Elasticity and classification of goods

Elasticity

Income Elasticity of Demand

$$\text{Income Elasticity of Demand} = \frac{E_q}{E_I} = \frac{I}{q}\frac{\partial q}{\partial I}$$

This measures the percentage change in the quantity demanded of the good that results from a 1% increase in income.

Clarification: Considering that $q > 0$ and $I > 0$ thus the sign of $\frac{\partial q}{\partial I}$ is the same as the sign of $\frac{E_q}{E_I}$.

Price Elasticity of Demand

$$\text{Price Elasticity of Demand} = \frac{E_q}{E_p} = \frac{p}{q}\frac{\partial q}{\partial p}$$

This measures the percentage change in the quantity demanded of the good that is caused by a 1% increase in its price.

Clarification: Considering that $q > 0$ and $p > 0$ thus the sign of $\frac{\partial q}{\partial p}$ is the same as the sign of $\frac{E_q}{E_p}$.

Cross Elasticity of Demand

Cross Elasticity of Demand for good j with respect to the price of good i is defined as:

$$\frac{E_{q_j}}{E_{p_i}} = \frac{p_i}{q_j}\frac{\partial q_j}{\partial p_i}$$

This measures the percentage change in the quantity demanded of good j that results from a 1% increase in the price of good i.

Clarification: Considering that $q_j > 0$, $p_i > 0$, the sign of $\frac{\partial q_j}{\partial p_i}$ will be the same as the sign of $\frac{E_{q_j}}{E_{p_i}}$.

Classification of Demand

Elasticity	**Type of Demand**
$\eta = 0$	Perfectly Inelastic (1)
$0 < \eta < 1$	Inelastic (2)
$\eta = 1$	Unit Elastic (3)
$\eta > 1$	Elastic (4)

1. 1% percentage changes in price or income do NOT produce any change in demand.
2. 1% percentage changes in price or income produce a proportionally smaller change in demand.
3. 1% percentage changes in price or income produce a proportionally equal change in demand.
4. 1% percentage changes in price or income produce a proportionally greater change in demand.

Normal Goods

A good is considered a *Normal Good* if an increment in income (a marginal increase) leads to an increase in its demand. Mathematically, this is represented as:

$$\frac{\partial q}{\partial I} > 0 \implies \textit{Normal Good}$$

Within the category of *normal goods*, economic theory distinguishes between *luxury goods* and *necessary goods* or *goods of first necessity*. To classify normal goods, one should consider the elasticity of demand relative to income.

Luxury goods

Luxury goods or *non-essential goods* are those for which consumption grows more rapidly than income. For example, for an individual with a median income, a luxury good could be the acquisition of jewels that exceed their income in such a way that they represent goods not essential for daily consumption. Another example would be leisure services. Hence:

$$\frac{\partial q}{\partial I}\frac{I}{q} = \frac{E_q}{E_I} \geq 1 \implies \textit{Luxury Normal Good}$$

Here, E_q stands for the elasticity of demand, and E_I stands for the elasticity of income.

Goods of First Necessity

Goods of first necessity or *necessary goods* are defined as those for which consumption increases as income increases; however, unlike luxury goods, the rate of consumption growth is slower than the rate of income increase. An illustrative example occurs when individuals receive a higher income and the consumption of items such as bread, milk, eggs, etc., increases. The criterion for this category is expressed as:

$$0 < \frac{E_q}{E_I} < 1 \iff \textit{Essential Normal Good}$$

where E_q denotes the elasticity of demand, and E_I indicates the elasticity with respect to income.

Inferior Goods

Inferior goods are characterized by a decrease in demand as consumer income increases. Unlike normal goods, inferior goods have a negative income elasticity of demand, which can be mathematically described as:

$$\frac{\partial q}{\partial I} < 0$$

Here, q denotes the quantity demanded, and I represents income. As income (I) increases, the quantity demanded (q) of inferior goods tends to decrease.

Goods Classification

Giffen Goods

Giffen goods defy the basic law of demand. For these goods, when prices rise, demand also increases. This can be represented as:

$$\frac{\partial q}{\partial p} > 0 \quad \text{(contrary to ordinary goods)}$$

Here, q is the quantity demanded and p is the price.

Ordinary Goods

Ordinary goods are those for which demand decreases as the price increases, reflecting the typical law of demand. This negative relationship between price and quantity demanded is represented by a negative price elasticity of demand, which can be mathematically described as:

$$\frac{\partial q}{\partial p} < 0$$

where q is the quantity demanded and p is the price. For ordinary goods, the consumer's demand response to a price change is inversely related, making them the most common type of goods in economic analysis.

Complementary Goods

Complementary goods exhibit a negative cross-elasticity of demand, meaning that an increase in the price of one good will decrease the demand for its complement. This relationship can be expressed as:

$$\frac{\partial q_i}{\partial p_j} < 0$$

where q_i and p_j represent the quantity demanded of good i and the price of good j, respectively.

Substitute Goods

Substitute goods have a positive cross-elasticity of demand. If the price of one good increases, the demand for its substitute increases, expressed as:

$$\frac{\partial q_i}{\partial p_j} > 0$$

where q_i is the quantity demanded for substitute good i when the price p_j of good j increases.