

Principles of Corporate Finance

Written exam - September 6, 2018

ANSWER TO ALL QUESTIONS (ALL EQUALLY MARKED). THE EXAM LASTS 2 HOURS.

(*) Students who have presented a paper in class may skip one, at their choice, among the starred questions.

Question 1 (numerical)

E owns liquidity A and seeks external funding for an investment that requires $I = 10$ at $t = 0$ and that returns $X = \{5, 30\}$ at $t = 2$. E can choose between two projects: a good project H and a bad project L . The success probability is $\Pr\{X = 30\} = p$; project H has a greater success probability $p_H = 0.8$, while project L has $p_L = 0.4$. However project L guarantees to E a private benefit $B = 10$:

1. Compute the NPV of the project H .
2. E raises $(I - A)$ by issuing a bond that repays a face value R_u to investors. Write the incentive constraint for E to choose project H and compute his maximum pledgeable income (constraint on R_u).
3. Write the investors' rationality constraint and find the minimum value R_u , assuming that E chooses project H . Find the minimum threshold for A for which E manages to raise external financing.
4. The bank monitors at cost $c = 3$, reducing as a consequence the private benefit from $B = 10$ to $b = 5$. Assume an E who is credit rationed. E asks funding exclusively to a bank and promises to repay R_m at $t = 2$. Which is the minimum threshold for A to obtain a loan from the bank?
5. Assume now funds A are uniformly distributed between 0 and 50. Compute the percentage of firms that are credit rationed, those that are financed by financial markets, those financed by the banks and those that self-finance the investment.

Question 2 (numerical)

Consider the case of Greece. In the past Greece has issued debt with face value $D = 120$. This debt is held by foreign investors and it has been invested in a productive project that generates a payoff of 90 with probability $1/3$ or 30 with probability $2/3$. Now a new opportunity arises: by investing 10 it will return a future payoff of 30 with certainty to be added to the payoff of the previous productive project. Assume that Greece had the liquidity to finance this new investment opportunity.

1. Will Greece invest in this new opportunity?
2. Which cut in the face value of debt (new face d smaller than D) would be accepted by Greece's past creditors to be as happy as in the status quo?
3. Will Greece undertake the new opportunity if the face value was d ?

Question 3 *

Discuss the different aspects of conglomeration.

Question 4 *

What are the pros and cons of arms' length finance compared to bank finance?

Solution

Question 1

1.

$$NPV_H = 30 \times 0.8 + 5 \times 0.2 - 10 = +15 > 0$$

2. The incentive constraint for E is

$$(30 - R_u)0.8 \geq (30 - R_u)0.4 + 10$$

from which $R_u \leq 5$.

3. From the point of view of investors, it must be that

$$0.8R_u + 0.2 \times 5 \geq 10 - A$$

from which

$$\frac{9 - A}{0.8} \leq R_u$$

Hence both constraints imply:

$$\frac{9 - A}{0.8} \leq 5$$

From which the threshold is $\bar{A} = 5$. All firms with $A \geq \bar{A} = 5$ will be financed.

4. In case of a loan from a bank, the incentive constraint for E becomes

$$(30 - R_m)0.8 \geq (30 - R_m)0.4 + 6$$

that is $R_m \leq 15$.

The bank's rationality condition is

$$0.8R_m + 0.2 \times 5 - 4 \geq 10 - A$$

From this constraint we derive

$$R_m \geq \frac{13 - A}{0.8}$$

Combining the two disequalities on R_m , leads to

$$\frac{13 - A}{0.8} \leq 15$$

We derive a second threshold $\underline{A} = 1$.

5. The percentage of firms that are self-financed is 80% (all firms with $A \in (10, 50)$); 10% firms raise funds from financial markets (all firms with $A \in (5, 10)$); 8% are financed by banks (all firms with $A \in (1, 5)$) and finally 2% are credit rationed.

Question 2

1. Let's compare Greece's payoffs in the two cases (recall that debtor's payoff is given by $\min(X, D)$ with $D = 120$):

no investment

$$\frac{1}{3}(90 - \min(90, D)) + \frac{2}{3}(30 - \min(30, D)) = 0$$

while with the investment is

$$\frac{1}{3}(90 + 30 - \min(120, D)) + \frac{2}{3}(30 + 30 - \min(60, D)) - 10 = -10 < 0$$

Hence Greece will choose not to invest. The reason is that the net benefit of the new investment is fully appropriated by the foreign creditors who gain 30 more in case of default, but the cost of the investment is paid by Greece.

2. In the status-quo (Greece not investing) creditors get:

$$\frac{1}{3}\min(90, D) + \frac{2}{3}\min(30, D) = \frac{1}{3}90 + \frac{2}{3}30 = 50$$

hence they should earn at least 50 for the renegotiation to be feasible.

In order to compute the maximum "cut" in the face value, we need to make assumptions about the new value d . Let's assume that the new value d belongs to the interval $[60, 90]$. Assuming that Greece invests, creditors would get:

$$\frac{1}{3}d + \frac{2}{3}60$$

Let's now compute the minimum d within the interval $[60, 90]$ accepted by the creditors:

$$\frac{1}{3}d + \frac{2}{3}60 \geq 50$$

that is

$$d \geq 30$$

Hence $d = 60$ is the minimum face value acceptable by creditors. The maximum "cut" in the old face value is therefore

$$\frac{D - d}{D} = (120 - 60)/120 = 50\%$$

3. Let us check that Greece will invest if the new face value is $d = 60$. In the status-quo Greece will earn 0, while when investing:

$$\frac{1}{3}(90 + 30 - \min(120, d)) + \frac{2}{3}(30 + 30 - \min(60, d)) - 10 = \frac{1}{3}60 - 10 = +10 > 0$$

Hence Greece will invest.