Economics 51
Summer 1999
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Solution Set: Quiz 2

Let $U(x_1, x_2) = x_1 x_2^2$ and the budget constraint be $I = p_1 x_1 + p_2 x_2$

a. To find the demand functions we set up the Lagrangian:

$$L = x_1 x_2^2 + \lambda(I - p_1 x_1 - p_2 x_2)$$

and take first order conditions with respect to x_1, x_2andλ

1. $\frac{\partial L}{\partial x_1} = x_2^2 - \lambda p_1$
2. $\frac{\partial L}{\partial x_2} = 2x_1 x_2 - \lambda p_2$
3. $\frac{\partial L}{\partial \lambda} = I - p_1 x_1 - p_2 x_2$

From (1.) and (2.) : $x_1 = x_2(\frac{p_2}{2p_1})$ and $x_2 = x_1(\frac{2p_1}{p_2})$
Substituting into (3.):$x_1 = \frac{I}{3p_1}$ and $x_2 = \frac{2I}{3p_2}$

b. Yes, the demand functions are both homogeneous of degree zero in p and Y. If we double both prices and income, the amount of the good demanded stays the same. More formally, $x(tm, tp) = x(m, p)$. Note however that the demand function is homogeneous of degree one in Y alone. $x(tm, p) = tx(m, p)$

c. The expenditure shares are constant.

1. $\frac{p_1 x_1}{I} = \frac{1}{3}$
2. $\frac{p_2 x_2}{I} = \frac{2}{3}$

d. The indirect utility function, $V(p, m)$ is the maximum utility attainable, given a particular (p, m). We calculate the indirect utility function by plugging in the [Marshallian] demand functions $x(p, m)$ into the utility function $U(x)$.

$$V(p, m) = (\frac{I}{3p_1})(\frac{2I}{3p_2})^2$$