Corporate Finance Theory

Lecture 13

IPOs versus Acquisitions (2)
Bayar and Chemmanur (2011)

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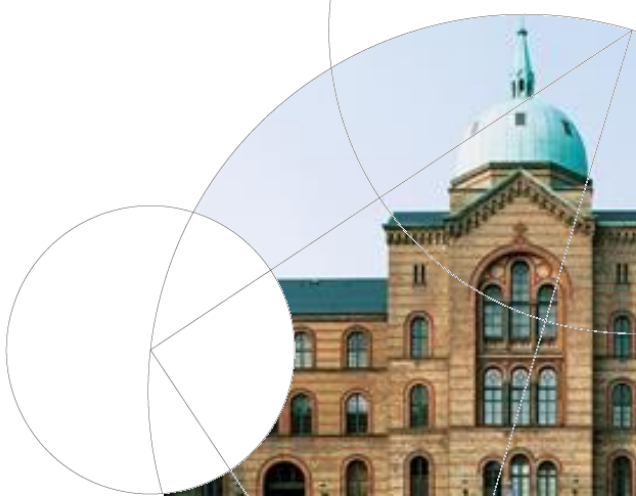


Intended outcomes for the day:

1. **To explain** the IPO valuation premium puzzle (entrepreneurs may opt for acquisitions, even though IPO would lead to higher share price) based on the mechanism of Bayar and Chemmanur (2011).

2. **To graphically represent** the mixed strategy equilibrium of Proposition 1, and to use this representation to carry out comparative statics (Propositions 2 and 3).

3. **To mathematically analyze** how a venture-capitalist veto (i.e. a jointly-controlled firm) affects the equilibrium decision to opt for IPO or acquisition.

4. **To relate** the analysis of Bayar and Chemmanur to Pecking Order Theory

Introduction

Last time, we considered a firm controlled by an entrepreneur, with equity financing from a venture capitalist.

Raise funds to invest in a new project and meet private liquidity needs, either through

1. Initial Public Offering (IPO)
2. Sale to a strategic acquirer

Key elements include

These elements relate to the question, asked in the last lecture

-Asymmetric information: insiders know whether firm/project is strong or weak, but IPO investors do not

-In IPO, Entrepreneur has long-term interest in the firm, retains at least some shares

-Acquisition helps both strong and weak firms in the product market, but helps weak firms to a larger degree

Results so far

IPOs and acquisitions, favored by different types of firms

-Mixed strategy equilibrium, where strong firms have a strictly higher incentive than weak firms to choose IPO. Specifically:

-Strong firms (high-quality project) choose IPO with prob. 1

-Weak firms (low-quality project) choose IPO with prob. β

How can this explain "IPO valuation premium puzzle"?

-Entrepreneurs of weak firms may choose acquisitions, even though IPO would lead to higher share price

-Recall that in equilibrium, weak firms are indifferent between IPO and acquisition.

Equilibrium: entrepreneur-controlled firm

Weak firm randomizes, indifferent between acquisition and IPO

Acquisition: payoff given by

$$(\delta_E \ \rho\ )[p_A V_s + (1 - p_A)V_F]$$

Depends on actual quality

IPO: payoff from substituting γ = I/P into

$$\delta_E (1 - \gamma)\left[\alpha_E P + (1 - \alpha_E)(I + V_q)\right] + B$$

Depends on investor beliefs

where $V_q = V_L = p_L V_s + (1 - p_L)V_F$ for the weak firm

and $P = I + p_{IPO} V_s + (1 - p_{IPO})V_F$

Notice: P > $I + V_L$, since choosing IPO (in equilibrium) sends a positive signal about project strength

-> Payoff from IPO is increasing in α_E.

Equilibrium: entrepreneur-controlled firm

Acquisition: payoff given by

$$(\delta_E \ \rho \ )[p_A V_s + (1 - p_A)V_F]$$

IPO: payoff from substituting γ = I/P into

$$\delta_E (1 - \gamma) [\alpha_E P + (1 - \alpha_E)(I + V_q)] + B$$

->Consider an equilibrium with α_E < 1. These two payoffs are equal for a weak firm, with project value $V_q = V_L$

-Just taking into account the share price P (ie, α_E = 1), an entrepreneur strictly prefers an IPO. **Shares overvalued!**

-> But since α_E < 1, entrepreneur also **takes into account fundamental project value**, lower than the share price.

Weak firms may choose acquisitions. Higher price in IPO (asym. info) but suffer from remaining stake in weak firm.

Equilibrium: entrepreneur-controlled firm

Two equilibrium conditions:

Condition 1. Involves P, but not (directly) Beta. Solve for unique value of P, that satisfies the condition.

1. $(\delta_E\ \rho\ )[p_A V_S + (1-p_A)V_F] = \delta_E(1-\gamma)[\alpha_E P + (1-\alpha_E)(I+V_q)] + B$

where γ = I/P, and $V_q = V_L = [p_L V_S + (1-p_L)V_F]$

Quadratic in P, pins down the equilibrium price, P*

2. $$P = I + Pr(H|IPO)\left[p_H V_S + (1-p_H)V_F\right] + (1-Pr(H|IPO))\left[p_L V_S + (1-p_L)V_F\right]$$

= P*

Condition 2. P = something (function of beta). When beta is high, investors are not willing to pay such a high price (becaues firm is likely weak)

where $\Pr(q = H \mid a = 1) = \dfrac{\theta}{(1-\theta)\beta_E + \theta}$,

Pins down probability β* that a weak firm chooses IPO

Equilibrium: pair (P*, Beta*) that satisfies the above two conditions.

Graphical analysis of equilibrium

View these equalities as two conditions in two unknowns (P and β)

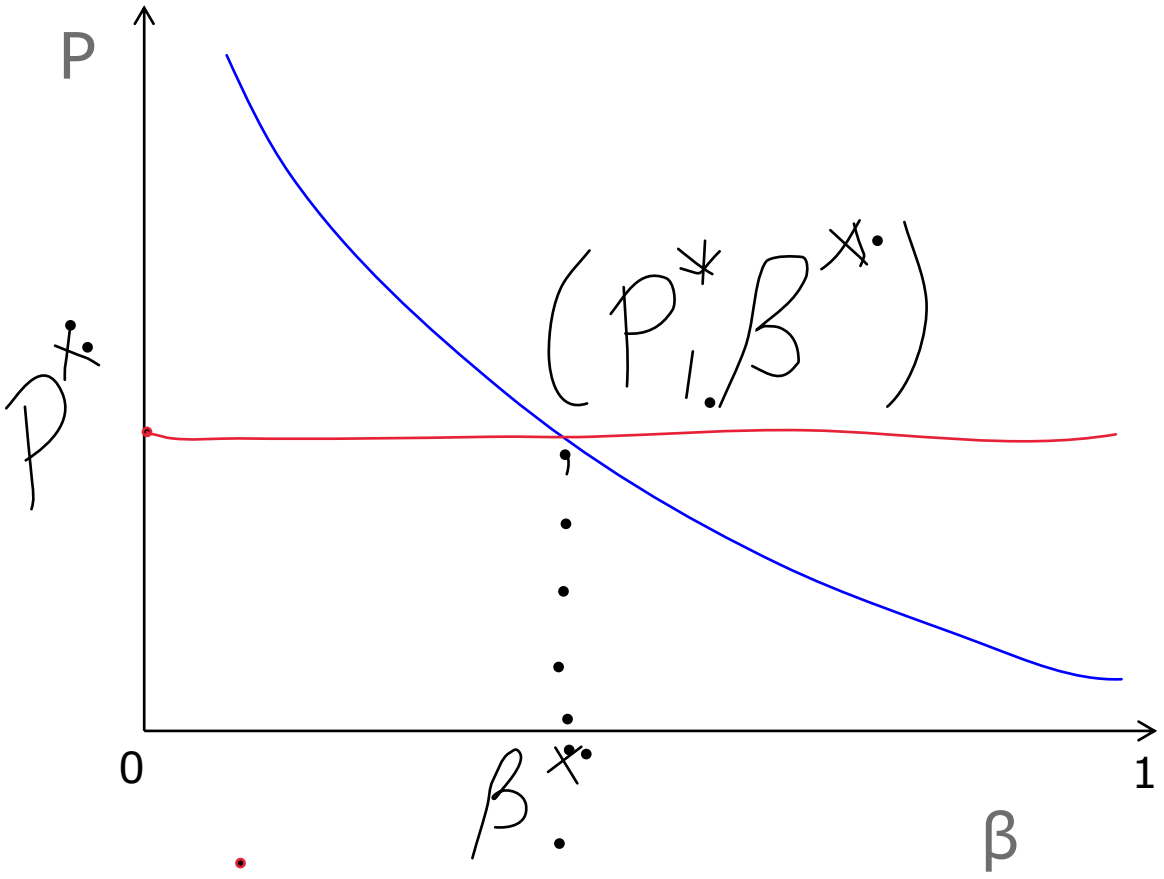
The equilibrium P* and β* are the parameter values that jointly satisfy both equations.

Question: Draw a graph with P on the vertical axis, and β on the horizontal axis. Represent each of the two equalities as a curve on the graph. Where can we see the equilibrium values of P and β?

You can focus on this one

Think about whether the curves should be horizontal, upward sloping, downward sloping.

You can also think about how the slopes depends on α_E, the fraction of shares sold by the entrepreneur (liquidity need)


P
P^*
(P^*, β^*)
0
β^*
1
β

Discussion

For the first condition, P is independent of β.

This yields a horizontal line in (P, β) space, drawn in red.

For the second condition, P is decreasing in β.

This yields a curve with negative slope in (P, β) space, drawn in blue.

The equilibrium P* and β* are the parameter values that jointly satisfy both equations: **the intersection of these two curves**

Comparative statics

Proposition 3 (IPO Price versus Acquisition Price in an Entrepreneur-Controlled Firm)

(i) Let the control benefits of an entrepreneur be not too large such that the following condition holds:

$$\delta_E(1-\alpha_E)(\rho V_A - V_L) \quad > \quad B\left(1+\frac{I}{\rho V_A}\right). \tag{15}$$

Then, the equilibrium IPO price $P_{\text{IPO}}^{E^*}$ is higher than the acquisition price P_{ACQ}.

(ii) The equilibrium IPO price $P_{\text{IPO}}^{E^*}$ is: a) decreasing in the fraction of shares α_E sold by the entrepreneur; b) decreasing in the control benefits B of the entrepreneur; c) increasing in the firm's investment requirement I; d) decreasing in the bargaining power of the acquiring firm, $(1-\rho)$; e) increasing in the type L firm's synergy benefits from an acquisition, $(p_A - p_L)$.

Comparative statics

The following condition determines the equilibrium price

1. $(\delta_E\ \rho\ )[p_A V_S + (1-p_A)V_F] = \quad \delta_E(1-\gamma)[\alpha_E P + (1-\alpha_E)(I+V_q)] + B$

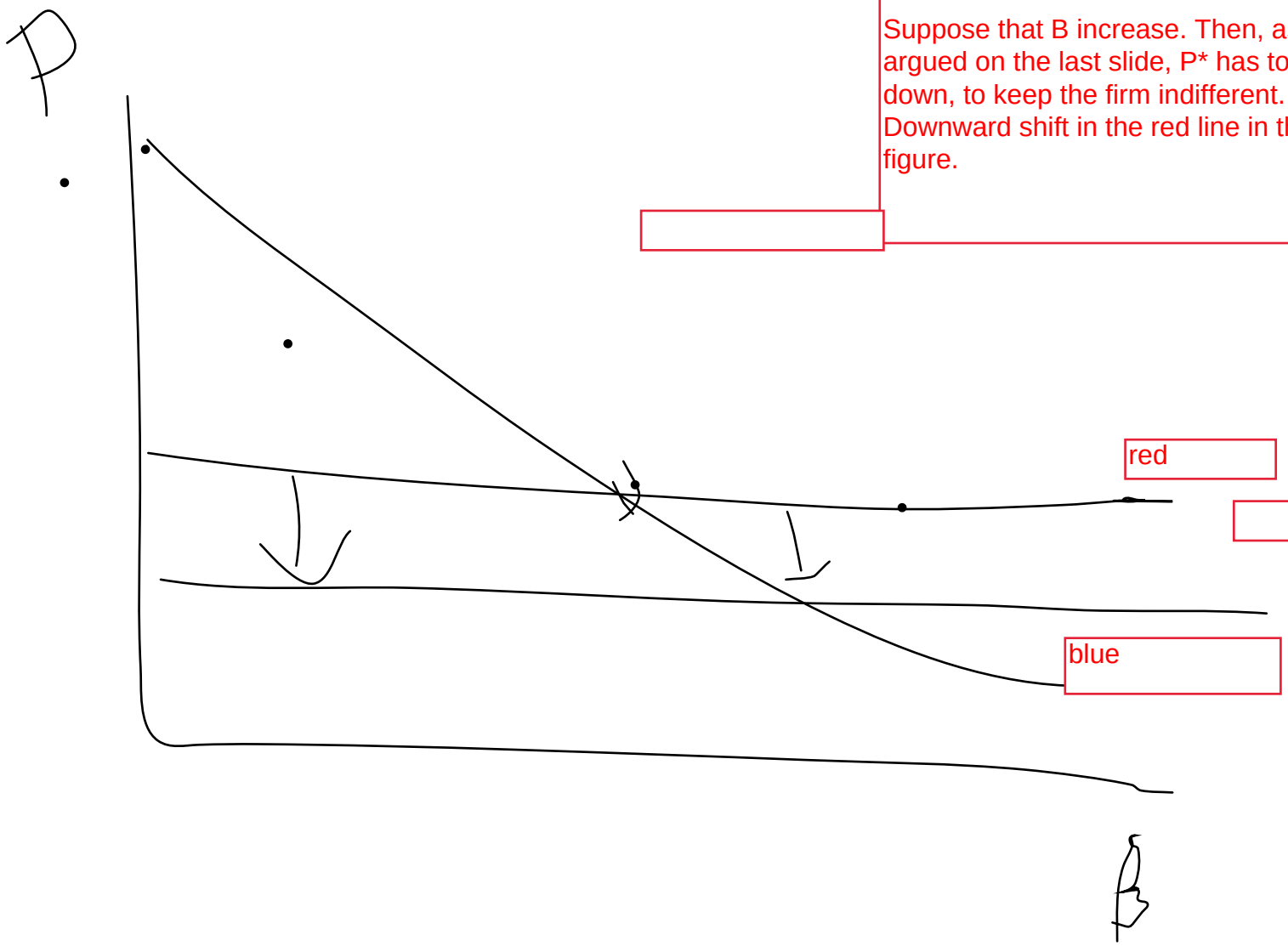
where γ = I/P, and $V_q = V_L = [p_L V_S + (1-p_L)V_F]$

Notice that the right-hand-side is increasing in P.

Mathematically, any change in parameters that **increases the left-hand-side**, or **decreases the right-hand side**, will **increase the equilibrium price**

Graphically, any such change in parameters will shift up the red line in the previous figure.

These include: an decrease in α_E, decrease in B, increase in I, increase in ρ.



Suppose that B increase. Then, as argued on the last slide, P* has to go down, to keep the firm indifferent. Downward shift in the red line in the figure.

Comparative statics

Proposition 2 (Comparative Statics of the Exit Choice between IPOs and Acquisitions in an Entrepreneur-Controlled Firm). The equilibrium probability of going public β_E of an entrepreneur-controlled type L firm is: (a) increasing in the control benefits B of the entrepreneur after the IPO; (b) increasing in the bargaining power of the acquiring firm, $(1-\rho)$; (c) decreasing in the synergy benefits of a type L firm from an acquisition, $(p_A - p_L)$; (d) increasing in the IPO market's prior probability assessment θ of a firm being type H; (e) increasing in the fraction of the shares α_E sold by the entrepreneur in the IPO; and (f) increasing in the investment level I.

Comparative statics

These conditions determine the equilibrium mixing probability

1. $(\delta_E\ \rho\ )[p_A V_S + (1-p_A)V_F] = \delta_E(1-\gamma)[\alpha_E P + (1-\alpha_E)(I+V_q)] + B$

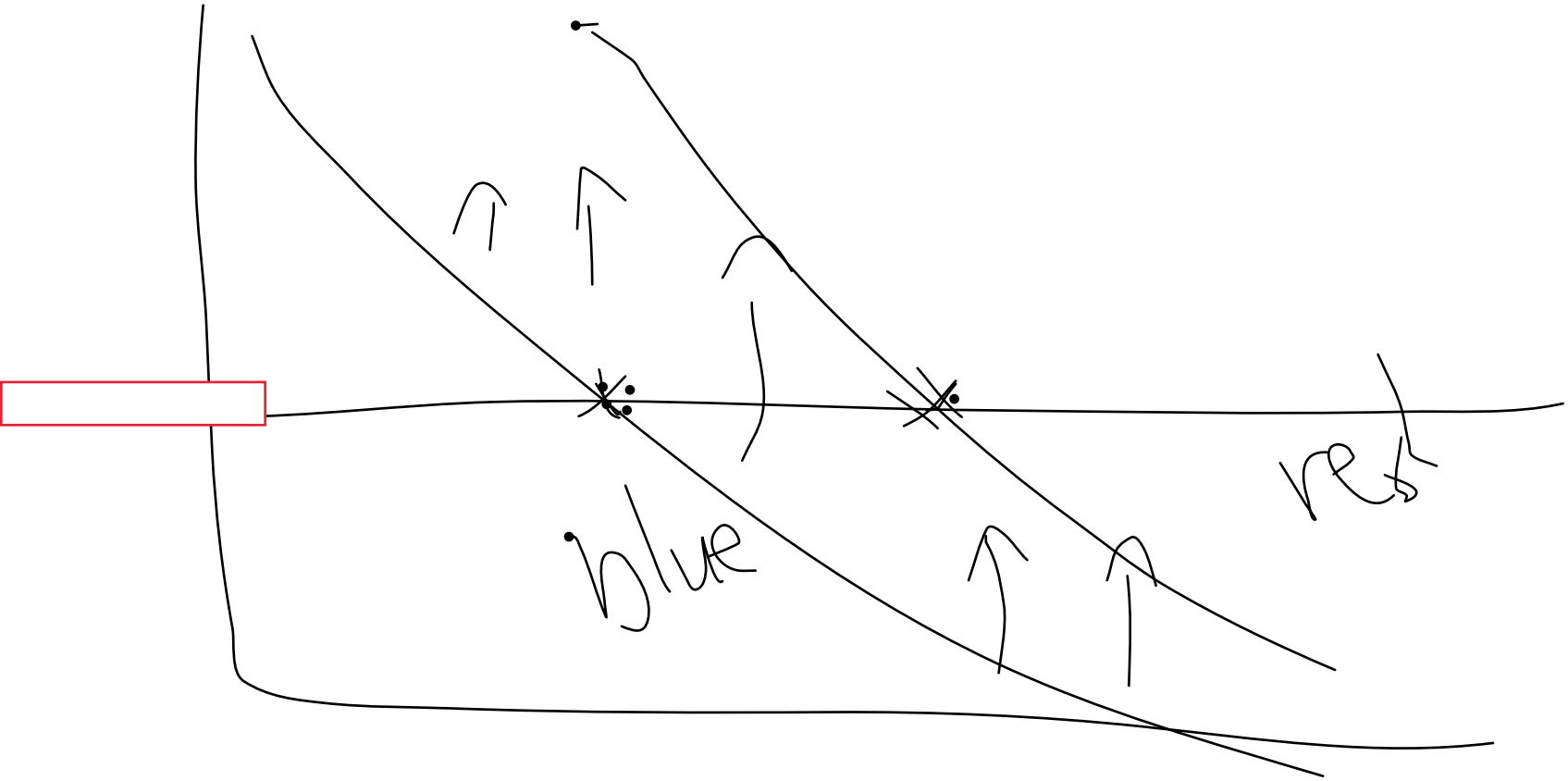
where γ = I/P, and $V_q = V_L = [p_L V_S + (1-p_L)V_F]$

2. $$P = I + Pr(H|IPO)\left[p_H V_S + (1-p_H)V_F\right] + (1-Pr(H|IPO))\left[p_L V_S + (1-p_L)V_F\right]$$

= P*

where $$\Pr(q = H \mid a = 1) = \frac{\theta}{(1-\theta)\beta_E + \theta},$$

Graphically, any change in parameters that shifts up the red line in the previous figure will **decrease the equilibrium probability that weak firms choose IPO, β***



Consider an increase in theta. Prior probability of the firm being high quality.
An increase in theta has no impact on condition 1, red line. Increase in theta will increase investor willingness to pay (more strong firms out there), corresponds to shifting up the blue line drawn earlier.

As shown in the picture, the new intersection points lies directly to the right of the old one. Higher Beta^, ie higher probability of IPO, but no change in the IPO share price.

Comparative statics

Some intuition:

-Suppose a parameter change decreases the payoff to IPO (or increases the payoff to acquisition)

-Then the equilibrium price must increase, so that a **weak firm remains indifferent**

-For the equilibrium price to increase, IPO **investors must be willing to pay this higher price**

-This will be the case if the expected strength of a firm choosing IPO increases – so if weak firms become more likely to choose acquisition.

Equilibrium in jointly-controlled firms

Acquisition (essentially same as for entrepreneur)

$$(\delta_V \ \rho\ )[p_A V_s + (1 - p_A)V_F]$$

IPO (two differences: high liquidity needs, no control benefits)

$$\left[\delta_V(1-\gamma)\left(\alpha_V P^V_{\text{IPO}} + (1-\alpha_V)(I + V_q)\right)\right]$$

No private benefit of control: makes IPO less attractive for a venture capitalist than for an entrepreneur

Higher liquidity need: makes IPO more attractive for a venture capitalist than for an entrepreneur, since shares (in a weak firm) are overvalued: P > I + $[p_L V_s + (1 - p_L)V_F]$

Equilibrium in jointly-controlled firms

Acquisition (essentially same as for entrepreneur)

$$(\delta_V \ \rho\ )[p_A V_s + (1 - p_A)V_F]$$

Assume: VC that veto the entrepreneur's decision (IPO or acquisition).

IPO (two differences: high liquidity needs, no control benefits)

$$\left[\delta_V(1-\gamma)\left(\alpha_V P^V_{\text{IPO}} + (1-\alpha_V)(I+V_q)\right)\right]$$

Entrepreneur is indifferent between acquisition and IPO

Venture capitalist will strictly prefer IPO if and only if his liquidity need is sufficiently high: $\alpha_V > \hat{\alpha}_V > \alpha_E$

Intuition: venture capitalist's extra gain from share overvaluation > entrepreneur's private benefit of control

Equilibrium in jointly-controlled firms

Venture capitalist will strictly prefer IPO if his liquidity need is sufficiently high: $\alpha_V > \hat{\alpha}_V > \alpha_E$

Assume this is the case, and that the venture capitalist can veto the entrepreneur's decision.

In this case, in a mixed-strategy equilibrium where the entrepreneur randomizes, he must compensate the venture capitalist when choosing acquisition (transfer).

Keeping all else constant, this required transfer makes it more attractive for the entrepreneur to choose IPO

Pushes down the equilibrium price, P*

Pushes up the equilibrium mixing probability, β*

Relating to Pecking Order Theory

Last time I asked you:

"Reflect on how the ideas from Bayar and Chemmanur relate to the Pecking order theory, in particular that firms tend to avoid issuing equity because of information asymmetries."

In pairs, discuss how this idea from pecking order theory relates to the main conclusions of the article: that some types of firms will opt for acquisitions, and other types of firms will opt for IPOs.

In particular, what do you expect would happen if α_E (proportion of shares sold by entrepreneur) was endogenous? What α_E would a strong firm choose? What about a weak firm? How would investors react to these different choices of α_E?

Discuss or think about these questions for about 6-7 minutes.

Then please go to : socrative.com, room 897458, and write a short answer.

Discussion

Pecking order theory: firms looking to fund investments tend to avoid issuing equity

Instead use retained earnings, or raise funds by issuing debt.

Information asymmetries: firm may be better informed than investors about earnings prospects, project value, etc.

Firm has an incentive to issue equity when shares are overvalued.

Investors take this into account when they see shares being issued, and interpret offer of new shares as a negative signal

Share price drops

Discussion

The situation is **different in Bayar and Chemmanur**: weak firms tend to opt for acquisitions, not IPOs

Hence, investors interpret IPO as a positive signal: a signal of strength, not of weakness

If a strong firm chooses IPO, incentive to set low α_E

->Share are undervalued, so sell as few as possible.

If a weak firm chooses IPO, incentive to set high α_E

->Shares are overvalued, so sell as many as possible.

But then in equilibrium, investors would interpret high α_E as negative signal, makes IPOs less attractive for weak firm.

We have got around these issues in our analysis, by assuming that liquidity need is exogenous

Intended outcomes revisited

1. To explain the IPO valuation premium puzzle based on the mechanism of Bayar and Chemmanur (2011).

Entrepreneur has long-term interest in the firm. IPO: benefit from higher share price today, suffer from weak performance in product market tomorrow

2. To graphically represent the mixed strategy equilibrium of Proposition 1, and to use this representation to carry out comparative statics

Equilibrium price and mixing probability at intersection of two curves. Any parameter change that shifts one curve will affect this intersection.

3. To mathematically analyze how a venture-capitalist veto (i.e. a jointly-controlled firm) affects the equilibrium decision to opt for IPO or acquisition

If venture capitalist prefers IPO, entrepreneur must make transfer when choosing acquisition; decreases share price, increases probability of IPO

4. To relate the analysis of Bayar and Chemmanur to Pecking Order Theory

Difference here: IPO is signal of strength. But α_E may also be a signal!

For next time

Please read : **Risking Other People's Money: Gambling, Limited Liability, and Optimal Incentives**

In the lectures, we will only consider the one-period model (section 2), so you do not need to focus on the continuous-time analysis (sections 3 and 4)

Please think about the following:

-How does the moral-hazard problem in this paper relates to the model of credit rationing from lectures 1 and 2?

-Why might the optimal contract not provide incentives for manager to choose the efficient project?

Be ready to share your thoughts next time