Marshallian Demand (Demand Function)

A relationship between how much you buy and the prices and income. Optimal amount to buy for any p_1, p_2, m.

"Optimal bundle" what does the consumer buy for some specific prices and income.

$$u\left(x_1, x_2\right) = x_1 x_2$$

Marshallian Demand (Demand Function)

$$x_1 = \frac{\frac{1}{2}m}{p_1}, x_2 = \frac{\frac{1}{2}m}{p_2}$$

$$u\left(x_1, x_2\right) = min\left\{x_1, x_2\right\}$$

$$x_1 = \frac{m}{p_1 + p_2}, x_2 = \frac{m}{p_1 + p_2}$$

Income (Normal/Inferior):

Normal: $m \uparrow, x_1 \uparrow$

Inferior: $m \uparrow, x_1 \downarrow$

Own Price (Ordinary/Giffen):

Ordinary: $p_1 \uparrow, x_1 \downarrow$, or $p_2 \uparrow, x_2 \downarrow$

Giffen: $p_1 \uparrow, x_1 \uparrow$

Other Price (Complement/Substitute):

Substitute: $p_2 \uparrow, x_1 \uparrow$

Compelement: $p_2 \uparrow, x_1 \downarrow$

0.1 Inverse Demand

Demand is a relationship between how much you buy and price. Inverse demand is the opposite. Price and how much you buy.

$$x_1 = \frac{\frac{1}{2}\left(20\right)}{p_1} = \frac{10}{p_1}$$

Demand (relationship between amount and price):

$$x_1 = \frac{10}{p_1}$$

Inverse demand asks: "what price would be responsible for me buying a certain amount of a good"

$$p_1 = \frac{10}{x_1}$$

This is the inverse demand. To buy 10 units of the good, the price must be 1.

Suppose demand is:

$$x = 100 - 2p$$

To get inverse demand, isolate p:

$$2p = 100 - x$$

$$p = 50 - \frac{1}{2}x$$

1 Budget

Budget set is all bundles (x_1, x_2) I can afford.

$$p_1x_1 + p_2x_2 \leq m$$

Budget line is the bundles that cost entire income.

$$p_1x_1 + p_2x_2 = m$$

$$x_2 = \frac{m}{p_2} - \frac{p_1}{p_2}x_1$$

Budget line has a slope:

$$-\frac{p_1}{p_2}$$

How much x_2 you have to give up to get one unit of x_1.

Budget line intercepts. How much of each good you can afford if you only buy that good.

$$\left(\frac{m}{p_1}, 0\right), \left(0, \frac{m}{p_2}\right)$$

If you have perfect substitutes utility:

$$u\left(x_1, x_2\right) = ax_1 + bx_2$$

$$2x_1 + x_2$$

2 Relations

Reflexive: Everything is related to itself in that way.

A relation on $\{x, y, z\}$

$$xRx, yRy, zRz$$

For a weak preference realtion $\succsim$

$$x \succsim x, y \succsim y, z \succsim z$$

Complete: For every pair of things (including a thing and itelf) some direction is true. (A complete relation must be reflexive).

This complete

$$x \succsim x, y \succsim y, z \succsim z, x \succsim y, y \succsim z, z \succsim x$$

This is not since it has no relationship between x and z

$$x \succsim x, y \succsim y, z \succsim z, x \succsim y, y \succsim z$$

This is not since it has not relfexive

$$y \succsim y, z \succsim z, x \succsim y, y \succsim z, x \succsim z$$

Transitive: If aRb and bRc (we have a chain) the outside objects must be related as well. aRc.

aRb and bRc then aRc

This is not transitive. $x \succsim y, y \succsim z$ we need $x \succsim z$ but we don't have it.

$$x \succsim x, y \succsim y, z \succsim z, x \succsim y, y \succsim z, z \succsim x$$

A transitive relation creates an ordering.

3 Preference Relation

$\succsim$. **Weak Preference Relation.** "Is at least as good as"**.**

$$(1, 1) \succsim (0, 1)$$

$$(2, 1) \succsim (1, 2)$$

$$(1, 2) \succsim (2, 1)$$

If only one direction is true (like $(1, 1) \succsim (0, 1)$ but not the opposite) we can infer the preference is strict and we write:

$$(1, 1) \succ (0, 1)$$

This is the strict preference relation $\succ$.

If both directions are true like $(2, 1) \succsim (1, 2)$ and $(1, 2) \succsim (2, 1)$

then we can infer they are indifferent and we write

$$(2, 1) \sim (1, 2)$$

This is the indifference relation.

Chain Notation

$$p \succ q, p \succ r, q \sim r$$

$$p \succ q \sim r$$

Choice. We say a bundle is **best** from a set if it is at least a good as everything else in the set.

$$p \succ q \sim r$$

What is 'best' from the set $\{p, q, r\}$? p

What is 'best' from the set $\{q, r\}$? q, r

Indifference Curve. $\sim (1,1)$ set of all bundle indifferent to $(1,1)$.

$u(x_1, x_2) = x_1 + x_2$.

To find the set $\sim (1,1)$.

What are all of the bundles that also give a utility of 2.

$$(2,0), (1,1), (0,2), (1.5, 0.5) \ldots.$$

If you have a utility function. To find an indifference curve, set it equal to some number:

$$x_1 + x_2 = 2$$

$$x_2 = 2 - x_1$$

4 Utility

A utility function represents preferences.

$$u(1,1) \geq u(1,0)$$

We know

$$(1,1) \succsim (1,0)$$

If

$$u(1,1) > u(1,0)$$

We know

$$(1,1) \succ (1,0)$$

MRS. represents the slop of an indifference curve. How much x_2 the consumer will give up to get a unit of x_1.

$$MU_1 = \frac{\partial u}{\partial x_1}, MU_2 = \frac{\partial u}{\partial x_2}$$

$$MRS = -\frac{MU_1}{MU_2}$$

5 Chapter 6 and 7

Finding how much a consumer wants to buy. Solving the constrained optimization problem.

$$p_1 x_1 + p_2 x_2 = m$$

$$u(x_1, x_2)$$

Optimal bundle I give you p_1, p_2, m (chapter 6). For marshalian demand, leave those as variables (chapter 7).

Step 1. Look at the utility function.

Perfect Substitues: $ax_1 + bx_2$

$$-\frac{1}{2} = -1$$

One of the endpoints of the budget constraint. Figure out whethere it is better to consume all x_1 or all x_2.

Perfect Compelement: $min\{ax_1, bx_2\}$

$$ax_1 = bx_2$$

$$p_1 x_1 + p_2 x_2 = m$$

Cobb Douglass: $x_1^a x_2^b$

$$MRS = -\frac{p_1}{p_2}$$

$$p_1x_1 + p_2x_2 = m$$

Quasi-Linear: $ln\left(x_1\right) + x_2$ or $\sqrt{x_1} + x_2$

$$MRS = -\frac{p_1}{p_2}$$

$$p_1x_1 + p_2x_2 = m$$

5.1 Cobb Douglass Example

$$x_1^2x_2$$

$$MU_1 = \frac{\partial\left(x_1^2x_2\right)}{\partial x_1} = 2x_1x_2$$

$$MU_2 = x_1^2$$

$$MRS = -\frac{2x_1x_2}{x_1^2} = -2\frac{x_2}{x_1}$$

$$-2\frac{x_2}{x_1} = -\frac{p_1}{p_2}$$

$$p_1x_1 + p_2\left(\frac{1}{2}x_1\frac{p_1}{p_2}\right) = m$$

$$\frac{3}{2}p_1x_1 = m$$

$$x_1 = \frac{\frac{2}{3}m}{p_1}$$

$$x_2 = \frac{\frac{1}{3}m}{p_2}$$

What is the marshlian demand for a consumer with utility

$$x_1^2 x_2$$

Wht bundle is optimal for $u = x_1^2 x_2$ if $p_1 = 10, p_2 = 10, m = 100$

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