Microeconomics: BSc Year One

Extending Choice Theory

Consumers, obviously, mostly have a choice of more than two goods; and to find the favourable combinations of these we must look at utility functions. To simplify this, we initially continue looking at two goods.

A consumer's utility can be defined as a function of the amount consumed of each good:

$$\text{utility} = U(X_1, X_2)$$

The actual function itself is ordinal only (that is, only the order, and not the magnatude matters) since we have no set units to measure utility in.. So, for example, if we take:

$$U = X_1 X_2,$$

we can also say that:

$$U = X_1^{1/2} X_2^{1/2},$$

or that:

$$U = \log(X_1) + \log(X_2).$$

The utility function has the following properties:

- Marginal utility can be found by differentiation (or partial differentiation):

$$MU_i = \frac{\partial U}{\partial X_i}$$

- The marginal rate of substitution can also be derived by keeping total utility constant:

$$MRS_{i,j} = -\left.\frac{dX_j}{dX_i}\right|_{U \text{ is constant}}$$

- And from these we can derive:

$$\dot{U} \approx \dot{X}_i \frac{\partial U}{\partial X_j} + \dot{X}_j \frac{\partial U}{\partial X_i}$$

- But if we hold U constant, and therefore look at the MRS,

$$\frac{\dot{X}_j}{\dot{X}_i} = \frac{-\frac{dU}{dX_i}}{-\frac{dU}{dX_j}} = \frac{MU_i}{MU_j} = MRS_{i.j}$$

- And from the slope of the indifference curves at the points where they touch the budget lines, we can see that:

$$\frac{P_i}{P_j} = MRS_{i,j}$$

Therfore, combining the above properties, we may find:

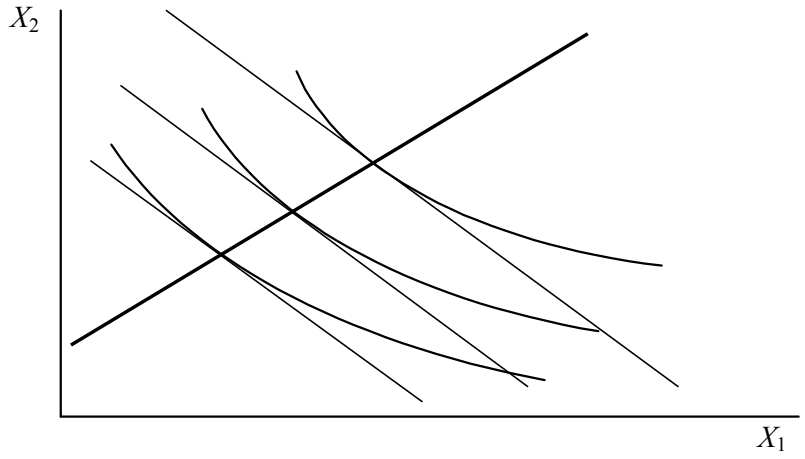
$$\frac{MU_i}{P_i} = \frac{MU_j}{P_j},$$

showing that prices reflect the attractiveness of goods.

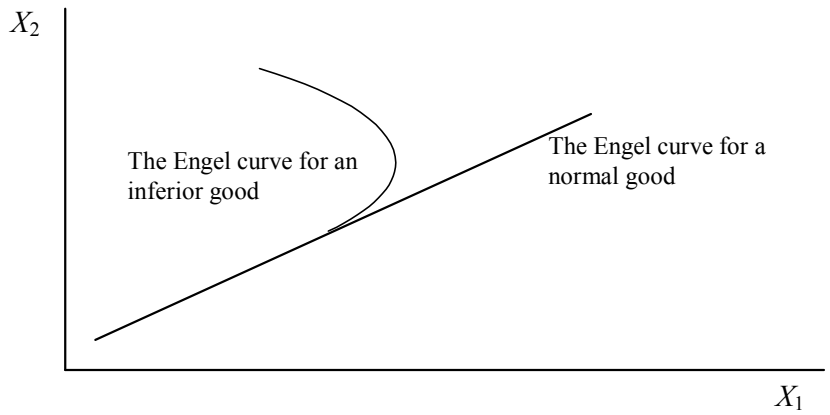
So, formally, consumers aim to maximise utility $U(X_1, X_2)$ subject to the constraint $P_1X_1 + P_2X_2 \leq M$ in the two-good case. For example, given the utility function $U = X_1X_2$, and a price constraint of the form $P_1X_1 + P_2X_2 = M$, we would look at the marginal utilities of the two goods (MU_1 and MU_2), and find the point at which $MU_1P_2 = MU_2P_1$.

Changes in Money Supply

An increase in money supply will have the effect of shifting the budget line away from the origin.



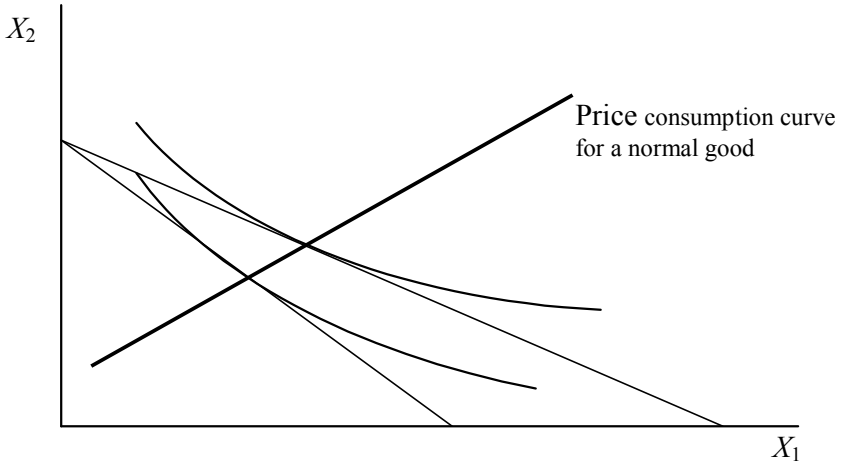
From this is derived the Engel curve, which looks at the demand for a good varying with income (here represented in terms of money supply):



As shown, not all goods have a monotonic Engel curve; goods such as inferior goods are not continually increased in consumption as income rises. This is due to uneven income and substitution effects – this will be discussed later.

Changes in Price

A change in the price of one good will lead to a pivoting of the budget line about the point at which it touches the other axis. A fall in the price in X_1 will lead to a movement thus:



From this we can derive the standard downward-sloping demand curve.

Changes in Tastes

Anything can happen when tastes change. In order to analyse standard demand theory here, the reasons for changes must be known – habit forming goods will have a different effect than other goods, for example. We need to look how demand for one good is related to demand for another.

A Couple of Interesting Points

From the theory of consumer demand explained so far, we can draw a couple of conclusions:

- Any new entries into the market must understand the fundamental preferences lying in the marketplace
- Market demand is found by summing all individuals' demands

Elasticities

We can say that an individual's demand for a good is a function dependant on the price of that good, prices of other goods, and personal income (amongst other things). Using the summation from above, we can say that the total market demand will primarily rely on prices of all goods in the economy, and market income (y).

It is useful to look at the partial derivative of market demand for a good with respect to prices, and especially proportional changes. This partial derivative is defined as an elasticity – the elasticity of A with respect to B is defined as $\frac{B}{A} \times \frac{\partial A}{\partial B}$.

The income elasticity of demand (often denoted by η) is defined by:

$$\eta = \frac{m}{x} \times \frac{\partial x}{\partial m}$$

where, for an inferior good, $\eta < 0$ (that is, the amount bought falls with a rise in income); for a necessity, η lies between 1 and 0 (and so the proportion of income spent on the good falls when income rises); and for a luxury good, $\eta > 1$.

A good's own price elasticity of demand (ε) is defined by:

$$\varepsilon = \frac{p}{x} \times \frac{\partial x}{\partial p}$$

at any point. The value of ε will normally be negative, but needn't be the same everywhere, even on a straight-line demand curve, as it will depend on the relative values of price and quantity.

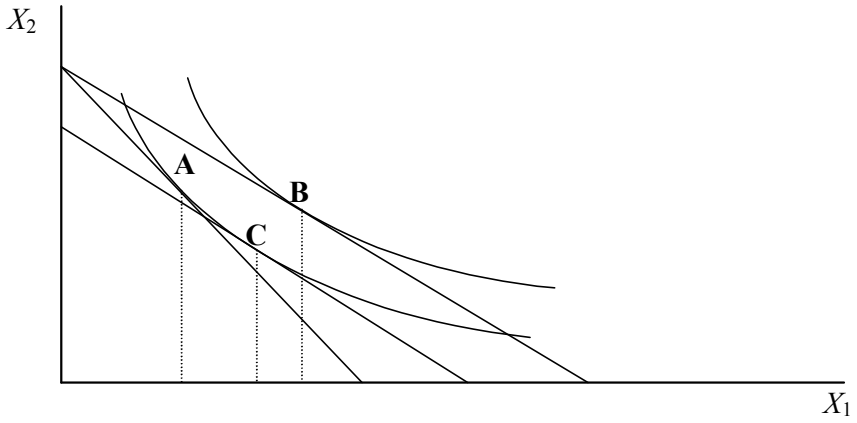
If $|\varepsilon| > 1$, when price falls more is spent on the good, and it is said to have elastic demand. On the other hand, inelastic demand ($|\varepsilon| < 1$) means that a fall in price leads to a lower expenditure on the good.

Income and substitution effects

With a price fall, two things occur:

- the relative price of the good falls compared to other goods
- the relative income of the individual rises (depending on the spending on the good)

We may look at a visual interpretation of the income and substitution effects, using indifference curves. We start at point **A**, and a price fall for good 1 skews the budget line so that we now lie on a higher indifference curve, at point **B**. With this new slope of budget line, if we were still on the same utility as originally, we would be at point **C**.



In thise case, the substitution effect is measured by the move from **A** to **C**, while the move from **C** to **B** is the income effect.

The substitution effect occurs because the individual chooses to purchase more of good 1; the income effect because the consumer buys more of both goods. The substitution effect is always positive, while the income effect depends on income elasticity.

Giffen goods

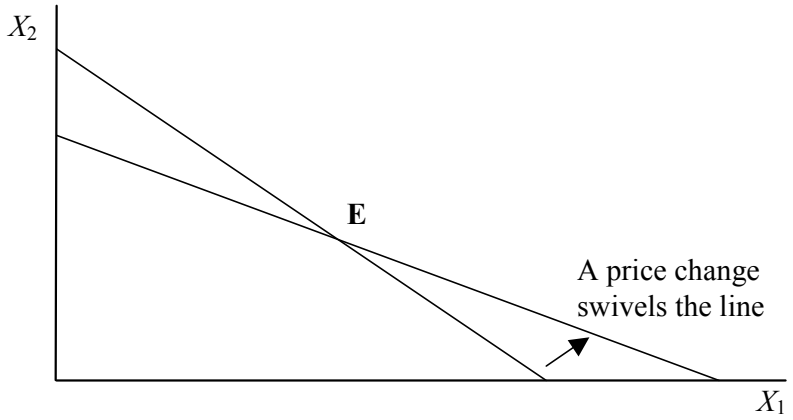
For inferior goods, the substitution and income effects go in opposite directions. It is theoretically possible for the income effect to outweigh the substitution effect, and for demand to fall with a fall in price. This is most likely if the good is very strongly inferior, and a large amount of income is spent on it. One example of this is subsistence foods in poor countries - if the price of bread falls, incomes rise quite a lot, and people can afford to buy other food such as fish rather than bread.

Endowment points

We want to drop the assumption that income is fixed, and we can assume that people have a certain amount of goods to barter with (an endowment). Take, for example, farmers producing food. An decrease in the price of other goods will lead to:

- a substitution effect where the farmer tries to eat less in order to raise income more, so he can buy other goods
- an income effect where the farmer is relatively better off, so he can afford to offer less of his food for sale, and so supply falls. This may outweigh the substitution effect.

The direction of an income effect depends on whether you are a net buyer or a net supplier of the good with the price change. The budget line will rotate about the endowment point (**E** below) instead of about the axis.



We can then find the change in consumption using the equation

$$\frac{\partial X_i}{\partial p_j} = \left.\frac{\partial X_i}{\partial p_j}\right|_{\text{Utility constant}} + \underbrace{(X_j - \overline{X_j})}_{\text{change from the endowment}} \cdot \frac{\partial X_i}{\partial M}$$