpha \equiv x\rho_1 - 1 + (1-x)(1-\nu)\rho_0$

and $\beta \equiv x(1-\mu)\big(\rho_1 - \rho_0\big)$

Debt capacity decreases with correlation between ν shocks.

$$I_i = kA_i \quad \text{where} \quad k = \frac{1}{1 - \rho_0\left[x + (1-x)(1-\nu)\right]}.$$

$I_i \geq 1$ (minimum scale) and $\alpha < 0$

multiple equilibria (complementarity).

Remarks: – decreasing returns,
– product market competition.