Intermediate Micro Midterm

June 15, 2016

Feel free to use your notes and a calculator. Any cell phones must be in airplane mode, no Wi-Fi; no Bluetooth, etc.

Remember to justify all of your responses. Little if any credit will be awarded to unjustified answers, even if they're correct.

Xi's Habits (15 points)

The purpose of this question is to probe your understanding of the intuitive meaning of risk aversion.

You offer Jinping to play a game. The game costs ¥1.

The game works as follows. You roll a dice. If the roll is a 6, you'll give Jinping ¥6.60; otherwise, he gets nothing.

1. What is the expected value of your game?

2. Suppose Jinping rejects your offer to play. Is he risk averse, risk neutral, risk loving, or can't we say?

3. Suppose Jinping accepts your offer to play. Is he risk averse, risk neutral, risk loving, or can't we say?

Combined CARA utility, Substitution (30 points)

The first purpose of this question is to demonstrate your facility with adapting the approaches of consumer utility maximization to new classes of utility functions you may not yet have before seen. The second purpose is to demonstrate familiarity with the concepts and methods for disentangling substitution from income effects.

Another class of utility functions that we haven't discussed yet in class are known as CARA preferences and take the general form $u(I) = -\frac{e^{-\alpha I}}{\alpha}$ [1] .

Consider an individual with preferences represented by the utility function:

$$u(x_1, x_2) = -\alpha e^{-x_1} - e^{-x_2}$$

This individual has income y and faces respective prices p_1 and p_2 for these goods. You can assume $\alpha > 0$, as are prices and income.

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[1] They are so called because the coefficient of absolute risk aversion, defined as $R(x;u) = -\frac{u''(x)}{u'(x)}$, is constant for this class of functions. There is much more to say about coefficients of risk aversion which we won't have time to get in to in this course.

1. Formulate the individual's decision problem. What do they choose, what is their objective, and what is (are) their constraint(s)?

2. Now set $\alpha = 2$, $y = 4$, $p_1 = 1$, and $p_2 = 3$. What is the individual's utility-maximizing consumption bundle?

3. Suppose p_2 increases to 4. What is the individual's new utility maximizing consumption bundle?

4. Explain briefly what the substitution and income effects are.

5. Separate the change in demand for good 2 from parts 2 to 3 into that change attributable to substitution effect, and that part which can be isolated as due to income.

Waking Up in a New Bugatti (30 points)

The purpose of this question is to probe your comfort with intertemporal tradeoffs.

You're considering buying a new Bugatti now, but can't afford it. You'll need to borrow against your future income (i.e., your income in the second and final period) in order to do so.

Your first-period income is I_1; I_2 is your future income. The cost of the Bugatti is c, and the utility benefit of using your fresh Bugatti is v_B – i.e., your total utility increases by exactly v_B when you own the wonderful Veyron 16.4.

The car dealership is willing to offer you phenomenally good financing – since you'll be paying them back in cash in period 2 (as any true baller must), they've offered to give you an *interest-free loan*. Note that these terms *only* apply to the car purchase. **It is otherwise impossible to transfer funds between periods through saving and borrowing!**

Your utility is otherwise represented by standard intertemporal Cobb-Douglas preferences:

$$u(c_1, c_2) = \ln c_1 + \beta \ln c_2$$

1. What is your utility, in terms only of *relevant* model parameters (I_1, I_2, c, v_B, β), of **not** buying the Bugatti? (*Hint: If we don't buy the car, the only choice we have left is to consumer our income*)

   In order to finance the Bugatti, you must decide how much money to borrow in period 1 from the dealership. Let b denote the (dollar) size of the loan you choose.

2. What is your utility, in terms only of b and *relevant* model parameters (I_1, I_2, c, v_B, β), of **buying** the Bugatti? (*Hint: What is your income in each period if you take out a loan for b to buy the car?*)

3. Formulate the decision problem associated with the choice of b.

4. Now, set $I_1 = 1$, $I_2 = 5$, $c = 5$, and $\beta = .96$. Solve for the optimal choice of b.

5. What is the utility of shelling out for the Bugatti? What is the utility of not doing so? How big does v_B have to be in order to justify the purchase?

Whimsy's Insurance Shack (25 points)

The purpose of this question is to delve into mechanics of insurance markets with perfect information.

You're considering whether or not to buy a policy from Whimsy's Insurance Shack, Inc.

For a premium of ¥350, Whimsy's will be contractually obligated to do the following:

- If no harm comes to you, they'll do nothing.

- If you're in an accident, one of two things will happen:

    - Whimsy will pay you ¥30000. This happens with probability 0.8.

    - Whimsy will pay you ¥50. This happens with probability 0.2.

As to you, you face only one type of risk – the risk of contracting a bacterial infection in a disgusting bathroom. The probability of this happening is p, and the economic cost of recovery from this is equivalent to ¥25000.

You have income ¥65000 from other sources, and your preferences in any state of the world are logarithmic – if you consume I of income in some state of the world, you receive utility $\ln I$ from doing so.

1. What are all of the possible states of the world that could befall you? Note that once you get the bacterial infection once, you are thereafter immune upon recovery.

2. What is your expected utility if you choose not to buy Whimsy's policy?

3. What is your expected utility should you decide to buy the policy?

4. Will you buy the policy?

5. Does Whimsy make money from you, in expectation?