University of Wisconsin

Microeconomics Prelim Exam

Monday, July 29, 2019: 9AM - 2PM

- There are four parts to the exam. All four parts have equal weight.
- Answer all questions. No questions are optional.
- Hand in 12 pages, written on only one side.
- Write your answers for different parts on different pages. So do not write your answers for questions in different parts on the same page.
- Please place a completed label on the top right corner of each page you hand in. On it, write your assigned number, and the part of the exam you are answering (I,II,III,IV). Do not write your name anywhere on your answer sheets!
- Show your work, briefly justifying your claims. Some solutions might be faster done by drawing a suitable diagram.
- You cannot use notes, books, calculators, electronic devices, or consultation with anyone else except the proctor.
- Please return any unused portions of yellow tablets and question sheets.
- There are five pages on this exam, including this one. Be sure you have all of them.
- Best wishes!

Part I

1. Consider the following observations of an individual's choices at three price and wealth levels:

observation	prices	wealth	demand
A	$p^A = (6, 2)$	120	$x^A = (15, 15)$
B	$p^B = (7, 2)$	120	$x^B = (12, 18)$
C	$p^C = (6, 3)$	120	$x^C = (10, 20)$

   Show that the data is consistent with rational choice given locally non-satiated preferences. Give the most complete preference ordering you can over the bundles (x^A, x^B, x^C).

2. The "data" above was generated by the demand function

$$x(p, w) \quad = \quad \left(\frac{w - 30p_2}{p_1 - p_2}, \quad \frac{30p_1 - w}{p_1 - p_2} \right) \tag{1}$$

   defined for prices $p_1 > p_2$ and wealth $w \in [30p_2, 30p_1]$.

   (a) Verify that $x(p, w)$ has a symmetric Slutsky matrix.

   (b) Is good 1 normal or inferior? Is good 2 normal or inferior? Is either good a Giffen good?

3. Now suppose $p_1 > p_2$ and $w \in [30p_2, 30p_1]$, and consider the maximization problem

$$\max x_1 \qquad \text{subject to} \qquad p_1x_1 + p_2x_2 \leq w \qquad \text{and} \qquad x_1 + x_2 \geq 30 \tag{2}$$

   (We omit the non-negativity constraints on x_1 and x_2 because they turn out not to bind; to keep things simple, you may ignore them.)

   (a) Show the constraint $p_1x_1 + p_2x_2 \leq w$ holds with equality at any solution to (2).

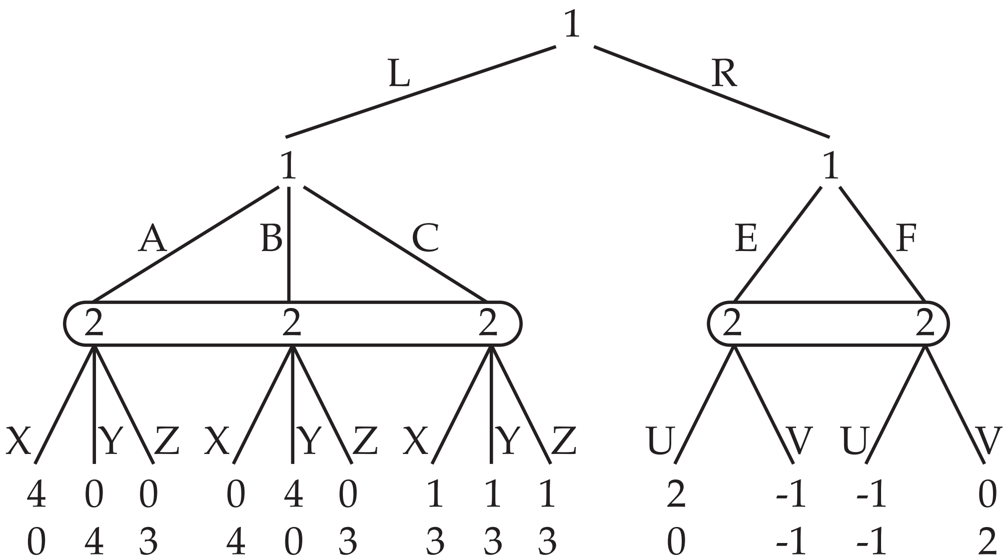
   (b) Show the constraint $x_1 + x_2 \geq 30$ holds with equality at any solution to (2).

   (c) Show that the solution to (2) is the demand function (1).

   (d) Knowing that (1) is the solution to (2), give a story for what the goods could be, and why demand would take the form (1). Describe a utility function (not necessarily continuous) which would give this demand.

Part II

Consider the extensive form game Γ below.



1. Find all subgame perfect equilibria of Γ.
2. Could it be beneficial to apply sequential equilibrium rather than subgame perfect equilibrium in Γ, in the sense that the set of equilibrium predictions becomes smaller? Your answer should be based on general principles, not on computation.
3. Are any subgame perfect equilibria of Γ ruled out by forward induction? Explain.

Part III

Ben's (Bernoulli) utility for money m is $U(m) = m - bm^2$, where $b > 0$. Throughout, we assume money wealth is bounded by $0 < m < 1/(2b)$.

1. Ben is willing to accept a gamble. If his wealth falls, will he still accept the gamble?
2. Ben faces random wealth risk ε, so that his final wealth is $m+\varepsilon$. Assume $E[\varepsilon] = \mu$ and $\sigma^2 = E[(\varepsilon - \mu)^2]$. Does Ben have convex preferences over (μ, σ^2) when $0 < \mu < 1/(2b)$? Illustrate your argument.
3. Ben is willing to accept wealth risk (μ, σ^2). If b falls, is he still willing to accept it?
4. Assume Ann's utility of leisure ℓ and money m is $U(\ell, m) = a\ell + m - bm^2$, where $0 < a < 1$. Ann lives the American dream, and works for herself. If she works h hours, she earns corporate profits $h + \varepsilon$, where ε is random, with mean 0 and variance σ^2. The government taxes a fraction $t \in (0, 1)$ of profits. Knowing this rate, Ann decides how many hours to work to maximize her expected utility, subject to the constraint $h + \ell = 1$. Does more luck (higher σ^2) lead Ann to work more or less?
5. Show that expected tax revenues from Ann is a hump-shaped function of the tax rate t, namely, where Ann pays a fraction t of her profits in taxes.

   PS Make sure your plot fits on the back of Arthur Laffer's napkin.
6. Assume that a social planner wants higher tax revenue and greater welfare of Ann. Is the socially optimal tax higher or lower than the tax with maximum tax revenue?

Part IV

Consider the labor market for sales representatives. Good sales reps produce output θ_H while bad reps produce output θ_L, where $\theta_H > \theta_L > 0$. Output is each representative's private information; i.e., companies interested in hiring a representative do not observe his productivity. Assume that $\Pr(\theta = \theta_H) = 1/2$. Suppose that prior to applying for jobs, the representatives can accumulate ratings $r \in \mathbb{R}_+$ (their choice variable). Since the accumulation of ratings requires effort, a representative's payoff is given by

$$u(w, r; \theta) = w - r/\theta ,$$

where w is the wage. Assume that the labor market is competitive: $w = \mathbb{E}(\theta \mid r)$.

1. Characterize all separating equilibria, assuming pessimistic off-equilibrium beliefs.

2. Characterize all pooling equilibria, assuming pessimistic off-equilibrium beliefs.

3. Suppose that an unemployment benefit becomes available: a representative receives a payment of $\beta \in (\theta_L, \theta_H)$ if he chooses to remain unemployed. How will this unemployment benefit change the payoffs of the two types of the representatives in the pooling and separating equilibria?