

## Finance 510 Problem Set #2

- 1) Consider a consumer choosing between three goods.

$$P = (P_1, P_2, P_3), X = (X_1, X_2, X_3) \text{ (i.e. three prices, three products)}$$

Each of the following groups represents choices of  $X_1$ ,  $X_2$ , and  $X_3$  for various prices of  $X_1$ ,  $X_2$ , and  $X_3$ . Determine which group is inconsistent with rational choice.

Group #1:  $P = (1, 2, 3), X = (3, 2, 1)$   
 $P = (2, 1, 2), X = (2, 2, 1)$   
 $P = (3, 5, 1), X = (1, 2, 1)$

Group #2:  $P = (3, 4, 1), X = (5, 1, 3)$   
 $P = (2, 3, 2), X = (3, 3, 3)$   
 $P = (5, 3, 1), X = (4, 2, 2)$

Group #3:  $P = (4, 3, 2), X = (2, 2, 2)$   
 $P = (5, 3, 3), X = (1, 3, 3)$   
 $P = (5, 2, 3), X = (1, 3, 2)$

- 2) Suppose that the price of good X is \$4 and the price of good Y is \$6. You have \$100 to spend and your preferences over X and Y are defined as

$$U(x, y) = x^{\frac{2}{3}} y^{\frac{1}{3}}$$

Solve for your optimal choice of X and Y.

- 3) Consider the following utility function.

$$U(x, y) = (x^\rho + y^\rho)^{\frac{1}{\rho}} \quad \rho \leq 1$$

- a) Calculate the marginal rate of substitution
- b) Calculate the elasticity of substitution (hint: it should be constant)
- c) Calculate the demand curves for x and y

- d) Show that when  $\rho < 0$ , the demand for x falls when the price of y rises (income effect dominates) and when  $\rho > 0$  the substitution effect dominates and x increases when the price of y rises.

- 4) Suppose that you estimated the following demand curve.

$$Q = 90.5 - 3.36P + .002I$$

$Q$  Represents quantity demanded,  $P$  represents price and  $I$  represents average income.

You know that the current market price is \$20 and average income is \$20,000

- Calculate current demand.
- Calculate the price elasticity of demand.
- Calculate the income elasticity of demand

How would your answers change if you estimated this demand curve in log form?

$$\ln(Q) = 63.6 - 2.5\ln(P) + .78\ln(I)$$

- 5) Suppose that you have estimated the following demand curve:

$$Q = 90.5 - 3.36P + .002I$$

You know that the current market price is \$20 and average income is \$20,000.

- Calculate the markets total willingness to pay.
- Calculate the market's consumer surplus.