ECON 301, Prof. Hogendorn

Problem Set 3

1. *Medical.* Prices of medical services have been rising much faster than other goods and services in the economy. Let μ be medical services and x be all other goods. Suppose that a consumer has a demand curve for medical services of

$$\mu(p_\mu, p_x, m) = m - 30\sqrt{p_\mu} + 2p_x$$

   (a) In 2000, the prices were $p_x = 1$, $p_\mu = 1$, and $m = 40$. By 2007 prices had risen to $p'_x = 1.2$, $p'_\mu = 1.5$ and income had risen to $m' = 48$. Draw an indifference curve diagram, (with x on the x-axis) showing the two budget lines and the two optimal points. Remember that all income not spent on μ is spent on x.

   (b) Calculate the Laspeyres price index for the price change from 2000 to 2007.

   (c) Calculate the Paasche price index for the price change from 2000 to 2007.

   (d) If the consumer had been given a raise based on the Laspeyres price index, how much x and μ would she have consumed in 2007. Would her utility have been higher or lower than in 2000?

2. *Apartments.* Suppose the market demand curve for apartments is

$$x(p) = \left(100 - \frac{pm^2}{2880}\right)$$

   x is the number of apartments rented, p is the monthly rent on a typical apartment, and m is the monthly income of a typical consumer in thousands of dollars.

   (a) If the current rent is \$900 and the current income is \$4, graph the demand curve and the Engel curve, labeling the current point and the intercepts.

(b) Which of the following describe apartments at the current price and income: price elastic, price inelastic, necessity, luxury, normal, inferior. (Presumably people would rather own houses or condos if they have higher incomes.)

(c) If the price falls to \$800, what lump-sum tax or subsidy would leave the consumer able to purchase the same consumption bundle as before?

3. *Pate.* There are two goods, goose liver pate (G) and beef (B). The typical French person has an endowment of $\omega_G = 50, \omega_B = 50$ and a utility function $U(G, B) = G^{0.7}B^{0.3}$. The typical American has an endowment of $\omega_G = 30, \omega_B = 70$ and a utility function $U(G, B) = B^{0.8}$. Note that the typical American simply does not receive utility from the pate.

   (a) What is the typical French and American MRS in (B, G) space at the endowment points?

   (b) Draw an Edgeworth box and show indifference curves for each type of consumer. Show the core and the contract curve.

Review Problems, not to turn in:

4. *Urp.* The residents of Uurp consume only pork chops (X) and Coca-Cola (Y). The utility function of the typical resident of Uurp is given by

$$U(X, Y) = \sqrt{XY}$$

   In 2006, the price of pork chops in Uurp was \$1 each; Cokes were also \$1 each. The typical resident consumed 40 pork chops and 40 Cokes (saving is impossible in Uurp). In 2007, swine fever hit Uurp, and pork chop prices rose to \$4; the Coke price remained unchanged. At these new prices, the typical Uurp resident consumed 20 pork chops and 80 Cokes.

   (a) What was the change in utility from 2006 to 2007?

   (b) What was the Laspeyres price index for 2007?

   (c) What was the Paasche price index for 2007?

(d) What do you conclude about the ability of price indices to measure changes in welfare? (Hint: calculate how much income the typical Urp resident had in 2006 and 2007.)

5. *AishaMrLee.* Aisha's utility function is

$$u(G, V) = G^{0.7}V^{0.3}$$

and Mr. Lee's utility function is

$$u(G, V) = G^{0.9}V^{0.1}$$

Aisha has 20 ounces of G and 10 ounces of V. Mr. Lee has 15 ounces of G and 15 ounces of V. This is all the G and V there is in the world, and there are no other people to trade with.

(a) Calculate the MRS in (G, V) space for both consumers at the endowment point.

(b) Draw an Edgeworth box showing the endowment and indifference curves of the consumers. (The indifference curves do not have to be plotted to match the utility function perfectly.)

(c) Assume that Aisha and Mr. Lee can trade at a market price as price-takers. If we set G as the numeraire, what is the price of V? What is the final allocation of G and V?

(d) Show the trading in your diagram.

Answers to Review Problems:

5. *Urp_a.*

(a)

$$\begin{aligned} U_{2006} &= \sqrt{40 \cdot 40} = 40 \\ U_{2007} &= \sqrt{20 \cdot 80} = 40 \end{aligned}$$

(b)

$$\frac{4 \cdot 40 + 1 \cdot 40}{1 \cdot 40 + 1 \cdot 40} = 2.5$$

(c)

$$\frac{4 \cdot 20 + 1 \cdot 80}{1 \cdot 20 + 1 \cdot 80} = 1.6$$

(d) We know that in actual fact, utility was unchanged and the new income in 2007 must have been $4 \cdot 20 + 1 \cdot 80 = 160$ which was twice the income of $1 \cdot 40 + 1 \cdot 40 = 80$ in 2000. Thus, Laspeyres overstated the amount of income needed to keep utility constant, and Paasche understated it.

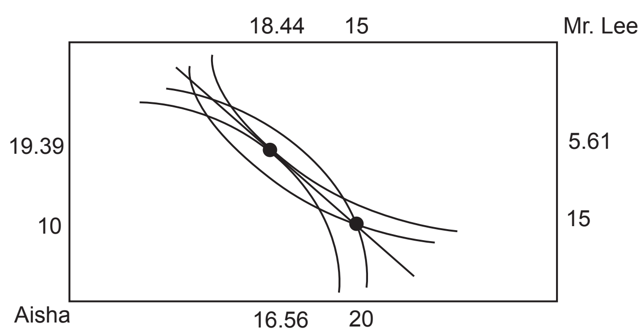
6. *AishaMrLee_a.*

(a)

$$MRS_A = -\frac{\frac{\partial u}{\partial G}}{\frac{\partial u}{\partial V}} = -\frac{.7G^{-.3}V^{.3}}{.3G^{.7}V^{-.7}} = -\frac{7}{3}\frac{V}{G} = -\frac{7}{3}\frac{10}{20} = -\frac{7}{6}$$

$$MRS_L = -\frac{\frac{\partial u}{\partial G}}{\frac{\partial u}{\partial V}} = -\frac{.9G^{-.1}V^{.1}}{.1G^{.9}V^{-.9}} = -9\frac{V}{G} = -9\frac{15}{15} = -9$$

(b) and (d)



(c) We have seen before that the demand functions for a Cobb-Douglas will produce the following results:

$$\begin{aligned} G_A &= 0.7\frac{m}{p_G} = 0.7\frac{20 + 10p_V}{1} \\ G_L &= 0.9\frac{m}{p_G} = 0.9\frac{15 + 15p_V}{1} \end{aligned}$$

Thus, the market equilibrium condition is:

$$\begin{aligned} G_A + G_L &= 35 \\ 27.5 + 20.5p_V &= 35 \end{aligned}$$

Solving this gives

$$20.5p_V = 7.5 \Rightarrow p_V = 0.366$$

This means that $G_A = 16.56$, $G_L = 18.44$, $V_A = 19.39$, $V_L = 5.61$.