**Name: .................................................. Student ID: ........................**

**Midterm Make-up Exam, Theory of Corporate Finance, ECN 5355**

**30 October 2023.**

**Part A: Short essay questions. Answer TWO of the following three questions!**

**A1** What are advantages and disadvantages of basing executive pay on the firm’s stock price performance? What is the advantage of paying in stock options rather than stocks? Explain what the consequences of options for incentives if the share price is relatively high/low?

**A2** How can the idea that “reputation” influences credit worthiness be captured within the standard model of borrowing capacity under moral hazard? Explain!

**A3** According to the Modigliani-Miller theorem, financial variables do not affect the value of the firm. Why then, do share buybacks tend to increase the share price? Explain!

**Part B: Problem Sets. Solve TWO of the following three problems!**

**B1:** Assume a project has a probability of success of *pH=0.9* if the borrower behaves and *pL=0.5* if the borrower misbehaves. The size of the necessary investment is *I = $300*. If successful, the project earns *R=*$400. If she misbehaves, the borrower can secure a private benefit *B=$40*. The risk-free interest rate is zero.

1. *How much income can the borrower maximally pledge in the case where the project is successful? How much is the expected pledgeable income?*

Pledgeable in case of success: 400 – 40/0.4 = 300

Expected pledgeable income: pH(R – B/p) = 0.9 (400 – 40/0.4) = 270

1. *How much of her own wealth does the borrower need to invest?*

Amin = I – pledgeable = 300 – 270 = 30

1. *What is the net present value of the project, what is the surplus of the borrower if she invests the minimum amount of her own wealth?*

 NPV = pH R – I = 0.9 \* 400 – 300 = 60

Ub = pH Rb – A = 0.9 (40/0.4) – Amin = 90 – 30 = 60

1. *How large would pledgeable income and, hence, how small would the private benefit B need to be to allow for a contract where no own wealth of the borrower is invested? Feel free to give your answer in fractions.*

0.9 (400 – x/0.4) = 300 ⬄ 400 – x/0.4 = 1,000/3 ⬄ 160 – x = 400/3 ⬄ x = 80/3

**B2** Assume an entrepreneur wants to undertake a deepening investment. The basics of the original contract are as follows (abbreviations as in the lecture slides):

I = 810 pH = 0.9, pL=0.5, R = 1,100, B = 80.

The new investment is debt financed and makes success more likely by changing the probabilities of success to pH’=0.95 and pL’=0.55 at a cost of J=110.

a) What is Rl and Rb , the reward of the lender and the borrower in the case of success in the original contract? (you need to determine pledgeable income to answer this question)

Pledgeable: pH(R – (B/Dp)) = I – Amin

⬄ 0.9 \* (1,100 – 80/0.4) = 810 = 810 – Amin 🡺 Amin = 0.

So Rb = 200 and Rl = 900.

b) Consider the new debt contract. Confirm, that the new investment is inefficient! If the initial investors have seniority: Will the new investors expect the entrepreneur to exhibit good behaviour? Why? Which condition must be fulfilled to support the equilibrium behaviour of the entrepreneur?

Inefficiency: added expected revenue = 0.05 \* 1,100 = 55 < 110 = added expense

Good behavior: as the investment is inefficient, someone has to lose. As Rl is contractually determined, the original investors cannot lose at good behavior, the entrepreneur would not undertake the investment if she loses (at good behavior) and the new investors have to break even. So only if behavior changes can a loss be inflicted on the original investors.

Equilibrium bad behavior: pL’ Rb’ + B’ > pH Rb

c) How much does the entrepreneur need to offer the new investors? What is Rl for the initial investors, what is Rl’ for the new investors and what is Rb’ for the borrower after signing a contract with the new investors? What must B’ be so that the entrepreneur is better off with the new investment than without it? Does this B’ fulfil the condition for equilibrium behaviour in part b)?

New investors need to break even, so 0.55 Rl’ = 110 🡺 Rl’ = 200

* Rb’ = Rb – 200 = 0,

So the condition for the entrepreneur becomes B’ > pH Rb or B’ > 0.9\*200 = 180

**B3** A borrower who has unpaid debt and no wealth of her own seeks finance for an attractive project.

Assume the borrower still owes some initial investors a debt D = 200 and has no collateral or wealth.

A new project has the data B = 80, pH = 0.9, pL = 0.5, R = 1,100, I = 710

1. *Evaluate the project on its own, i.e. ignore that there is outstanding debt! Does the entrepreneur need to have a minimum amount of wealth? Formally, which value does the minimum amount of wealth assume and how do you interpret that number?*

pH (R – B/p) > I or pH (R – B/p) = I – Amin with Amin < 0

0.9 (1,100 – 200) = 810 > 710, so Amin = - 100.

i.e. the investors would be willing to pay an advance to the entrepreneur and incentives would still work (i.e., the entrepreneur would get her agency rent of 200).

1. Now assume that the initial debt D = 200 has seniority! Would it be possible to win new investors in the absence of debt forgiveness? Demonstrate how much debt forgiveness one would need for the new investors to agree on the project! Would the initial investors be willing to grant debt forgiveness?

pH (R – B/p – D) < I

0.9 (1,100 – 200 – 200) = 630 < 710

As the entrepreneur has no wealth to put up Amin, new investors are not willing to invest. On the other hand, for a smaller debt d = 100, no wealth is needed:

0.9 (1,100 – 200 – 100) = 710,

So if initial investors forgive 100 of the initial debt of 100, the project can go ahead from which they get 100 in case of success or 100 under expectations.

1. Now assume R = 900, all other parameters as above except that the investor has a wealth of A = 80. What would the initial investors want to do and how would this affect the need of debt forgiveness?

Initial investors could now put their hands on 80 so that the remaining debt would be 120.

0.9 (1,100 – 200 – 120) < 710 but with debt forgiveness of 20, one gets 0.9 (1,100 – 200 – 100) = 710.