University of Oslo
Department of Economics

Exam: ECON3200/4200 – Microeconomics and game theory

Date of exam: Tuesday, November 26, 2013

Grades are given: December 17, 2013

Duration: 14:30 - 17:30

The problem set covers 5 pages (including this page)

Resources allowed: No resources allowed

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

The exam consists of four problems. They count as indicated. Start by reading through the whole exam, and make sure that you allocate time to answering questions you find easy. You can get a good grade even if there are parts of problems that you do not have time to solve.

Question 1 (25%)

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Consider a world with two goods, good 1 and good 2. Let $\underline{x} = (x_1, x_2)$ denote a bundle of goods comprising x_1 units of good 1 and x_2 units of good 2. Suppose a consumer, call him A, has preferences which can be represented by the utility function u^A where $u^A(\underline{x}) = x_1^{\alpha} x_2^{1-\alpha}$, α being some number in $(0, 1)$. Another consumer, call him B, has preferences which can be represented by the utility function u^B where $u^B(\underline{x}) = x_1 + \phi(x_2)$ and ϕ is a strictly increasing function. You are being told that the price of good 1 is 2 NOK, while the price of good 2 is 1 NOK, but you are not given any more information than this. In particular, you are not being told how much cash A or B has.

1. Which condition on ϕ will guarantee that u^B is quasi-concave? (As usual you can use any results from the lecture notes, provided that you state these results very clearly)
2. Which bundles of goods could potentially constitute the Marshallian demands of consumer A? Express these candidate bundles of goods in the form $x_2(x_1)$ (i.e. x_2 as a function of x_1), and give a qualitative graphical representation of these points.
3. Which bundles of goods could potentially constitute the Marshallian demands of consumer B? Express these candidate bundles of goods in the form $x_2(x_1)$ (i.e. x_2 as a function of x_1), and give a qualitative graphical representation of these points.
4. Comment your findings.

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Question 2 (25%)

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Two consumers, called A and B, both have initial wealth M and both face the risk of an accident. The probability of the accident occurring is fixed exogenously, and equal to q. If the accident occurs, each of them loses L (where $L \leq M$). Both consumers are risk-averse. In addition, you are being told that A is an expected-utility maximizer. However you do not know whether B is an expected-utility maximizer. A risk-neutral insurance company offers individual insurance contracts at a unit price p (so that for a price pK, the insurance commits to making payment K in case the accident occurs).

1. Define risk aversion.

2. How is a full-insurance contract characterized in the present context?

3. Suppose that $p = q$. Show that A demands full-insurance.

4. Again suppose that $p = q$. Show that B also demands full-insurance (remember that you are not allowed to assume that B is an expected-utility maximizer).

5. Are all expected-utility maximizing consumers necessarily risk-averse? If not, illustrate with an example.

6. Are all risk-averse consumers necessarily expected-utility maximizers? If not, illustrate with an example.

Question 3: Product design (25%)

Two firms are about to engage in a joint venture where they each are to produce one part of a device. They need to choose which color to have for their part – blue or red. Having the same color gives sales revenues of 3 each. If choosing different colors, the device cannot be sold and so revenues are zero. Firm 1 has free access to blue paint but has a cost of 1 when painting in red. Firm 2 has free access to red paint but has a cost of 1 when painting in blue.

1. Without specific reference to this game, what is a Nash Equilibrium (NE)? Define formally or describe in words.
2. Set up the game in normal form.
3. What is the set of rationalizable strategies for each player? Remember to specify the beliefs under which a certain strategy is rationalizable.
4. What are the pure and mixed NE in this game?
5. Suppose they meet up to agree on colors, discuss briefly what agreements they might make. (E.g. you may discuss the relevance of the equilibria found in the previous subquestion.)

Question 4: Bargaining (25%)

Two hungry players are bargaining over how to divide a warm pie which has a total size of 1. There are three rounds and the pie is cooling as they bargain. Player 1 prefers hot food, so for him the payoff of any given size of the pie is depreciating by a factor $\delta = 5/8$ for each round of delay. Player 2, on the other hand, has an affinity for cold food, so his payoff for any given size of the pie is appreciating by the factor $\beta = 3/2$ for each round of delay. (Note that δ and β are the equivalents of time discounting in the stardard bargaining game. But there is no actual time discounting on top.)

Let m_t be the proposal made in period t about the amount of pie to be allocated to Player 1. In the first round, Player 1 makes an offer m_1. Player 2 can then accept the offer, which yields payoff m_1 for player 1 and $1 - m_1$ for player 2, or reject it. If he rejects, Player 2 gets to offer m_2 in a second round. Player 1 then can accept the offer, in which case payoffs are δm_2 for player 1 and $\beta(1 - m_2)$ for Player 2, or reject it. If Player 1 rejects, he gets to to offer m_3 in a third round. Player 2 then can accept the offer, in which case payoffs are $\delta^2 m_3$ for Player 1 and $\beta^2(1 - m_3)$ for Player 2. If he rejects, they both get nothing.

1. Set up the game in extensive form.

2. Without reference to this problem, define or explain in words what is a Subgame Perfect Nash Equilibrium (SPNE).

3. Determine the unique SPNE outcome in this game using backward induction. Specify also the strategies that make up for this SPNE. (Make sure to check whether Player 1 actually wants to make an acceptable offer in the first round instead of continuing to later rounds.)

4. Who gets the biggest piece of pie in this equilibrium? Discuss briefly what forces determine this.