

UNIVERSITY OF OSLO
DEPARTMENT OF ECONOMICS

Exam: **ECON4240 – Equilibrium, welfare and information**

Date of exam: Monday, May 18, 2015

Grades are given: June 8, 2015

Time for exam: 2.30 p.m. – 5.30 p.m.

The problem set covers 2 pages (**not** including the cover sheet)

Resources allowed:

- No resources allowed (except if you have been granted use of a dictionary from the Faculty of Social Sciences)

The grades given: A-F, with A as the best and E as the weakest passing grade. F is fail.

ECON 4240 Exam: Spring 2015

PART I: ECONOMICS OF INFORMATION

Problem 1. (25 points)

Consider the setup in the Akerlof "lemons" model. There are two groups of traders for cars: B and S with (group) incomes Y_B and Y_S , respectively. Incomes include earnings from sale of cars. As in the Akerlof model, consider each group to be acting as an individual player in the car-exchange market.

There are two goods which B and S care about: cars and M , where x_i is the quality of car i , M is the other "consumption good" and n is the number of cars bought.

Group B has the following utility function: $U_B = M + \sum_{i=1}^n 2x_i$.

Similarly, $U_S = M + \sum_{i=1}^n x_i$ applies to group S .

Assume that group S has N cars with quality x where x is uniformly distributed on the interval $[0, 3]$. Group B has 0 cars to begin with. Normalize the price of M to 1 and ignore any indivisibilities (for cars). Proceed by taking the price of a car to be p .

- (i) Write down the demand and supply functions of cars for each group.
- (ii) Now calculate the equilibrium price and corresponding quantity of cars traded.
- (iii) How is this different from the full information first-best outcome?

Problem 2. (25 points)

Consider a competitive labor market with many workers and many employers. There are two types of workers, H and L . One-third of the workers are of H type and the rest are all L type. The value of the marginal product of an H type is 30 and that of an L type is 15.

Suppose every worker has the option of choosing some (non-negative) years of education. This choice is perfectly observable. Education does *not* affect the productivity of a worker. The cost to an H type of e years of education is $\frac{1}{2}e^2$. The corresponding cost to an L type is $\frac{4}{5}e^2$.

- (i) Suppose that employers *can* observe a worker's type. What will be the equilibrium wages for each type of worker? What levels of education will each type of worker choose? Is this outcome efficient?
- (ii) Suppose that employers *cannot* observe a worker's type. But if the same wage is paid to all, what would it be in equilibrium?
- (iii) Now suppose workers can signal their productivity by choosing education levels. What do we mean by *pooling* equilibrium and *separating* equilibrium in this context? For what range of values for e , would a *pooling* equilibrium exist? Describe any specific *pooling* equilibrium.

PART II: GENERAL EQUILIBRIUM ANALYSIS

Problem 3. (25 points)

Consider a setting with N consumers. Each consumer i chooses an action a_i . Consumer i 's utility takes the form $u_i \left(a_i, \sum_{j=1 \dots N} a_j \right) = \lambda \sum_{j=1 \dots N} a_j - \frac{a_i^2}{2}$, where $\lambda > 0$. Then, the utility of each consumer is affected by both his individual action and the actions of the other consumers.

- (i) Characterize the optimal levels of a_i for each i .
- (ii) Characterize the equilibrium levels of a_i for each i by solving the decentralized maximization problem.
- (iii) Compare the equilibrium levels of a_i with the optimal levels.
- (iii) What tax/subsidy scheme induces the optimal outcome?

Problem 4. (25 points)

Consider a pure-exchange economy, consisting in two consumers, denoted by $i = 1, 2$, who trade two commodities, denoted by $l = 1, 2$. Each consumer i is characterized by an endowment vector, $\omega_i = (\omega_i^1, \omega_i^2)$, a consumption set, $x_i = (x_i^1, x_i^2)$, and quasilinear utility of the type:

$$\begin{aligned} u_1(x_1^1, x_1^2) &= x_1^1 + \log x_1^2 \\ u_2(x_2^1, x_2^2) &= x_2^1 + 2 \log x_2^2 \end{aligned}$$

- (i) Assuming that the consumers' endowments are $\omega_1 = (1, 2)$ and $\omega_2 = (2, 1)$, respectively, construct the Edgeworth Box relative to economy under consideration. With reference to the same economy, define the following notions: competitive equilibrium, Pareto-efficient allocation, Pareto set, contract curve.
- (ii) Find the equation describing the Pareto set; then, taking commodity 1 as the numeraire, hence positing $p^1 = 1$, find the competitive equilibrium allocation and price system; and, finally, draw your results in the Edgeworth Box.
- (iii) Explain why with this type of preferences wealth effects associated with price changes are ruled out.