HUL212 - MICROECONOMICS

MAJOR EXAMINATION (May 02, 2017), IITD SEM-II, AY 2016-17,

Time Allowed: 2 Hours. (ANSWER ALL, Max marks=30)

(Please read the questions carefully. No clarifications will be provided in the exam hall. Please draw diagram where ever you can even if there are no explicit mention of this.)

Q1 [10 marks].

Consider a homeowner with Von-Neumann and Morgenstern utility function u, where $u(x) = 1 - e^{-x}$, for wealth level x, measured in million INR. His entire wealth is his house. The value of a house is 1 (million INR), but the house can be destroyed by a flood, reducing its value to 0, with probability $\pi \in (0, 1)$.

(i) What is the largest premium P that the homeowner is willing to pay for a full insurance? (2)

(ii) Suppose there is a local insurance company who has insured n houses, all in his neighborhood, for premium P for each house. Suppose also that with probability π there can be flood in the neighborhood destroying all houses (i.e., either all houses are destroyed or none of them is destroyed). Suppose finally that P is small enough that the homeowner has insured is house. Having insured his house, what is the largest Q that he is willing to pay to get the $\frac{1}{n}$ share of the company? (The value of the company is the total premium it collects minus the payments to the insured homeowners in case of a flood.) (3)

(iii) Answer part (ii) assuming now that the insurance company is global. It insured n houses in different parts of the world (all outside of his neighborhood), so that the destruction of houses by flood are all independent (i.e., the probability of flood in one house is π independent of how many other houses has been flooded). (2)

(iv) Assume that n is large enough so that $\sum_{k=0}^{n} C_{n,k} e^{k/n} \pi^k (1-\pi)^{n-k} \approx e^{\pi + \pi(1-\pi)/2n}$. Simplify your answer in earlier part and discuss it intuitively. [Here, $C_{n,k}$ denotes the number of k combinations out of n] (1+2)

Q2 [5 marks].

Imagine that you start off with a portfolio of 60 percent stocks and 40 percent bonds. The returns on stocks, bonds, and gold are uncorrelated. Stocks earn a higher expected return than bonds. Bonds and gold earn the same lower expected return, but gold returns are three times as volatile as bond returns, as measured by the standard deviation. You want to minimize risk, measured by the variance of your portfolio return, without changing the expected return on your portfolio. How much gold should you buy?

$E((x - E(x))^2)$

Q3 [5 marks].

In the movie, "A Beautiful Mind", John Nash gets the idea for Nash equilibrium in a student hangout where he is sitting with three buddies (presumably the topologist John Milnor, the economist Harold Kuhn, the mathematician David Gale, and the economist Lloyd Shapley, all Princeton colleagues of Nash at the time). Five women walk in, four brunettes and a stunning blonde. Each of the four buddies starts forward to introduce himself to the blonde. Nash stops them, though, saying, "If we all go for the blonde, we will all be rejected and none of the brunettes will talk to us afterwards because they will be offended. So let's go for the brunettes." The next thing we see is the four buddies dancing with the four brunettes and the blonde standing alone, looking unhappy.

Assume that if more than one buddy goes after a single woman, they will all be rejected by the woman and end up alone. The payoffs are as follows. Ending up with the blonde has a payoff of 10, ending up with a brunette has a payoff of 5, and ending up alone is 0. The four buddies are players in this noncooperative game.
(i) Is the result in the story a Nash equilibrium? (1)
(ii) Find all pure-strategy Nash equilibria for this game. (2)
(iii) Are the Nash equilibria you find better than what Nash suggested in the movie? (2)

Q4 [**10 marks**].

Consider a two-consumer economy where each consumer has identical preferences given by:

$$u_i(x_i, G) = ln\ x_i + ln\ (G_i + G_j); \quad i \in \{1,2\}, j \in \{1,2\}, i \neq j, G_i \geq 0.$$

Individuals 1 and 2 have endowments I_1 and I_2 and face budget constraints: $I_i = x_i + G_i$. Good x is a private good while good G ($= G_i + G_j$) is a pure public good.
(a) Assuming that each consumer treats the other's spending on the public good as fixed in making his/her own consumption decisions, find the equilibrium level of privately-provided public good. Contrast this with the socially efficient level. (2+1)
(b) Find the equilibrium level of the privately-provided public good for the case of $I_1 = I_2 = 10$. What is the effect of a lump sum redistribution which changes endowments to $I_1 = 12, I_2 = 8$ on the privately-provided level of the public good? (1+1)
(c) Starting again from equal endowments of 10 per consumer, find the maximum transfer from person 2 to person 1 that will not alter the (equilibrium) level of privately provided public good. Contributions to the public good must be non-negative. (1)
(d) Suppose $I_1 = 14$, and $I_2 = 6$. What is the equilibrium provision of the public good? Is this a Pareto improvement than the one in (c)? Explain. (1+1)
(e) Keeping the amount of wealth equal to 20 in this economy, what will happen to the level of public good as we add two new consumers with the same preferences and as each consumer receives an equal endowment of 5? (2)

THE END