Theory of incentives
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translation :

feature = caractéristique

fee = amende

lie, lying = mentir, mensonge

stockholder, shareholder = actionnaire

perquisities = "abus de bien social"

EX 1 AUDIT AND ADVERSE SELECTION

One considers the simple model of task delegation : the principal wants to delegate a task to an agent. the agent has to produce a good (quantity will be noticed q) . This costs θq to him with $\theta \in \{\underline{\theta}, \overline{\theta}\}$ with $\underline{\theta} < \overline{\theta}$. The principal extracts a surplus $S(q)$. S being concave and increasing. The principal proposes a direct mechanism : if the declared cost is $\widehat{\theta}$ then the agent has to produce $q\left(\widehat{\theta}\right)$ and will be payed $t\left(\widehat{\theta}\right)$.

If he refuses the contract, the agent obtains (with an outside option) a profit $U_0(\theta) = 0$. That means that an agent with type θ will accept only if his profit is higher than 0.

Part I

perfect information

Assume first that rhe principal observes θ.

1. **What are the (First Best) optimal contracts $(t^*(\theta), q^*(\theta))$.**

2. **What is the level of utility achieved by the two types of agents**

Part II

Asymmetric information with audit

We assume now that the principal uses an audit process. When the agent declares $\overline{\theta}$ then the principal makes an audit of the agent. This audit has the following feature :

- a false declaration has a probability p to be detected.
- the cost of such an audit depends on p : $c(p)$ is an increasing strictly convex function, $c'(0) = 0, c'(1) = +\infty$.

If a false declaration is detected (the true θ is $\underline{\theta}$) then a fee F must be payed by the agent.

The problem of the principal is to design the optimal contract AND the optimal audit p^* and F^*.

3. **Write the incentive and participation constraints**

We assume here that the fee F cannot be larger than the rent obtained by lying : $F \leq t\left(\overline{\theta}\right) - \underline{\theta}q\left(\overline{\theta}\right)$.

4. Explain why it is optimal, for the principal, to set F at its maximal value : $F^* = t\left(\overline{\theta}\right) - \underline{\theta} q\left(\overline{\theta}\right)$.

5. Write the problem of the principal, (make the conjecture that the only relevant constraints are $IC\left(\underline{\theta}, \overline{\theta}\right)$ and $PC\left(\overline{\theta}\right)$)

6. Write the first order conditions giving $q^{SB}(\theta)$, F^*, p^* .

7. Comment

EX 2 Moral Hazard and Financial contracts (facultatif)

We consider the relation between stockholders of a firm and the manager. The corporate finance literature has stressed that moral hazard may not be due to the desire of the manager to avoid costly effort but, instead, to his desire of choosing projects with private benefits. Those private benefits arise, for instance, when the manager devotes the resources of the firm to consume perquisities (buy a new car, organize trips...).

Let us consider that the risk-neutral manager can choose between a "good" and a "bad" project. The shareholders' return on the investment I of the good project is $\overline{V}$ with probability π_1 and 0 otherwise. If the bad project is chosen the return on the investment I, is $\overline{V}$ with probability π_0 and 0 otherwise. However, by choosing the bad project, the manager gets a private benefit B which is strictly positive. A contract is a pair of transfers $(\overline{t}, \underline{t})$ where, assuming limited liability, $\underline{t} = 0$. To sum up : the shareholder puts I, the manager chooses the project, the return is a random V for the shareholder, with a private benefit for the manager if the chosen project is the bad one.

8. Write the incentive constraint

9. Show that under limited liability, the participation constraint is always satisfied as soon as the incentive constraint is.

10. Write the expected payoff of the shareholder as a function of $\overline{V}, \pi_0, \pi_1, B, I$.

11. Write the expected payoff in case of perfect information

12. Comment