Intermediate Microeconomics
Econ 3101, Section 002
Midterm-Solutions

Name: ______________________________

Student Number: ___________________

1 Economic Concepts

1.1 Definitions (10 Points)

- Optimization principle: agents are doing the best they can given the constraints
- Monotonic preferences: more (of each good) is preferred to less
- Inferior good: good for which demand goes up (down) when income goes down (up)
- Endogenous variable: variable whose value is determined in the model
- Inelastic demand: demand that is not very responsive to price changes ($\|PED\| < 1$)

1.2 True or False (10 Points)

False 1. With convex preferences, people prefer one good or the other, not a mixture of both.
True 2. Giffen goods do not satisfy the law of demand.
True 3. A positive subsidy results in the expansion of the consumer's budget set.
False 4. Rationing poses no limit to what can be consumed in equilibrium.
True 5. When assets that yield the same return have different prices, arbitrage occurs.

2 Economic Models

Question 1. ***Consumer Choice.***

Suppose the representative consumer, Robinson Crusoe, has the following utility function: $u(x, y) = 7x + 2y$, where x and y denote the only two goods in the economy. Let p_x and p_y denote prices for x for y, and m income.

(a) [4] Write down the budget constraint for this consumer.

Ans: $p_x x + p_y y = m$

(b) [12] Derive Robinson's demand for both x and y.

Ans: Robinson's demand is given by:

- For $\frac{p_y}{p_x} < \frac{2}{7}$, $x^* = 0; y^* = \frac{m}{p_y}$
- For $\frac{p_y}{p_x} > \frac{2}{7}$, $x^* = \frac{m}{p_x}; y^* = 0$
- For $\frac{p_y}{p_x} = \frac{2}{7}, (x^*, y^*) = \{(x, y) : p_x x + p_y y = m, x \geq 0, y \geq 0\}$

(c) [4] How much of x and y will Robinson consume if $p_x = p_y = 5$ and $m = 50$?

Ans: $\frac{p_y}{p_x} = 1$ Since $\frac{p_y}{p_x} > \frac{2}{7}$, from part (b) we have $x^* = 10; y^* = 0$

Question 2. ***Income and Substitution Effects.***

Consider a Robinson Crusoe (i.e. single agent) economy with demand function $x(p_1, p_2, m) = (\frac{p_2-m}{p_1}, \frac{p_1+m}{p_2})$. The price of good 1 is denoted by p_1, that of good 2 by p_2, and income by m.

(a) [6] Is good 1 inferior? What about good 2? Justify your answer.

Ans: Good 1 is inferior. This is because $\frac{\partial x_1}{\partial m} = \frac{-1}{p_1} < 0$. Good 2 is normal as $\frac{\partial x_2}{\partial m} = \frac{1}{p_2} > 0$.

(b) [6] Are there Giffen goods in this economy? Justify your answer.

Ans: There are no Giffen goods in this case. This can be seen from the fact that $\frac{\partial x_1}{\partial p_1} = \frac{-p_2}{p_1^2} < 0$ and $\frac{\partial x_2}{\partial p_2} = \frac{-p_1}{p_2^2} < 0$.

(c) [6] Let $p_2 = 100$, $m = 20$, and suppose p_1 increases from 4 to 8. Find the change in the quantity demanded of good 1.

Ans: Calculating demand of good 1 for both prices yields $x_1(4, 100, 20) = \frac{100-20}{4} = 20$ and $x_1(8, 100, 20) = \frac{100-20}{8} = 10$. The change in quantity demanded is then $\Delta x_1 = -10$

(d) [12] For the change in part (c), calculate the magnitude of the Slutsky substitution and income effects.

Ans: Find the income associated with the pivoted budget line: $\Delta m = x \cdot \Delta p_x = 20 \cdot 4 = 80$ Hence $m' = 20 + 80 = 100$

Then compute $x_1(8, 100, 100) = \frac{100-100}{8} = 0$ Thus the substitution effect is $0 - 20 = -20$ and the income effect is $-10 - (-20) = 10$ Note the income effect in this case is positive as the good is inferior.

Question 3. ***Mispriced Assets.***

Consider two assets, x and y, where x yields a return p_x every period and y a return of p_y every other period starting today. The interest rate is r, where $r > 0$.

(a) [12] At what price should assets x and y be sold so that arbitrage is not possible? Write your answer in terms of p_x and p_y.

Ans: Market price should be equal to the sum of discounted present value of all future returns to prevent arbitrage.

The price for x should then be $\frac{p_x(1+r)}{r}$ and for y $\frac{p_y(1+r)^2}{r^2+2r}$.

(b) [6] Suppose the return structure for asset y has changed so that it now yields p_y every other period half the time, and p_x the other half. (There is still no return to holding y every even period.) What will be the new price for this asset?

Ans: It's new price will be $\frac{p_y(1+r)^4}{(1+r)^4-1} + \frac{p_x(1+r)^2}{(1+r)^4-1}$

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(c) [12] Something that has been common in the lead up to the current financial crisis has been the mispricing of assets. Suppose in our model that x was mispriced and that in reality it only yields p_x with certainty every other period. What relation between p_x and p_y must hold if x and y have the same price in equilibrium? Take the return structure for y to be that given in part (b).

Ans: Find the new price for asset x: $\frac{p_x(1+r)^2}{r^2+2r}$

Equate this price with the price for y found in part (b): $\frac{p_x(1+r)^2}{r^2+2r} = \frac{p_y(1+r)^4}{(1+r)^4-1} + \frac{p_x(1+r)^2}{(1+r)^4-1}$

Simplifying yields $p_x = p_y$.