**-MICROECONOMICS 2018-2019 exam of 26-06-2019**

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*- Time: 70 minutes.* **Any answer not justified by calculations, graphs or whatever, will not be considered.**Use the present sheet for calculations, graphs and any other observation.

**1a. In a Stackelberg duopoly inverse market demand is** $p=120-y$**. Firms 1 is quantity leader, firm 2 the follower; both have zero marginal cost. Determine industry output in Stackelberg equilibrium.**

- The quantity leader knows the reaction function of the follower $q\_{2}=f\_{2}(q\_{1})$, which he exploits to fix the quantity $q\_{1}$ maximising his profit: $π\_{1}=q\_{1}\left[120-q\_{1}-f\_{2}\left(q\_{1}\right)\right]-C\_{1}$, where $C\_{1}$ is leader’s total cost.

First order condition for profit maximization is MR = MC. Since leader’s and follower’s marginal cost is zero, and inverse market demand has slope $-1$, $f\_{2}\left(q\_{1}\right)=120-\frac{1}{2}q\_{1}$ and leader’s optimum quantity is $q\_{1}=\frac{1}{2}120=60$. This is the output of monopolist with zero marginal cost, facing inverse demand $p=120-y$.

Thus, $q\_{1}=60$; $q\_{2}=30$ and industry output $q=90$

**1b.** Anna's wealth consists of a lottery ticket L, paying prize L1 = 400 with probability 1/2, and prize L2 = 100 with probability 1/2. She is prepared to sell the lottery ticket at the *minimum* price *p* = 250. Select which among the following utility functions represent her preference for sure wealth *w, and motivate your choice*.

1. $u\left(w\right)=w^{1/2}$
2. $u\left(w\right)=w^{2}$
3. $u\left(w\right)=w$
4. $u\left(w\right)=logw$
5. every other answer is wrong

The expected prize from the lottery L is $E\left(L\right)=\frac{1}{2}400+\frac{1}{2}100=250$. The minimum price at which the agent is prepared to sell the lottery ticket is the certainty equivalent of the lottery *CE(L)*. Thus *CE(L) =* $E\left(L\right)$*. This holds if and only if the agent is risk neutral and her utility for sure wealth is linear.* Therefore $u\left(w\right)=w$ and the answer is c.

**2a. Explain why, if consumer’s money income is given, a *Giffen good* is necessarily an *inferior good*, but the reverse may not hold.**

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What defines a Giffen good is $\frac{dx\_{1}}{dp\_{1}}>0.$ That is the demand curve of a Giffen good is upward-sloping. When money income is given Slutsky’s equation is $\frac{dx\_{1}}{dp\_{1}}=\frac{dx\_{1}^{s}}{dp\_{1}}-\frac{dx\_{1}}{dm}q\_{1}$ where $q\_{1}$ is here the quantity of good 1 demanded in the initial price situation. The first term in the right-hand side of Slutsky’s equation is the substitution effect which is proved to be always negative (with given money income) through WARP. We conclude that $\frac{dx\_{1}}{dp\_{1}}>0$ only if $\frac{dx\_{1}}{dm}<0$, that is only if good 1 is inferior. The condition is necessary, but not sufficient, because and inferior good is an ordinary good, if the substitution effect prevails over the income effect. In such a case, $\frac{dx\_{1}}{dp\_{1}}<0.$

**2b.** A consumer buys only two goods, x and y. Initially, at prices [1,1], the consumer chooses the basket (3, 3). When prices change and become [1,2], the consumer chooses the basket (4, 2). Then it is possible to state that:

a) consumer’s choices violate the weak axiom of revealed preference (WARP)

b) consumer’s choices do not violate the weak axiom of revealed preference

c) without knowing preferences, it is impossible establishing if consumer’s choices do, or do not, violate WARP

d) none of the other statements is correct

The value of basket (3, 3) at prices (1, 1) is m = 6, which is consumer’s money income in the initial price situation (1, 1). At such prices, the basket (4, 2) costs 6. Thus consumer with money income m = 6 affords buying basket (4, 2), but prefers (3, 3). The latter is directly revealed-preferred to the former at prices (1, 1). At prices (1, 2) consumer’s money income must be m’ = 8, namely the value of basket (4, 2) at these prices. With money income m’ = 8 the consumer cannot afford buying basket (3, 3), which now costs 9. It follows that basket (4, 2) is not directly revealed-preferred to basket (3, 3) and WARP is not violated.

**3a.** An economy consists of two agents A, and B, sharing a room for 20 hours a day, and having endowments of a consumption good *c* $W\_{c}^{A}=W\_{c}^{B}=60$. A loves playing jazz music with the piano in the room, while B loves listening to jazz music, but cannot play at all. If *M* and *S* are the hours of jazz music and silence, their preferences are represented by $u\_{A}=4logM+2c $, $u\_{B}=2logM+2c$, where *M + S* = 20. Determine the Pareto efficient distribution of time between music and silence, and represent the *contract curve* in the Edgeworth box of this economy.

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| Since both agents love jazz music, the problem is trivial. The only Pareto efficient solution requires that agent A plays all the time, hence M = 20, and B will enjoy a positive externality by listening to music which is to her liking. So M = 20, S = 0.In an Edgeworth box with consumption on the horizontal axis (good 1), and the externality music- silence on the vertical axis, the set of Pareto Efficient allocations correspond to the upper-edge of the box. These are the set of allocations such that M = 20, S = 0.  |

**3b.** A competitive industry has market demand $Y=1200-20p$. Each firm has cost function $C(0)=0$; $C\left(y\right)=100+y^{2}$, if y > 0. Determine the long-period number *n* of firms in the industry.

1. 160
2. 120
3. 100
4. 80
5. 40
6. Every other answer is wrong

Long-run average cost is minimum if long-run average cost AC is equal to long-run marginal cost MC.

$AC=\frac{C(y)}{y}=\frac{100}{y}+y=MC=2y$ $y(AC\_{min})=y^{\*}=10$ $AC\_{min}=MC\left(y^{\*}\right)=20$

The lowest price that can persist in a long-run equilibrium is $p^{\*}=MC\left(y^{\*}\right)=20$. At $p^{\*}$ market demand is $Y=1200-20p^{\*}=800$. The long-run number of firms $n\leq \frac{800}{AC\_{min}}=80$, because *n* > 80 implies $p$ < 20. If it is *n* = 79, 1 extra firm could enter. Thus *n* = 80.

**4a.** Explain what is a ‘public good’. Next, consider an economy in which 2 agents A, B consume a public good G, and a private good *x*, supplied at constant market prices pG = 1, *px* = 10. A and B have utility functions $u\_{A}\left(G,x\right)=10logG+x$ , $u\_{B}\left(G,x\right)=20logG+x$, respectively. Determine the Pareto efficient quantity G.

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| A public good is defined by the properties of non-rivalry and non-excludability. The Pareto efficient output of a public good G meets the condition $|MRS|\_{A}+|MRS|\_{B}=\frac{p\_{G}}{p\_{x}}=\frac{1}{10}$Thus $\frac{10}{G}+\frac{20}{G}=\frac{1}{10}$, and $G^{\*}=300$ |

**4b.** A consumer has utility function $u\left(x,y\right)=2x+3y$. Her income is *m* = 120, and the prices of goods are [2, 2], respectively. If the price of good *x* decreases at *p’x* = 1 (with the price of y fixed at *py* = 2), what can you say about the substitution effect for good x?

a) Δxs = +120

b) Δxs = + 60

c) Δxs = + 25

d) Δxs = + 40

e) it is equal to the income effect

f) every other answer is wrong

|MRS|= $\frac{2}{3}<\frac{p\_{x}}{p\_{y}}=1$ at prices (2, 2). The agent spends income *m* = 120 to consume only *y* = 60, so *x* = 0.

|MRS|= $\frac{2}{3}>\frac{p\_{x}}{p\_{y}}=\frac{1}{2}$ at prices (1, 2). The agent spends income *m* = 120 to consume only *x* = $\frac{m}{p'\_{x}}=120$, and the change in demand for good *x is entirely explained by the substitution effect. So* Δxs = +120

**5a.** A’s wealth is W1 = 0 if state 1 occurs, and W2 = 20000 if state 2 occurs. State 1 and 2 occur with probability 1/4, and 3/4, respectively. A can ensure wealth K, 0 ≤ K ≤ 20000, paying an insurance premium γK , where γ = 1/3. A's utility for sure consumption is $u\_{A}\left(c\right)=c^{1/2}$, her preferences for contingent consumption satisfy expected utility. Determine which, among the following alternatives, will be selected by A and explain why: K = 0; 0 < K < 20000; K = 20000 .

The premium γ= 1/3 is slightly higher than the probability p = ¼ of the damage. Since consumer A with utility for sure wealth $u\_{A}\left(c\right)=c^{1/2} $is risk-averse, she wants to buy insurance, but K\* < damage = 20000, because the premium is not fair.

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**5b.** A’s and B’s preferences for consumption bundles (*x*, *y*) are represented by *uA*(*x, y*) = $x\_{A}^{1/3}y\_{A}^{2/3}$ and *uB*(*x, y*) = $x\_{B}^{2/3}y\_{B}^{1/3}$. Their endowments of goods are (120, 0) for A and (0, 120) for B. Determine the price *px* in a general competitive-equilibrium, if the price *py* is set as numeraire (*py* = 1).

1. *px* = 2
2. *px* = 3
3. *px* = ½
4. *px* = 1
5. *px* = 1/3
6. every other answer is wrong

Preferences of agents A and B are Cobb-Douglas. Their money income is $m\_{A}=120p\_{x}$ $m\_{B}=120$. The demand for good x by agents A and B is $x\_{A}=\frac{1}{3}\frac{m\_{A}}{p\_{x}}=40$ , and $x\_{B}=\frac{2}{3}\frac{m\_{B}}{p\_{x}}=\frac{80}{p\_{x}}$.

The total supply of good x in the economy is x = 120. In equilibrium: $x\_{A}+x\_{B}=120$

$40+\frac{80}{p\_{x}}=120$. Which yields $p\_{x}=1.$

**6a.** Define and discuss the concept adverse selection and make examples concerning the insurance and the credit market.

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| To answer, use Varian’s chapter on asymmetric information, and my lecture notes and slides on asymmetric information in credit markets.  |

**6b.** A competitive firm has production function $y=2x\_{1}+x\_{2}$. Factor prices are w1 = 10, w2 = 10, respectively. Determine the total-cost function *C(y)*

a) $C\left(y\right)=10 y$

b) $C\left(y\right)=5 y$

c) $C\left(y\right)=20 y$

d) $C\left(y\right)=15 y$

e) every other answer is wrong

Factors 1 and 2 are perfect substitutes. |TRS| = 2 > $\frac{w\_{1}}{w\_{2}}=1$. A cost-minimising firm will use only factor 1. Thus $y=2x\_{1}$, or equivalently $x\_{1}=\frac{1}{2}y$. Each unit of $x\_{1}$ costs 10. The cost of producing output y is $C\left(y\right)=10\frac{1}{2}y=5y$. Thus the answer is b.