Swiss Program for Beginning Doctoral Students in Economics 2001

Final Exam in Microeconomics

Tuesday, February 26, 2002, 08.30h – 11.30h

1. You are allowed to use all material that you want (lecture notes, books, etc.) with the exception of PC's.
2. Please **do not** mention your name on top of the pages, but use your identification number from the enclosed list. The reason is that the exams will be graded anonymously. Please use **a pen** rather than a pencil so that your answers can be read without problems.
3. Good luck!

ID-Number:____

Final Exam (Micro 1):

[20 points] Consider a risk averse decision maker who faces the possibility of an accident, in which case he will suffer a loss of L. The probability of the accident is q, $0 < q < 1$. His current wealth is w. He can buy insurance at price p per unit of coverage. Suppose that the insurance premium is not actuarially fair, i.e., $p > q$.

(a) Show that the decision maker will not buy full insurance.

(b) Why is this result independent of the degree of risk aversion of the decision maker? Put differently, why would an extremely risk averse person not buy full insurance even if p is only slightly larger than q?

1 Microeconomics:

Consider an exchange economy with L goods ($l = 1, \ldots, L$) and I agents ($i = 1, \ldots, I$), where all agents have the same utility function, of the Cobb Douglas type:

$u(C_1, \ldots, C_L) = C_1^{a_1} C_2^{a_2} \ldots C_L^{a_L}$.

Total endowments are denoted ω_l, $l = 1, \ldots L$

- Compute the competitive equilibrium price vector
- How does it express the fundamental determinants of value theory: preferences and relative scarcity of the goods?
- Why is it that the equilibrium price vector does not depend on the repartition of total endowments among consumers?
- Can you give other examples where this property also holds true?

Gerzensee exam, Micro IV, February 2002.

Question 1: Competition and market integration

Consider a country A where demand for a product is defined by:

$$P_A = 3 - (\Sigma_i\, q_i),$$

where $\Sigma_i\, q_i$ is the total output of all active firms (q_i being the output of firm i). Each firm has a constant marginal cost equal to 2. Competition takes place in quantities, that is, à la Cournot. If each firm has a fixed cost of being active of 0.1, what is the free-entry equilibrium, in terms of:

- the number of active firms (n_A);
- the quantity per firm (call it q_A);
- and the price level P_A?

Assume there is also country B, initially separated from country A, which has the same demand as country A, with domestic firms in this country that produce with the same technology, and therefore the same free-entry equilibrium, if the two markets are segmented (that is, n_B=n_A, q_B=q_A, and P_B=P_A).

But assume now that the two markets become *integrated*, in that all firms now face the same *overall* market demand:

- What is the equation of this demand?
- What is the free-entry equilibrium now (number of active firms in the unified market, quantity per firm, and price level), if each firm still has the same fixed cost of being active of 0.1?
- Does market integration increase total welfare? How does such a policy compare with the entry of new firms on a market of given size? (10 lines max).
- What are the limits of the analysis? (10 lines max).

Question 2 : Spence model with productive-but-costly education.

Assume two types of workers, H and L, with probabilities a and 1-a in the population.

Their respective utilities are $w - c_H e$ and $w - c_L e$, where e is the level of education, w the wage and we have $1 < c_H < c_L$.

Worker productivity is L+e for type L and H+e for type H (with $0 < L < H$).

- show graphically the equilibrium if worker types are publicly observable. Why will unobservability of worker types matter ?
- describe *the set* of fully separating Bayesian-perfect equilibria (be precise).
- describe *the set* of fully pooling Bayesian-perfect equilibria (be precise).
- describe *one* semi-separating Bayesian-perfect equilibrium (be precise).
- which of these equilibria satisfies the Cho-Kreps intuitive criterion ? (be precise).

Risk-Averse Principal and Moral Hazard

Suppose that a risk-averse principal delegates a task to a risk-neutral agent. With probability e (resp. $1-e$) the outcome is $\bar{q}$ (resp. $\underline{q} < \bar{q}$). The risk-averse principal utility is $v(q-t)$ where t is the agent's transfer and $v(\cdot)$ is a CARA von Neumann-Morgenstern utility function. Effort costs $\psi(e)$ to the agent ($\psi' > 0, \psi'' > 0$).

1- Suppose that e is not observable, compute the optimal contract with a risk-neutral agent.

2- Suppose that the agent is protected by limited liability. Compute the second-best level of effort.

3- Analyze the two limiting cases where the principal is infinitely risk-averse and where he is risk-neutral. Explain your findings.

Inducing Information Learning

We consider a principal-agent problem in which the risk-neutral principal wants to delegate to a cashless risk-neutral agent protected by limited liability, the acquisition of soft information about the quality of a risky project as well as the decision to engage or not in the risky project.

There is a safe project which yields 0 to the principal with probability 1. There is also a risky project. In the absence of information, the risky project yields $\bar{S}$ with probability ν and $\underline{S}$ with probability $1-\nu$. We will assume that $\nu\bar{S}+(1-\nu)\underline{S}=0$.

By incurring an effort with cost ψ, the agent can learn a signal $\sigma \in \{\underline{\sigma}, \bar{\sigma}\}$ on the future realization of the risky project.

We will assume that $\Pr(\bar{\sigma}|\bar{S}) = \Pr(\underline{\sigma}|\underline{S}) = \theta$, with $\theta \in [\frac{1}{2}, 1]$ being interpreted as the precision of the signal.

1- As a benchmark, suppose that the principal uses the technology for information gathering himself. Show that the project is done only when $\bar{\sigma}$ is observed. Write the condition under which the learning of information is optimal.

2- Suppose now that the agent decides to adopt or not the risky project. The principal uses a contract $(\bar{t}, \underline{t}, t_0)$ to incentivize the agent. $\bar{t}$ (resp. $\underline{t}$) is the transfer received by the agent if he chooses the risky project and $\bar{S}$ (resp. $\underline{S}$) realizes. t_0 is the transfer he receives if he chooses the safe project. Write the incentive constraints needed to have the risky project being chosen if and only if $\bar{\sigma}$ is observed.

3- Write the incentive constraint needed to induce the agent to learn information.

4- Find the optimal contract offered to the agent and show that $\bar{t}$ which induces information learning.

5- Find the second-best rule followed by the principal.