

Econ 8010 HW2

Due Tuesday, September 12

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1. Consider a quasilinear utility function $u : \mathbb{R}_+^L \times \mathbb{R} \rightarrow \mathbb{R}$ given by

$$u(x, m) = \phi(x) + m$$

Suppose that ϕ is twice continuously differentiable and strictly concave: its Hessian derivative matrix $D^2\phi(x)$ is a continuous function of x and is negative definite for all x .

- (a) Express Walrasian demand for x as an **implicit** function of prices p and wealth w .
 - (b) Express Hicksian demand for x as an **implicit** function of prices p and required utility level \bar{u} .
 - (c) Use the implicit function theorem to compute the Slutsky matrix. (Hint: Negative definite matrices are always invertible.) What has to be true about the Hessian derivative matrix $D^2\phi(x)$ for each of the L non-numeraire goods to be net substitutes? What about net complements?
2. (exercise by Dan Quint¹) Let $u(x) = x_1^\alpha(x_2 + x_3)^{1-\alpha}$.

¹I have added part (d) to the original exercise.

- (a) Is utility homothetic? What does that tell you about the change in Walrasian demand as wealth increases?
- (b) If $p_2 > p_3$, which goods will the consumer demand? If $p_3 > p_2$?
- (c) Solve the UMP and find Walrasian demand:
 - i. when $p_2 > p_3$
 - ii. when $p_3 > p_2$
 - iii. when $p_2 = p_3$
- (d) Solve the EMP and find Hicksian demand:
 - i. when $p_2 > p_3$
 - ii. when $p_3 > p_2$
 - iii. when $p_2 = p_3$
- (e) Compute the indirect utility function $v(p, w)$ and the expenditure function $e(p, \bar{u})$.

3. A consumer has Cobb-Douglas utility

$$u(x_1, x_2) = \frac{1}{3} \log x_1 + \frac{2}{3} \log x_2$$

and wealth $w = 18$.

Suppose prices change from $(p_1, p_2) = (1, 2)$ to $(3, 1)$.

- (a) What is her consumption bundle at the original price vector? How much utility does this yield? How much wealth will she need to afford her old consumption bundle after the price change?
- (b) Calculate the (total, not infinitesimal) Slutsky substitution effect of the price change.
- (c) Calculate the (total, not infinitesimal) Hicks substitution effect of the price change.