



Corporate Finance Theory

Lecture 8

A theory of LBO activity ... (1)
Malenko and Malenko (2015)

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Intended outcomes for the day:

1. **To mathematically analyze** how the amount creditors are willing to lend in the framework of Malenko and Malenko (2015) depends on creditor beliefs about repayment.
2. **To describe** the role of sponsor-creditor conflicts in this setting, and comment on whether sponsors are helped or hurt by their ability to take advantage of creditors.
3. **To intuitively explain** the impact of sponsor competition on LBO activity.



Introduction

Leveraged buyouts (LBOs): financial acquisitions, typically financed through large amounts of debt

Private equity firm buys out established company (public to private)

Adding value: **operational improvements** vs. **financing value**.

Theory based on **repeated interactions** (reputation), and shareholder-creditor **conflict of interest** (see Introduction).

Explore link between LBO activity and firm-specific factors (e.g. sponsor skill), economy-wide factors (e.g. interest rate).

For more information on private equity and leverage buyouts:

"Leverage buyouts and private equity" by Kaplan and Strømberg - Journal of Economic Perspectives, 2009.



Model Framework – Simplified Version

Discrete time with infinite horizon: $t = 0, 1, 2, \dots$

Market with **Creditors**, **Targets**, **PE firms ("Sponsors")**,

You can think of creditors here buying a bond that promises to pay D .

But the actual amount they are willing to pay of this bond, "market value" is V .

Creditors: (relatively) passive players in competitive credit markets.

When offered debt of face value D , they are willing to pay market value V

This market value is the amount that creditors expect to be repaid on average. Thus, creditors have a "break-even constraint".

The amount creditors expect to be repaid depends on their beliefs.

- (i) in what situations will they be repaid in full / not repaid in full?
- (ii) how likely are these different situations?
- (iii) if they are not repaid in full, how much will they receive?



Model Framework – Simplified Version

Discrete time with infinite horizon: $t = 0, 1, 2, \dots$

Market with **Creditors**, **Targets**, **PE firms ("Sponsors")**,

Targets: live for one time period, identified with a risky project. Must decide whether to remain independent, and if so how much debt to issue. **Target skill** q_T is the probability of project success if they remain independent.

Sponsors: infinitely lived. Must decide whether to acquired a target, and if successful how much debt to issue. **Sponsor skill** q is the probability of project success if they acquire the target.

Assume: q_T and q are both elements of

$$[\underline{q}, \bar{q}] \subset [0, 1]$$



Timing per Period – Three Phases

Acquisition phase

- Each target is randomly matched with a sponsor
- The sponsor offers price **p**: take-it-or-leave-it offer to acquire the target. The target either accepts the offer or remains independent.

Capital Structure phase

- Sponsor/Target chooses how much debt to issue.
- either issue $\mathbf{D}_L$ to raise market value $\mathbf{V}_L$
- or issue $\mathbf{D}_H$ to raise market value $\mathbf{V}_H$
- assume $\mathbf{D}_H > \mathbf{D}_L$.

In the paper: continuous debt level.
In the slides: assume debt, i.e. the amount borrowed, is either high, D_H , or low, D_L .

$\mathbf{D}_H$ and $\mathbf{D}_L$ are parameters. They reflect the two possible levels of borrowing.

$\mathbf{V}_H$ and $\mathbf{V}_L$ are “equilibrium objects”. They reflect the willing to pay of creditors, for debt of face value $\mathbf{D}_H$ and $\mathbf{D}_L$, given beliefs about repayment.



Timing per Period – Three Phases

Payoff phase (i)

- Project success: $X_G + g(D)$. Project failure: X_B
- Probability of success is given by skill, q_T or q
- $g(D) > 0$ reflects benefits and costs of debt (tax shield, debt overhang)
- Assume high debt is more efficient: $g(D_H) > g(D_L) > 0$

$$x_G > x_B.$$

Here, debt is not necessary to finance the project. Here, debt is purely to generate financial benefits. Captured by $g(D)$.

Assumption: financial benefit, $g(D)$, only exists in case of success.

Payoff phase (ii)

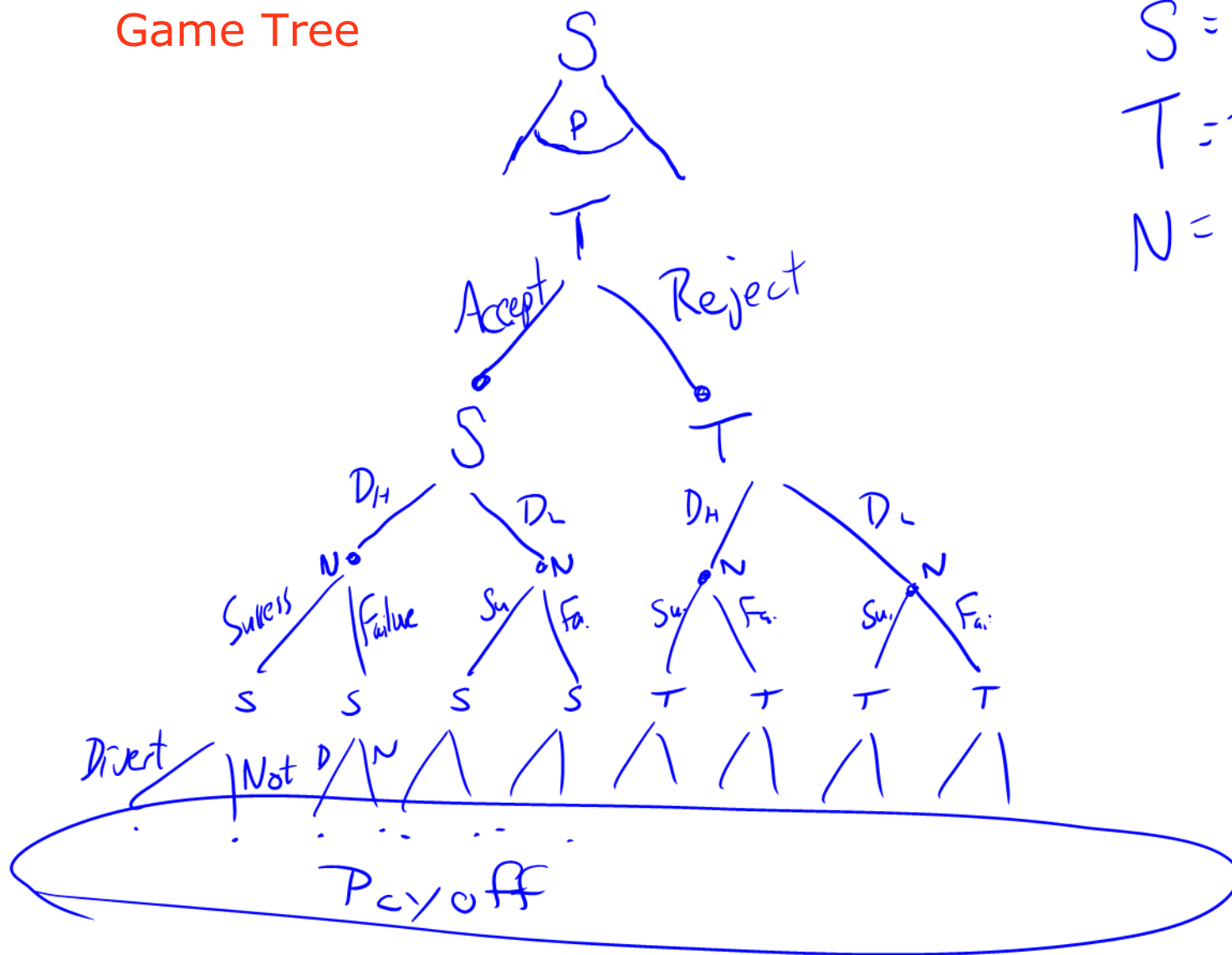
- Sponsor/Target decides whether to **pay creditors** or **divert cash flows** (deadweight loss captured by parameter $\lambda < 1$)

We can draw a game tree, to describe the game in extensive form.

Payoffs depend on amount of debt issued, D , amount of funding raised, V , whether the projects succeeds, and whether cash is diverted.



Game Tree



S = Sponsor
T = Target
N = Nature



Payoffs – sponsor acquires target, issues debt D

Suppose project succeeds. Then

Below, I write "target". But really I mean the sponsor who acquired the target, given acquisition at price p .

No diverting:

Creditor payoff: $-V + D$. Target payoff: $X_G + g(D) + V - D - p$

Divert cash:

Creditor payoff: $-V$. Target payoff: $\lambda(X_G + g(D)) + V - p$

$\lambda < 1$

Suppose project fails.

Cost of diverting cash: $(1 - \lambda) \text{Cash Flow}$.
This cost is larger after project success.

Benefit of diverting cash: just the debt level D .
This benefit is larger when you have high debt.

No diverting:

Creditor payoff: $-V + D$. Target payoff: $X_B + V - D - p$

Divert cash:

Creditor payoff: $-V$. Target payoff: $\lambda X_B + V - p$



Conflict of Interest

Just like in Admati et al. (2018), there is a **conflict between shareholders and creditors**. Modeled simply as shareholder ability to **divert cash flows**.

Focus on a candidate equilibrium with the following on the equilibrium path:

- Given debt $\mathbf{D}_L$, sponsor will not divert cash
- Given debt $\mathbf{D}_H$, sponsor will divert cash when the project fails, but not when it succeeds.

Assume sponsor skill q

Question 1: if the sponsor issues debt $\mathbf{D}_L$, what do creditors believe about the probability of repayment? How much funding $\mathbf{V}_L$ is the sponsor able to raise?

Question 2: if the sponsor issues debt $\mathbf{D}_H$, what do creditors believe about the probability of repayment? How much funding $\mathbf{V}_H$ is the sponsor able to raise?



Conflict of Interest

Focus on a candidate equilibrium with the following on the equilibrium path:

- Given debt $\mathbf{D}_L$, sponsor will not divert cash
- Given debt $\mathbf{D}_H$, sponsor will divert cash when the project fails, but not when it succeeds.

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Question 1: if the sponsor issues debt $\mathbf{D}_L$, what do creditors believe about the probability of repayment? How much funding $\mathbf{V}_L$ is the sponsor able to raise?

Question 2: if the sponsor issues debt $\mathbf{D}_H$, what do creditors believe about the probability of repayment? How much funding $\mathbf{V}_H$ is the sponsor able to raise?

Activity: discuss in groups how to calculate the value of $\mathbf{V}_L$ and $\mathbf{V}_H$, then calculate these values.



Borrow: D_L ; Creditors repaid: $q D_L + (1-q) D_L = V_L$

$$\Rightarrow \boxed{V_L = D_L}$$

Borrow: D_H ; Creditors repaid: $q D_H + (1-q) \overset{\text{divert}}{\underset{\text{Failure.}}{(0)}} = V_H$

$$\Rightarrow \boxed{V_H = q D_H}$$

Plug these values of
 (V_L, D_L) , and (V_H, D_H)
 into expressions / payoff
 on slide 10 $\rightarrow$ give sponsor
payoff

"higher interest
 rate".

Creditors break
 even on expectation



Equilibrium expected payoffs, different debt levels

Issue D_H .

$\lambda < 1$.

Sponsor expected payoff: $q(X_G + g(D_H)) + (1-q)\lambda X_B - p$

Creditor expected payoff: $0 = gD_H - V_H = gD_H - gD = 0$



Creditors charge an interest rate such that they break even on average.

Issue D_L .

Sponsor expected payoff: $q(X_G + g(D_L)) + (1-q)X_B - p$

Creditor expected payoff: $0 = gD_L + (1-g)D_L - V_L = D_L - D_L = 0$.

Point 1: sponsors captures all expected surplus. Full NPV of the project because creditors break even on average.

Point 2: sponsor expected payoff on this slide is just the project NPV. In the first case, with high debt, and cash diverted after success. In the second case, with low debt, and cash never diverted.





Question: Conflict of Interest

Answer A. Okay but not great. Indeed, sponsors are helped ex post. They divert cash, get a benefit. But creditors break even on average. So any benefit ex post from diverting cash is "eaten up" ex ante by the higher interest rate creditors would charge.

Answers B and C are best. I vote for C, but we'll get to that now.

"In this setting, are Private Equity Firms ("sponsors" who carry out leveraged buyouts) helped or hurt by their ability to exploit creditors? Be ready to share your thoughts next time."

The question also applies to target firms that remain independent

Think about this question, given what we have seen so far this lecture. Then go to socrative.com, room 897458, and choose that you think is the best answer.

- A. Sponsors are **helped**: enjoy monetary benefit from diverting cash flows
- B. Sponsors are **hurt**: lowers the price they obtain when issuing debt.
- C. Sponsors are **hurt**: lowers the amount of debt that they choose to issue
- D. Sponsors are **neither helped nor hurt**: cash flows are never diverted in equilibrium, so there is no impact on payoffs
- E. None of the above/ Different answer

Note: "lowers the price they obtain when issuing debt" really is equivalent to saying "pushes up the interest rate at which they borrow"



Single-deal: Stand-alone firm (independent)

Stand alone firm.
No acquisition.
Skill level = prob. of success = q_T

1) Issue high debt D_H . Divert cash after project failure but not after success.

$$V(D_H, q_T) = q_T(X_G + g(D_H)) + (1 - q_T)\lambda X_B$$

2) Issue low debt D_L . Never divert cash.

$$V(D_L, q_T) = q_T(X_G + g(D_L)) + (1 - q_T)(X_B)$$

Assume: $2) > 1)$ for all possible values of q_T , q in $[\underline{q}, \bar{q}]$. This amounts to assuming that $\bar{q}$ is “not too large”.



Single-deal: Acquisition by Sponsor

Just like slide 18.
But skill = prob. of success = q .

1) Issue debt D_H . Divert cash flows after project failure but not after success.

$$V(D_H, q) = q(X_G + g(D_H)) + (1-q)\lambda X_B$$

2) Issue low debt D_L . Never divert cash flows.

$$V(D_L, q) : q(X_G + g(D_L)) + (1-q)(X_B)$$

Notice that q_T has been replaced by q !

The expressions above do not include the price p that the sponsor pays in order to acquire the target



Question: Acquisition by Sponsor

Recall that the sponsor makes a take-it-or-leave-it offer to acquire the target (Acquisition phase) before the decision on how much debt to issue is made (Capital Structure phase). **How much** will the Sponsor offer to acquire the target? What condition must hold for the target to accept the offer?

Answer:

Value from the sponsor making the acquisition:
 $V(D_L, q)$ where q denotes sponsor skill. See the last slide!

Offer $\min[V(D_L, q_T), V(D_L, q)]$. Accepted if $q > q_T$

standalone value of the target.

Thus, when an acquisition takes place, it does so at price $\mathbf{p = V(D_L, q_T)}$

When do acquisitions take place:
 $V(D_L, q) > V(D_L, q_T)$

$$q > q_T$$

Single-deal: Discussion

i.e. $q > q_T$
 ↑ "sponsor skill" "target skill."

Leveraged buyouts only occur if they provide operational benefits; they provide no financing benefits

Related to sponsor skill level (probability of project success)

Contrast with quote from footnote 1: "Private equity is nothing more than incredibly brilliant financial engineering".

Two related channels for commitment problems

-Equilibrium price of debt

-Equilibrium amount of debt that is issued

(interest rate r , given high debt)
 (equilibrium amount borrow ↓,
 i.e. it is slow
 D_t)

Ex post, shareholder actions are efficient!

Ex ante, shareholder actions are inefficient!

This is the case whether or not an acquisition takes place



Single-deal with competition

→ see this on Frickey.

Now assume two types of sponsors in the market, high and low skilled

Denote low skill level by q , same as in earlier slides. Denote high skill level by q_H , with $q_H > q$ and $q_H > q_T$

Fraction of high-skilled sponsors is α , fraction of low-skilled sponsors is $1 - \alpha$

For the acquisition phase, compare two scenarios:

"No competition" As before, each target is randomly matched with a sponsor. Sponsor makes a take-it-or-leave-it offer, and target decides whether to accept

"Competition" Each target is randomly matched with two sponsors. Sponsors bid for the target in an open ascending auction, which ends when one sponsor drops out of the bidding. The remaining sponsor then makes a take-it-or-leave-it offer (equal to his final auction bid) and the target decides whether to accept.



Question: Single-deal with competition

How will competition between sponsors should affect LBO activity in this market? Specifically, **what** will be the difference between the “Competition” and “No Competition” scenarios, and **why**?

Specific points to consider:

- Will competition lead to more or fewer acquisitions?
- Will competition lead to higher or lower acquisition prices?
- Will competition lead to more or less value being created?



Single-deal with competition: $q_H > q > q_T$

No competition

Prob. $1 - \alpha$: match with low-skill sponsor. Offer of $V(q_T, D_L)$, accepted

Prob. α : match with high-skill sponsor. Offer of $V(q_T, D_L)$, accepted

Competition

Prob. $(1 - \alpha)^2$: match with two low-skill sponsors. Offer is $V(q, D_L)$, accepted

Prob. $2\alpha(1 - \alpha)$: match with low- and high-skill. Offer is $V(q, D_L)$, accepted

Prob. α^2 : match with two high-skill sponsors. Offer is $V(q_H, D_L)$, accepted

Number of acquisitions: **UNCHANGED**

Acquisition price: **INCREASE**

Value created: **INCREASE**



Intended outcomes for the day:

1. **To mathematically analyze** how the amount creditors are willing to lend in the framework of Malenko and Malenko (2015) depends on creditor beliefs about repayment. **The less likely creditors expect to be repaid, the less they are willing to lend (for debt of a given face value D). Moreover, issuing high debt D can actually affect beliefs about repayment.**
2. **To describe** the role of sponsor-creditor conflicts in this setting, and comment on whether sponsors are helped or hurt by their ability to take advantage of creditors. **The sponsor – independent firm can take advantage of creditors by diverting cash. In equilibrium, this leads not to cash being diverted, but rather to inefficiently low debt levels. The sponsor – independent firm is hurt.**
3. **To intuitively explain** the impact of sponsor competition on LBO activity. **So far: competition can lead to higher acquisition prices, more value created, all due to operational benefits (note: we return to this next time)**

→ on Friday.



For next time

1. Take a second look at the sections of Malenko and Malenko (2015) that you previously read, in the light of the material covered in today's lecture.
2. Read through the slides for Lecture 9 with a particular focus on the following: will increased competition between sponsors result in more value, or less value, being created by LBOs?
3. Read the two articles from Reuters and Bloomberg, in the folder / module for "Lecture 9", regarding the recent \$590 million settlement of a lawsuit alleging collusion in LBOs. Think about the following question: which insights, if any, from Malenko and Malenko (2015) can help shed light on this lawsuit and the impact of the alleged collusion? Why?



Practical points:

1. The obligatory assignment is now available on Absalon.
2. The lecture planned for Friday October 13 will take place online, using Zoom.

The Zoom link and password will be posted in the module with the lecture slides.

