Corporate Finance Theory

Lecture 16

The Commitment Role of Equity Financing

Fahn et al. (2019)

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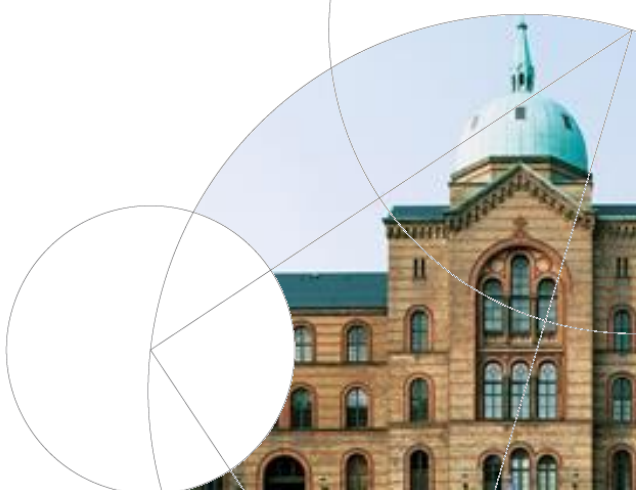


Intended outcomes for the day:

1. To describe what is the key market friction in Fahn et al. (2019), by which debt levels affect firm value

2. To mathematically analyze optimal contracting in a static setting (corresponding to Lemmas 1 and 2)

3. To discuss the role of commitment problems and bankruptcy costs

Introduction

Trade-off theory of capital structure.

Balance between:

-Benefits of debt (in particular, tax benefits)
-Costs of debt (in particular, agency costs)

"*However, the empirical case for the classical tradeoff theory is not too strong. It rather seems that actual debt levels are much lower than predicted, and firms with potentially low costs of financial distress seem to be substantially underleveraged*" Fahn et al. p.1237.

Puzzle: why not increase debt, take better advantage of tax benefits?

Introduction

Idea of this paper

Additional agency cost: related to Creditor-Owner-Employee relationships

Effectively two potential conflicts: Creditor-Owner and Owner-Employee

Possible way to explain the puzzle

- Firms are choosing the optimal capital structure
- But debt levels appear too low, because analysts are failing to take into account this additional cost.

Anecdotal evidence that debt levels are particularly low for firms with strong commitment to workforce.

Lincoln Electric

High workplace morale -> can relate to motivating workers.

Low debt levels.

Link to so-called "relational contracting" (in a dynamic setting)

Question

In Fahn et al. (2019), firm value can depend on capital structure (debt level). We know from Modigliani-Miller that this result must be due to market frictions.

Which friction in Fahn et al. is most important for generating this result?

A) Positive bankruptcy costs
B) Commitment vis-à-vis agent: principal cannot commit to pay the agent the bonus specified under the contract, after the agent performs well (i.e. performance is non verifiable)
C) Commitment vis-à-vis creditors: principal cannot commit to creditors that it will offer the agent a particular contract, or to reveal to creditors whether it paid a particular bonus (i.e. contract and payments are unobservable to creditors)
D) A) and B) are equally (most) important
E) A) and C) are equally (most) important

C is the most popular answer. Followed by D.

Please discuss in pairs. Then go to m.socrative.com, room 897458, and vote for the **best** answer.

Static model

Three players: Creditors, Principal, Agent

Formally, we are going to allow for the possibility that D > K.

Perhaps not particularly realistic.

Principal has project, requires total investment K > 0

Borrows D from creditors, uses equity K-D

Principl = Owner issues debt D and uses own cash K - D to finance the project.

Competitive credit markets: promise to repay D(1+r), where interest rate ensures that creditors break even in expectation.

r is the net interest rate

Start of period

After borrowing D, Principal offers contract (w, b) to Agent:

- w is a fixed wage
- b is a promised bonus for high performance

Static model (continued)

Agent decides whether to accept contract (w, b).

If **rejected**, project is liquidated (see below). If **accepted**, Agent receives w and chooses effort $e \in \{0,1\}$.

f(0) > 0

Low effort, $e = 0$: zero cost, value $f(0) + K$ (low performance)

High effort, $e = 1$: cost $c > 0$, value $f(1) + K > f(0) + K + c$ (high performance)

Assume f(1) > f(0). Moreover, high effort is efficient, even taking into account the cost c.

Principal observe performance (equivalently effort), chooses whether to pay b.

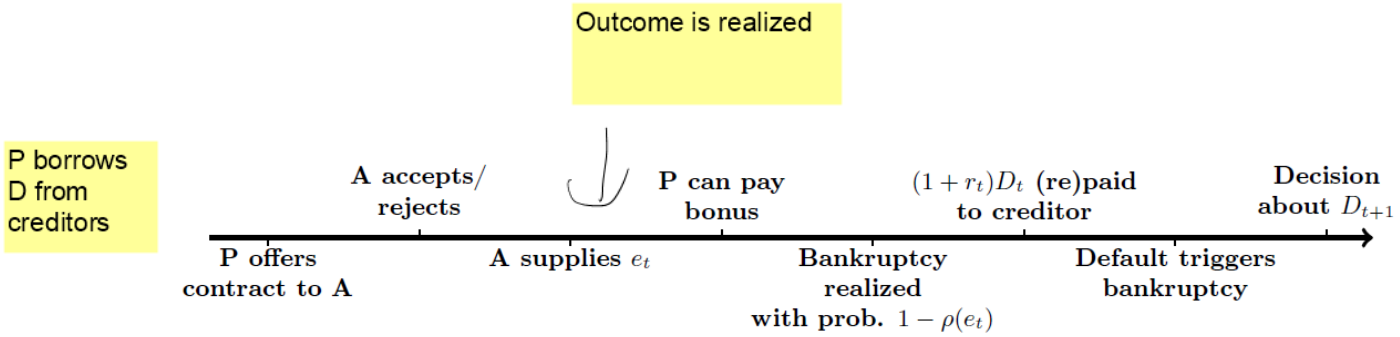
If effort was low, then shock occurs with probability $1 - \rho$, project liquidated

Shock -> destroys capital $(1 - \gamma)K > 0$, creditors repaid $\min\big(\gamma K, D(1 + r)\big)$

No Shock -> no capital destroyed, creditors repaid $D(1 + r)$

Shock: destroy captial, where 1 - gamma is a measure of the deadweight loss.

Static model (continued)



Limited liability

Agent: If agent rejects contract, takes outside option $\bar{u}$ (small)

u upperbar > 0 (may be small).

-> Can think of both wage and bonus in (w, b) being non-negative

Principal:

-> After shock, creditors can reclaim at most remaining capital, γK.

Baseline – Static, no contracting frictions

Principal **commits to creditors** to offer agent contract $(b\ ,\ w)$ (observability); **commits to agent** to pay b after high performance (verifiability)

Then contract $(b = c\ ,\ w = \bar{u})$ is optimal: leads agent to accept and exert high effort, at the lowest possible cost.

Participation constraint: $w + b\ - c \geq \bar{u}$. Incentive constraint: $w + b\ - c \geq w$

Leaves agent indifferent between high effort, low effort, and non-participation.

Principal's expected payoff, given debt D, contract $(b = c\ ,\ w = \bar{u})$:

Payment to agent

$$\pi_H = -(K - D) + f(1) - c - \bar{u} - (1 + r)D + K$$

cash in project; output; Pay creditors; output

$$= f(1) - c - \bar{u}$$

Thus, the principal (owner) captures all surplus. Increased value generated by the project (net of the wage to the agent).

since creditor break-even constraint implies r = 0.

Efficient outcome, value does not depend on γ or D.

Static, no commitment to agent

Principal **commits to creditors** to offer agent contract $(b\ ,\ w)$ (observability); **cannot commit to agent** to pay b after high performance (non-verifiability)

Then contract $(b = c\ ,\ w = \bar{u})$ cannot implement high effort. Agent realizes that Principal will later renege, i.e. not pay the promised bonus.

The same reasoning shows that no contract can implement high effort.

Optimal contract: $(b = 0\ ,\ w = \bar{u})$, implements low effort.

Participation constraint: $w \geq \bar{u}$; agent indifferent with non-participation.

Principal's expected payoff, given debt D, contract $(b = 0,\ w = \bar{u})$:

$$\pi = -(K - D) + f(0) - \bar{u} + \rho[K - (1 + r)D] + (1 - \rho)[\gamma K - \min[(1 + r)D, \gamma K]]$$

Cash in | Output | Wage | "No shock" / Payment to creditors | "Shock" / Payment to creditors (and capital).

Static, no commitment to agent (cont.)

Principal's expected payoff, given debt D, contract $(b = 0, w = \bar{u})$:

$$\pi = -(K - D) + f(0) - \bar{u} + \rho[K - (1 + r)D] + (1 - \rho)[\gamma K - \min[(1 + r)D, \gamma K]]$$

Problem now is that low effort can lead to a shock, liquidation.

D < gamma K , creditors are confident in full repayment, even after a shock

If creditors always expect to be repaid in full, then r = 0. These expectations are confirmed if $D \leq \gamma K$, so if creditors are fully repaid even in liquidation.

Take the expresion for profits above, and plug in r = 0, D < gamma K

Simplify to the expression below, written in green

Case 1: $D \leq \gamma K$.

$$\pi_L = -(K - D) + f(0) - \bar{u} + \rho[K - D] + (1 - \rho)[-D + \gamma K]$$

$$= f(0) - \bar{u} - K(1 - \rho)(1 - \gamma)$$

Inefficient outcome, value depends on γ but not on D.

Owner captures all surplus: f(0), i.e. what the project generates, minus the wage to the agent, minus the expected loss in capital stock due to a shock.

Static, no commitment to agent (cont.)

Principal's expected payoff, given debt D, contract $(b = 0, w = \bar{u})$:

$$\pi = -(K - D) + f(0) - \bar{u} + \rho[K - (1 + r)D] + (1 - \rho)[\gamma K - \min[-(1 + r)D, \gamma K]]$$

Problem now is that low effort can lead to a shock, liquidation.

Case 2: creditors are not fully repaid in liquidation, $D > \gamma K$.

Debt is relatively high Creditors cannot expect full repayment after a shcok.

$$\pi = -(K - D) + f(0) - \bar{u} + \rho[K - (1 + r)D\,] + (1 - \rho)[\gamma K - \gamma K] \quad ->$$

$$\pi = -(K - D) + f(0) - \bar{u} + \rho[K - (1 + r)D\,]$$

Creditor break even constraint: $\rho(1 + r)D + (1 - \rho)\gamma K = D$ implies:

$$= f(0) - \bar{u} - K(1 - \rho)(1 - \gamma)$$

Use the break even constraint to solve for r.
Then plug r into the expression for owner profits. Then simplify to get the expression in green

Inefficient outcome, value depends on γ but not on D.

Conclusion is the same as in Case 1, owner captures all surplus.

The story so far

In this setting:

- Bankruptcy costs (taken in isolation) do not affect value
- Loss in value due to contracting frictions: specifically, Principal's inability to commit to bonus payments.

Bankruptcy costs reduce value when combined with this contracting friction

No commitment to bonus -> low effort -> possibility of bankruptcy - > strictly positive expected bankruptcy costs

But so far, debt does not affect firm value ('Modigliani-Miller-type irrelevance result') Curious, given the presence of bankruptcy costs.

Question: in pairs, discuss why high debt does not reduce firm value (as seen so far), despite the presence of positive bankruptcy costs. What is the intuition for this result?

Discussion

- In most settings, high debt increases the probability of bankruptcy
- Why? Bankruptcy occurs when the repayment obligations (i.e. debt level) exceeds realized cash flow.
- Thus, if bankruptcy is costly, then high debt increases expected costs.
- Difference in Fahn et al. is that bankruptcy is related to effort/performance, but not directly to debt.
- Shock leaves firm unable to continue (for some reason that is not explicitly modeled). Forced to liquidate, even in the case of zero debt. Realistic?
- Advantage: when Fahn et al. show capital structure matters, we will know this is caused by agency problems, unrelated to bankruptcy costs.

Static – no commitment to creditors

Principal **cannot commit to creditors** to offer agent particular contract (non-observability). But given contract $(b\ ,\ w)$ actually offered, **commits to agent** to pay b after high performance (verifiability)

This contract would implement high effort (as we saw earlier in the slides).

Suppose creditors believe $(b = c\ ,\ w = \bar{u})$ will be offered, expect high effort, so that r = 0. Does the principal have an incentive to actually offer this contract?

Principal's expected payoff, given D, contract $(b = c\ ,\ w = \bar{u})$: see slide 9

$$\pi_H = f(1) - c - \bar{u}$$

Principal's expected payoff, given $\mathrm{D} \leq \gamma K$, contract $(b = 0\ w = \bar{u})$: see slide 11

$$\pi_L = -K + f(0) - \bar{u} + \rho K + (1-\rho)\gamma K = f(0) - \bar{u} - K(1-\rho)(1-\gamma)$$
$$< \pi_H$$

Conclusion: principal has an incentive to implement high effort

These are all expressions we have seen so far.

pi_H > pi_L, since high effort generates more surplus, which is then captured by the owner/principal

Static – no commitment to creditors (cont)

Principal's expected payoff, given debt D, contract $(b = c\ ,\ w = \bar{u})$:

$$\pi_H = f(1) - c - \bar{u}$$

Principal's expected payoff, given debt $D > \gamma K$, contract $(b = 0\ w = \bar{u})$:

$$\pi_L = -(K - D) + f(0) - \bar{u} + \rho[-(1 + r)D\ + K] + (1 - \rho)(0)$$

shock

different

Plug in r = 0 and simplify

$$\pi_L(D) = -K + f(0) - \bar{u} + \rho K + (1 - \rho)\ D$$

Owner payoff is increasing in D
Why? Creditors are making losses lend D to the firm, but get repaid less than D on average.

Depends on D. By $D > \gamma K$, strictly larger than π_L, given on previous slide:

$$\pi_L = -K + f(0) - \bar{u} + \rho K + (1 - \rho)\gamma K$$

Static – no commitment to creditors (cont)

This inequality: when creditors expect high effort, then the owner has an incentive to actually implement high effort inside the firm (i.e. equilibrium effort is high!)

If the inequality is violated, then equilibrium effort cannot be high. Instead it will be low.

Principal will implement high effort if $\pi_H \geq \pi_L(D)$

$$f(1) - c - \bar{u} \geq -K + f(0) - \bar{u} + \rho K + (1-\rho)\, D$$

$$(1-\rho)(D - \gamma K) \leq \big(f(1) - c - f(0)\big) + (1-\rho)(1-\gamma)K$$

RHS: efficiency loss, associated with low effort. LHS: costs passed on to the creditors.

i.e. when efficiency loss from low effort exceeds the extra costs passed on to creditors.

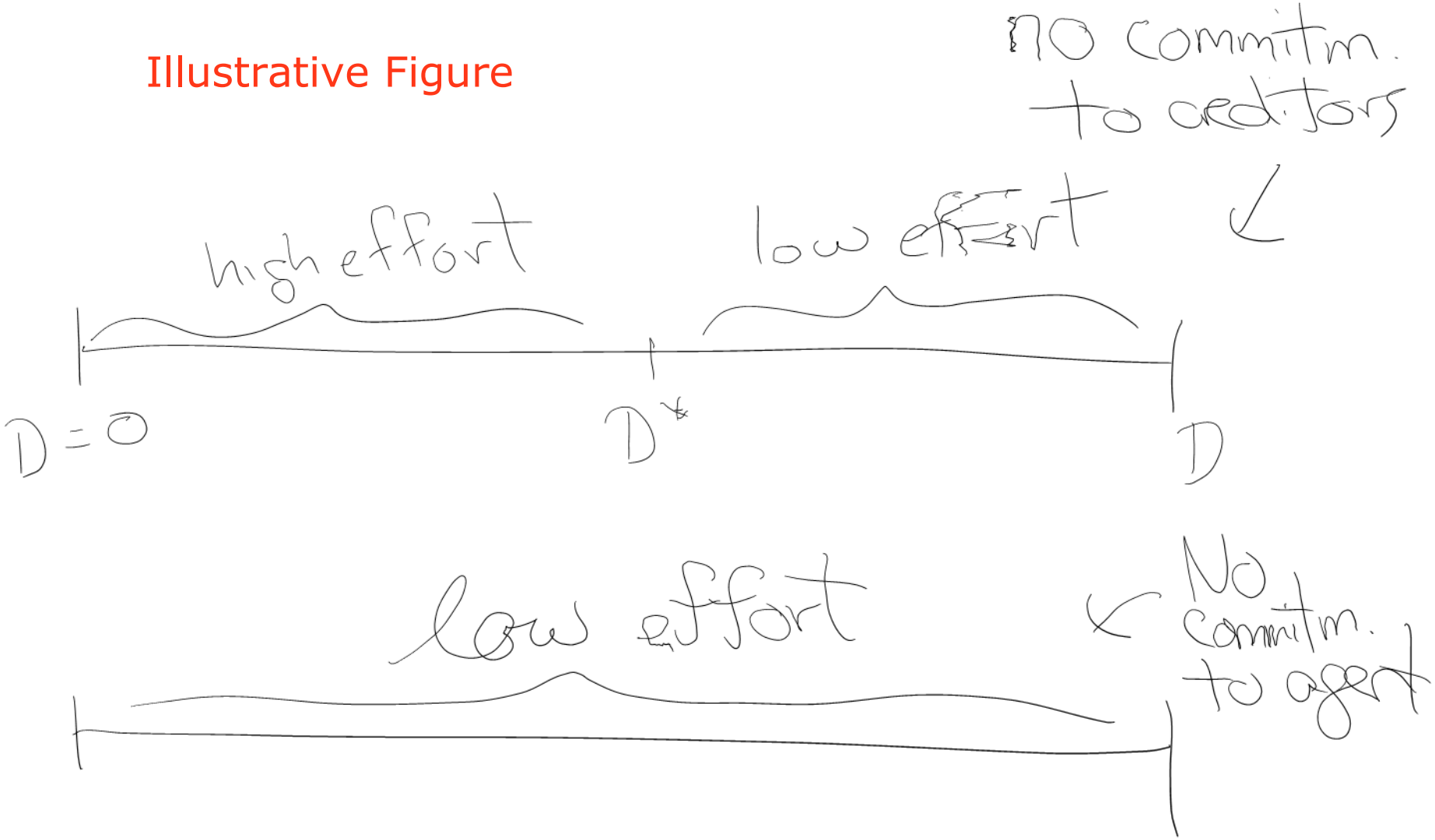
Condition violated when debt exceeds a threshold value, defined by $\pi_H = \pi_L(D^*)$

Conclusion: when D>D*, principal has an incentive to implement low effort

Creditors realize this and charge r > 0, taking into account possible liquidation

Value depends on D – capital structure matters!

Illustrative Figure



Question (revisited)

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Could also be argued before, because default / deadweight loss costs matter as well.

Please discuss in pairs. Then go to m.socrative.com, room 897458, and vote for the **best** answer.

Question (revisited)

Intended outcomes revisited

1. To describe what is the key market friction in Fahn et al. (2019), by which debt levels affect firm value

In this setting, bankruptcy costs do not create a relationship between debt and firm value. Contracting frictions matter: in particular, principal's inability to commit to creditors how it will handle its relationship with the agent.

2. To mathematically analyze optimal contracting in a static setting (corresponding to Lemmas 1 and 2), Bankruptcy costs can reduce firm value when combined with contracting frictions.

3. To discuss the role of commitment problems and bankruptcy costs

Commitment problems reduce firm value by reducing effort, increasing probability of bankruptcy.

For next time

1. We will look at a dynamic setting: commitment problems vis-à-vis creditors, and vis-à-vis both creditors and the agent.

2. Connects to Sections 5 and 6 in Fahn et al. (2019), so please take a look at these sections.

3. Read the first two pages of "Relational Incentive Contracts" by J. Levin (2003), posted in the folder for Lecture 17. Do the examples there (First Boston, Credit Suisse etc.) support the mechanism proposed by Fahn et al. (2019)?