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ECON 201 - Problem Set 6

1. You have data on an individual's consumption of three goods in three price regimes:

Regime	Price			Consumption		
	p_1	p_2	p_3	q_1	q_2	q_3
A	1	1	2	1	0	0
B	2	1	1	0	1	0
C	1	1	2	0	0	1

- (a) Do these data satisfy (i) WARP (ii) SARP?
- (b) Should we expect to be able to fit a stable demand system consistent with utility maximising behaviour to this data?
2. You are given the following information about a consumer's purchases. Goods 1 and 2 are the only goods consumed.

	Year 1		Year 2	
	Quantity	Price	Quantity	Price
Good 1	100	100	120	100
Good 2	100	100	?	80

For what values of good 2 consumed in year 2 would you conclude:

- (a) that the consumer's consumption bundle in year 1 is revealed preferred to that in year 2?
- (b) that the consumer's consumption bundle in year 2 is revealed preferred to that in year 1?
- (c) that her/his behaviour contradicts the weak axiom?
- (d) that good 1 is an inferior good somewhere for this consumer (assume WARP holds)?
- (e) that good 2 is an inferior good somewhere for this consumer (assume WARP holds)? What is the total change in consumption of x_1 ?

3. Answer the following questions:

(a) When prices are (\$6,\$3), Holly chooses the bundle (9,18), and when prices are (\$1,\$2), she chooses the bundle (8,14). Does Holly violate WARP?

(b) If Goldie chooses the bundle (6,6) (call it bundle A) when prices are (\$6,\$2) and the bundle (10,0) (call it bundle B) when prices are (\$2,\$5), can you say that A is revealed preferred to B? What about B is revealed preferred to A? Is there any evidence that she violates WARP and why?

(c) Desmond has lived in Australia, Belgium, and Canada. His tastes never changed but his income and prices did. In Australia his commodity bundle was $(x_1, x_2) = (7, 8)$, in Belgium it was (9,4), and in Canada it was (7,5). Prices in Canada were $(p_1, p_2) = (\$3, \$3)$, and prices in Belgium were $(p_1, p_2) = (\$5, \$6)$, and prices in Australia were $(p_1, p_2) = (\$16, \$4)$. Does Desmond's preferences satisfy weak axiom of revealed preferences? Why or why not? Explain carefully.

(d) At prices $(p_1, p_2) = (\$4, \$2)$, Ivan buys the bundle $(x_1, x_2) = (8, 20)$. At prices $(p'_1, p'_2) = (\$2, \$4)$, he buys the bundle $(x'_1, x'_2) = (10, 13)$. At prices (p''_1, p''_2) , he buys the bundle $(x''_1, x''_2) = (14, 11)$. Assuming that his preferences satisfy the strong axiom of revealed preferences, and find a relation between p''_1 , and p''_2 (i.e. something like $ap''_1 < bp''_2$). Show your work.

4. Carina buys two goods, food (F) and clothing (C), with the utility function $u(F, C) = FC + F$. She has an income of \$20, and the price of clothing is \$4 per unit.

(a) Compute the optimal consumption bundle when the price of food is \$1 per unit.

(b) Suppose the price of food rises to \$4 per unit. What is the new optimal bundle?

(c) How much of the change in food consumption from part (a) to part (b) is attributable to the substitution effect and how much to income effect, if we use Slutsky compensation?

(d) How much of the change in food consumption from part (a) to part (b) is attributable to the substitution effect and how much to income effect, if we use Hicksian compensation?

(e) Solve part (a) through (d) when the utility is $u(F, C) = 2F^{\frac{1}{2}} + C$.

5. Mark's utility function is described as $u(x_1, x_2) = x_1^2 x_2$. His income is \$600, and $p_2 = \$1$. The price of x_1 decreases from \$10 to \$5.

(a) How much does the consumption of x_1 change due to this price change?

(b) Find the substitution and income effects on x_1 , using Hicksian compensation?

- (c) Find the substitution and income effects on x_1 , using Slutsky compensation?
 - (d) Is x_1 an ordinary good or a Giffen good? Why?
 - (e) Is x_1 a normal or inferior good? Why?
 - (f) Illustrate substitution and income effect on a graph using Hicksian compensation.
6. Benjamin spends his time either watching movies (x_1) on Netflix or listening to songs on Spotify (x_2). His preferences are described by $U(x_1, x_2) = 4\ln(x_1) + \ln(x_2)$. His total income is $m = 100$, the price of a song is one dollar ($p_2 = \$1$). Suppose that the price of a movie drops from $p_1 = 10$ to $p'_1 = 5$.
- (a) By how much the "consumption" of movies changes due to the price drop?
 - (b) Are movies ordinary or Giffen goods? Explain why.
 - (c) By how much x_1 changes because movies are cheaper relative to songs (find substitution effect)
 - (d) How about the effect of increased purchasing power of Benjamin's income? (find income effect)
 - (e) Is the income effect in (d) positive or negative? Why? (Hint: is a movie a normal or inferior good?)
 - (f) Show the total change, the substitution and income effects on the graph.
7. Consider Trevor from our previous problem set. He begins the day with a strawberry milkshake (milk and strawberries mixed in proportion 1:5). His income is equal to $m = 200$, and one strawberry costs $p_2 = 1$. Suppose the price of milk drops from $p_1 = 15$ to $p_1 = 5$.
- (a) What is the total change in demand for milk.
 - (b) What is a substitution effect?
 - (c) How about income effect?
8. Assume that a consumer has a utility function given by $u(x_1, x_2) = 2x_1 + x_2$.
- (a) Find the optimal bundle for $p_1 = \$1$, $p_2 = \$1$ and $m = \$5$.
 - (b) Find the optimal bundle when the price of x_1 rises to $\$3$ and the price of x_2 and income both stay the same as in (a).
 - (c) Find the income and substitution effects due to this increase in price of x_1 (from $\$1$ to $\$3$), using Hicksian compensation.

- (d) Would the income and substitution effects be different if the price of x_1 rises only to \$1.25 from \$1?
9. Suppose that the utility function of a consumer is given by $u(x_1, x_2) = \ln(x_1) + x_2$.
- (a) Derive the Hicksian demand functions, $h_1(p_1, p_2, \bar{u})$ and $h_2(p_1, p_2, \bar{u})$, assuming interior solutions.
- (b) Find the values of the substitution effect, the income effect, and the total effect, on both goods, of a change from $p_1 = \frac{1}{3}$ to $p_1' = \frac{1}{2}$, when $p_2 = 1$ and $m = 6$.
10. Draw two graphs, one directly above the other. On the upper graph, label the vertical axis Good X and label the horizontal axis Good Y. On the lower graph, label the vertical axis the Price of good Y and label the horizontal axis Good Y. In the upper graph, show the income and substitution effects of a decrease in the Price of good Y when Y is a Giffen good. Draw the corresponding demand curve for Good Y in the lower graph.
11. True/False/Explain.
- (a) Consumer surplus provides an exact measure of a change in consumer welfare if and only if the substitution effect is zero.
- (b) Consider two different welfare policies: (i) a per unit subsidy s on good 1 or (ii) a lump sum cash grant S to all consumers. If both programs leave the consumer equally well off, the first program is always less expensive to taxpayers than the second.
- (c) In a two good world, the compensated (i.e., Hicksian) demand curve is always steeper than the ordinary (i.e., Marshallian) demand curve.
12. The government wants to raise a specific amount of revenue with either (1) an excise tax t or (2) a lump-sum tax τ . Assuming that preferences for the taxed good and all other goods are strictly convex, and assuming that the lump-sum tax must raise the same exact amount of revenue as the per unit excise tax, which tax do people prefer? Draw a carefully labelled diagram to illustrate your answer.