**Review Questions and Problems for Lecture 4b: Outside Financing Capacity**

**Question 1:** How can “reputation” influence credit worthiness within the standard model of borrowing capacity under moral hazard.

**Question 2:** In the model of borrowing capacity under moral hazard: what is the effect of an increase in A? Why may it be that an increase in cash flow does not seem to have a significant impact on investment?

**Problem 1:** *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 = 794,000, pH = 0.99, pL=0.79, R = 1,000,000, A = 200,000, B = 80,000.*

*The new investment is debt financed and yields pH’=1 and pL’=0.8 at a cost of J=20,000.*

*a) What is RI and Rb in the original contract? Demonstrate that the original contract fulfills the participation constraint of the original lender and the incentive compatibility constraint of the entrepreneur (borrower).*

By the zero profit condition, Rl = (794,000 – 200,000)/0.99 =600,000

Hence, Rb = 400,000.

By construction, Rl satisfies the zero profit condition. For the borrower, Rb≥B/p or Rb≥80,000/0.2=400,000.

*b) Consider the new debt contract. What is Rl’ and Rb’?*

J = 20,000, so investors need to realize 0.8 Rl’ = 20,000, so Rl’ = 25,000. As the return of the initial creditors is fixed, Rb’ = Rb –Rl’ = = 400,000 – 25,000 = 375,000.

*c) What would the new private benefit B’ need to be to make misbehaving an equilibrium outcome after the investment has been realized?*

pL’ Rb’ + B’ > pH’ Rb

so 0.8 \* 375,000 + B’ > 1 \* 400,000

or B’ > 100,000

d) What do the original lenders expect to get and how does this compare?

(pL + ) Rl = 0.8 \* Rl = 0.8 \* 600,000 < 0.99 \* 600,000

**Remark:** The deepening investment increases the probability of success of the project by 1% point, so its expected return is 0.01 × 1,000,000 = 10,000. This falls short of its cost of 20,000 so the project is inefficient. Hence, rational agents would never want to realize it if the high effort/good behaviour scenario applies. So the only way where it might be realized is under the low effort/bad behaviour scenario provided that the new investors and the new borrowers want to participate. If this scenario applies, the initial investors are losing money.

**Problem 2:** *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 and has no collateral. But she has a new project which does not need upfront equity:*

*pH (R – B/p) > I so that Amin < 0*

*Demonstrate that it is possible to win new investors for the project and that the initial investors would be willing to forgive some of the their claims.*

There is 0 < d < D such that new investors are willing to invest:

pH (R – B/p – d) = I with pH d = – Amin.

The borrower receives B/p and initial investors receive d > 0 where 0 would be their default outcome.

*Does the size of the initial debt play a role? What if there is some collateral A?*

This result is independent of the initial debt D as their default outcome is zero, not D.

If there is collateral A, the initial investors can always claim the collateral, so they are only owed D’ = D – A (if the collateral does not cover the debt), otherwise the analysis is not affected.