The Paradigm of Consumer Behavior

How Dog Haters are like Dog Lovers

Dog Haters

- Just keep ‘em alive
- Do it Efficiently -- Known Nutrition Function
- Expenditure Minimizing Behavior

$$\min_{\{x_i\}} E = \sum_{i=1}^{n} p_i x_i + \lambda [N^0 - N(x_1,\ldots,x_n)]$$

Dog Hater Optimal Choices

- FOC & SSOC:

$$\partial E / \partial x_i = p_i - \lambda N_i(.) = 0, \; i = 1, n$$

$$\partial E / \partial \lambda = N^0 - N(.) = 0$$

$$H = \begin{vmatrix} -\lambda N_{ij} & \vdots & -N_j \\ \cdots & & \cdots \\ -N_i & \vdots & 0 \end{vmatrix}, \; i \& j = 1, n$$

Dog Hater Demand Curves

$$\begin{bmatrix} -\lambda N_{11} & \cdots & -\lambda N_{1i} & \cdots & -\lambda N_{1n} & -N_1 \\ \vdots & \ddots & \vdots & & \vdots & \vdots \\ -\lambda N_{i1} & \cdots & -\lambda N_{ii} & \cdots & -\lambda N_{in} & -N_i \\ \vdots & & \vdots & \ddots & \vdots & \vdots \\ -\lambda N_{n1} & \cdots & -\lambda N_{ni} & \cdots & -\lambda N_{nn} & -N_n \\ -N_1 & \cdots & -N_i & \cdots & -N_n & 0 \end{bmatrix} \begin{bmatrix} \partial x_1^* / \partial p_i \\ \vdots \\ \partial x_i^* / \partial p_i \\ \vdots \\ \partial x_n^* / \partial p_i \\ \partial \lambda^* / \partial p_i \end{bmatrix} = \begin{bmatrix} 0 \\ \vdots \\ -1 \\ \vdots \\ 0 \\ 0 \end{bmatrix}$$

$$\frac{\partial x_i^*}{\partial p_i} = (-1)\frac{H_{ii}}{H}$$

Dog Lovers

- Fat ‘n Happy
- Maximize Nutrition
- Subject to an Expenditure Constraint

$$\max_{\{x_i\}} N = N(x_1,\ldots,x_n) + \mu\left[E^0 - \sum_{i=1}^{n} p_i x_i\right]$$

Dog Lover Optimal Choices

- FOC & SSOC:

$$\partial N / \partial x_i = N_i(.) - \mu p_i = 0; i = 1, n$$

$$\partial N / \partial \mu = E^0 - \sum_{i=1}^{n} p_i x_i = 0$$

$$H^E = \begin{vmatrix} N_{ij} & \vdots & -p_i \\ \cdots & & \cdots \\ -p_j & \vdots & 0 \end{vmatrix}$$

Dog Lover Demand Curves

$$\begin{bmatrix} N_{ij} & \vdots & -p_i \\ \cdots & & \cdots \\ -p_j & \vdots & 0 \end{bmatrix} \begin{bmatrix} \partial x_k^E / \partial p_i \\ \cdots \\ \partial x_i^E / \partial p_i \\ \cdots \\ \partial \mu^E / \partial p_i \end{bmatrix} = \begin{bmatrix} 0 \\ \cdots \\ \mu \\ \cdots \\ x_i \end{bmatrix}$$

$$\frac{\partial x_i^E}{\partial p_i} = \mu \frac{H_{ii}^E}{H^E} + x_i \frac{H_{n+1,i}^E}{H^E}$$

Dog Haters v. Dog Lovers

- Haters:

$$x_i^N = x_i^N(p_1,\ldots,p_n,N^0)$$

- Lovers:

$$x_i^E = x_i^E(p_1,\ldots,p_n,E^0)$$

Dog Hater Hires a Dog Lover

- Hater's Budget becomes Lover's Constraint

$$E^* = \sum_{i=1}^{n} p_i x_i^N$$

- Commodity Choices are Identical (Duality)

$$x_i^E(p_1,\ldots,p_n,E^*(p_1,\ldots,p_n,N^0)) \equiv x_i^N(p_1,\ldots,p_n,N^0)$$

- Demand Slopes Embody Symmetry

$$\frac{\partial x_i^E}{\partial p_i} + \frac{\partial x_i^E}{\partial E}\frac{\partial E^*(N^0)}{\partial p_i} = \frac{\partial x_i^N}{\partial p_i}$$

Dog Lovers act like Dog Haters

- Envelope Theorem:

$$E^* = \sum_{i=1}^{n} p_i x_i^N$$

$$\frac{\partial E^*}{\partial p_i} = x_i^N = x_i^E$$

- Behavioral Equivalence =>

LAW OF DEMAND:

$$\frac{\partial x_i^E}{\partial p_i} + \frac{\partial x_i^E}{\partial E} x_i^E = \frac{\partial x_i^N}{\partial p_i} < 0$$