

# HSS 201: Economics for Engineers

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# The Basics of Demand and Supply

- 1 Understanding and predicting how changing economic conditions affect market price and production
- 2 Evaluating the impact of government price controls; production incentives, among others
- 3 Determining how taxes, subsidies, tariffs affect the consumers and producers

# Demand

The demand curve shows how much of a good consumers are willing to buy as the price per unit of it changes. Mathematically, we can write the relationship between quantity demanded and its price as

$$Q_d = f(P)$$

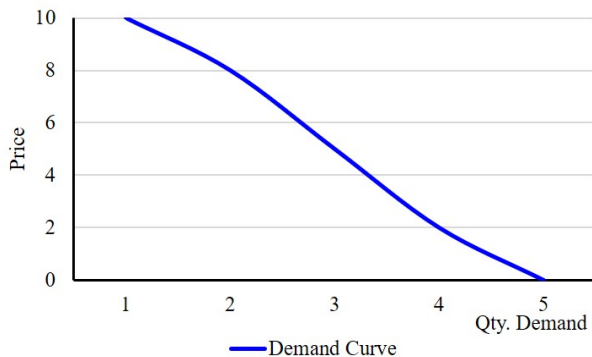
The **quantity demanded** of any good is the amount of the good that buyers are *willing* and *able* to purchase at any given point of time.

**Law of Demand:** *Ceteris paribus* (other thing remaining the same), when the price of a good **falls**, the quantity demanded of the good **rises** and when the price of a good **rises**, the quantity of the good **falls**.

# Demand Schedule

<b>Price of Cold Drinks</b>	<b>Quantity Demanded of Cold Drinks</b>
0	10
5	8
7	5
10	2
15	0

# The Demand Curve



The downward-sloping line relating price and quantity demanded is called the demand curve.

# Other Factors Affecting Quantity Demand

## ① Income

- **Normal Goods:** If the demand of a good *falls* when income *falls*.  
E.g., Sports shoes of Adidas, Basmati rice by India Gate.
- **Inferior Goods:** If the demand of a good *falls* when income *rises*.  
E.g., Sports shoes of Power, Mobile phones made by Micromax.

## ② Price of Related Goods

- **Substitutes:** When a *fall* in the price of one good *reduces* the demand for another good.  
E.g., When price of Samsung LED television increases, we demand LED television made by LG.
- **Complements:** When a *fall* in the price of one good *raises* the demand for another good.  
E.g., When price of petrol increases the demand for cars fall.

- ③ Tastes and Preferences: For instance, a segment of consumers of smart phones only have a preference for Apple iphone while the other segment is happy with budget phones.
- ④ Expectations: Expectations about the future may affect your demand for a good or service today. For instance, Price of petrol may rise tomorrow hence, by today most people would fill up their cars with petrol.
- ⑤ Advertisement and Awareness: A positive advertisement about a product might lead to increase in demand. For instance, RO water purifiers.
- ⑥ Demographic Structure: For instance, when population of a society is majorly driven by people between the age group 18-30 it would have a high demand for fast food centers.
  - **No. of Buyers:** Market demand of a good also depends on the number of buyers.

# Why does the Demand Curve Slope Downward?

- ① Law of Diminishing Marginal Utility: As **more of a product is consumed** then the **additional utility (satisfaction) that is derived from the product is less**. Hence, the consumers are prepared to pay less.  
Consumers will prefer to buy additional unit of a product at a lesser price.
- ② Income Effect: Assuming **money income is fixed**, the effect suggest that as **price of a product falls**, **real income** that is what consumers can buy with their money **rises** and consumers **demand for a product increases**.
- ③ Substitution Effect: Assuming two substitute (alternative) goods, if price of one good falls and the price of other remains same. Then consumers will prefer the cheaper product.
- ④ Entry and Exit of New Consumers



# Changes in Demand

## ① Movement along the demand curve

- Other things remaining the same, if price of commodity *falls* its demand *expands*. It is called *extension of demand*
- Other things remaining the same, if price of commodity *rises* its demand *falls*. It is called *contraction of demand*

## ② Shift of the demand curve

- Keeping price to be constant, if demand for any commodity *increase* we have a *rightward (upward) shift of the demand curve*.  
E.g., Demand curve for Apple iphones will shift rightwards if the individual's income increases.
- Keeping price to be constant, if demand for any commodity *decrease* we have a *leftward (downward) shift of the demand curve*.  
E.g., Demand curve for Apple iphones will shift leftwards if the individual's income decrease.

# Exceptions to the Law of Demand

- ① Giffen Goods: Such goods are consumed in greater quantities when their price rises. Giffen goods are inferior goods for which the income effect dominates the substitution effect.

E.g., “Some historians suggest that potatoes were a Giffen good during the Irish potato famine of the 19<sup>th</sup> century. Potatoes were such a large part of people’s diet that when the price of potatoes rose, it had a large income effect. People responded to their reduced living standard by cutting back on the luxury of meat and buying more of the staple food of potatoes. Thus, it is argued that a higher price of potatoes actually raised the quantity of potatoes demanded.” [Mankiw (2008, p. 47)]

All giffen goods are inferior goods but not all inferior goods are giffen goods.

- ② Veblen Effect: The demand for a product increases when its price increases. These are types of luxury goods.

# Exceptions to the Law of Demand

- ③ Snob Effect: The demand for a certain good by individuals of a higher income level is inversely related to its demand by those of a lower income level.
- ④ Essential Goods: Products which are essential to life will always be demanded irrespective of their price. E.g., Salt, Water.
- ⑤ Economic and Non-Economic Shocks: Demand reduces due to war or famine.

# Elasticity of Demand

Imagine a situation where the price of tomatoes has increased. It is an easy understanding to answer that consumers would demand less of tomatoes. But by how much would this demand fall? To answer this we require the concept called *elasticity*.

Elasticity measures the extent till which demand change.

An elasticity measures the sensitivity of one variable to another. Specifically, *it is a number that tells us the percentage change that will occur in one variable in response to a 1% increase in another variable.*

# Types of Elasticity

- 1 Price Elasticity
- 2 Income Elasticity
- 3 Cross-Price Elasticity

# Price Elasticity of Demand

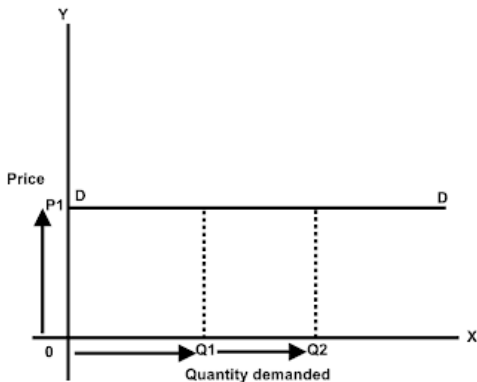
It is measured by:

$$\begin{aligned}e_p &= \frac{\Delta Q/Q}{\Delta P/P} \\&= \frac{P}{Q} \frac{\Delta Q}{\Delta P} \\&= \frac{\text{Percentage Change in Quantity Demand}}{\text{Percentage Change in Price}}\end{aligned}$$

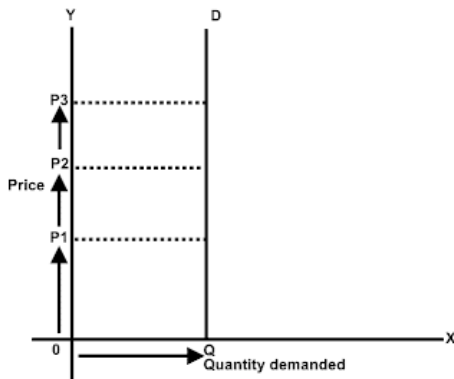
The price elasticity of demand is usually a *negative* number as price and quantity demanded are inversely related. Hence, to compare the magnitude of elasticity we take the absolute value.

- 1 If  $e_p > 1$  holds; we have *elastic* demand. E.g., Luxury Goods
- 2 If  $e_p < 1$  holds; we have *inelastic* demand. E.g., Goods which are essential; Salt, Medicines

## Perfectly Elastic Demand; $e_p = \infty$



## Perfectly Inelastic Demand; $e_p = 0$





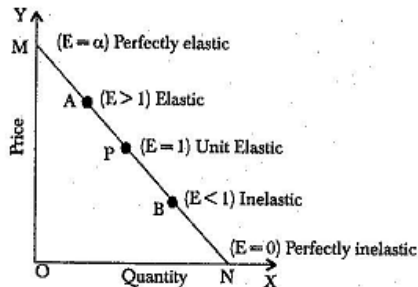
# Price Elasticity of Demand

When there are *close substitutes* a price increase will cause the consumer to buy less of the good and more of the substitute. Demand will then be *highly price elastic*.

When there are *no close substitutes*, demand will tend to be *price inelastic*.

# Difference between Slope of the Demand Curve and Elasticity

$$Ed \text{ at a point} = \frac{\text{Lower segment}}{\text{Upper segment}}$$



# Difference between Slope of the Demand Curve and Elasticity

The price elasticity of demand is different at each point on a demand curve with constant slope. The reason is that slope and elasticity are different concepts.

Slope measures the steepness or flatness of a line in terms of the measurement units for price and quantity. Elasticity measures the relative response of quantity to changes in price.

# What Causes Demand to be Inelastic?

- 1 Necessity
- 2 Smaller the number of close substitute
- 3 Date of purchasing the good cannot be rescheduled
- 4 Less proportion of income is spent on the good

# What Causes Demand to be Elastic?

- 1 Luxury
- 2 Larger the number of close substitute
- 3 Date of purchasing can be rescheduled
- 4 Larger proportion of income is spent on the good

# Income Elasticity of Demand

The income elasticity of demand is the percentage change in quantity demanded, resulting from a 1% change in income. It is measured by:

$$\begin{aligned} e_I &= \frac{\Delta Q/Q}{\Delta I/I} \\ &= \frac{I}{Q} \frac{\Delta Q}{\Delta I} \\ &= \frac{\text{Percentage Change in Quantity Demand}}{\text{Percentage Change in Income}} \end{aligned}$$

# Income Elasticity of Demand

- ① If  $e_I < 0$  holds; we have *inferior* good. E.g., Public bus ride
- ② If  $e_I > 0$  holds; we have *normal* good. E.g., Goods which are essential; Salt, Medicines
  - *Essential goods* tend to have a *smaller income elasticity* (typically,  $e_I < 1$ ).  
E.g., Food Grains
  - *Luxury goods* tend to have a *higher income elasticity*; (typically,  $e_I > 1$ ).  
E.g., Demand for SUVs
- ③ If  $e_I = 0$  holds; then the demand for the good is *income inelastic*.

# Cross-Price Elasticity of Demand

The demand for some goods is also affected by the prices of other goods. For example, because tea and coffee can easily be substituted for each other, the demand for each depends on the price of the other.

A **cross-price elasticity of demand** refers to the percentage change in the quantity demanded for a good that results from a 1% increase in the price of another good.

$$\begin{aligned} e_{Q_j P_i} &= \frac{\Delta Q_j / Q_j}{\Delta P_i / P_i} \\ &= \frac{P_i}{Q_j} \frac{\Delta Q_j}{\Delta P_i} \\ &= \frac{\text{Percentage Change in Quantity Demand of Good } j}{\text{Percentage Change in Price of Good } i} \end{aligned}$$



# Cross-Price Elasticity of Demand

- 1 When the goods are complements,  $e_{Q_j P_i} < 0$ .

E.g., Petrol and Motor oil are complements. If the price of petrol increases then the quantity demanded of petrol falls as people would drive less vehicles. As people drive less the demand for motor oil too falls. Thus, the cross-price elasticity of petrol with respect to motor oil is negative.

- 2 When the goods are substitutes;  $e_{Q_j P_i} > 0$ .

E.g., A rise in the price of tea, which makes coffee cheaper relative to tea, leads to an increase in the quantity of coffee demanded.

- 3 When goods are unrelated;  $e_{Q_j P_i} = 0$

E.g., Quantity demand of mobile phones and price of gold.

# Ways to Measure Elasticity

- 1 Percentage Method
- 2 Total Expenditure (Outlay) Method
- 3 Geometric Method

# Percentage Method

The value of elasticity is computed by dividing the relative change in quantity demanded with the relative change in price.

# Total Expenditure Method

Price	Quantity	Total Expenditure	Value of Price Elasticity
10	1	10	$e_p > 1$
9	2	18	
8	3	24	
7	4	28	
6	5	30	$e_p = 1$
5	6	30	
4	7	28	$e_p < 1$
3	8	24	
2	9	18	
1	10	10	

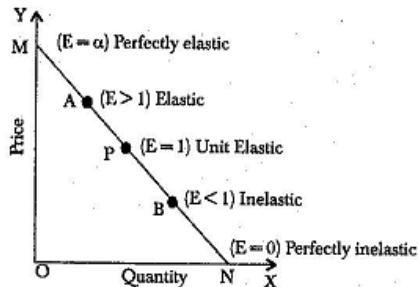
# Total Expenditure Method

- 1 If with a fall in price the total expenditure increases or with a rise in price, the total expenditure falls, in that case the elasticity of demand is greater than one; i.e.,  $e_p > 1$ . We have *elastic demand*.
- 2 If with a rise or fall in the price, the total expenditure remains the same, the demand will be unitary elastic; i.e.,  $e_p = 1$
- 3 If with a fall in price, the total expenditure also falls, and with a rise in price the total expenditure also rises, the demand is said to be less elastic; i.e.,  $e_p < 1$ . We have *inelastic demand*.

# Geometric Method

It is measured by:

$$Ed \text{ at a point} = \frac{\text{Lower segment}}{\text{Upper segment}}$$



# Some Review Questions

- ① For each of the following pair of goods, would you expect a more elastic demand? Why?
  - NCERT textbooks or books of Tintin
  - Coconut water or water
- ② You have the following information about good X and good Y:
  - Income elasticity of good X is  $-3$
  - Cross price elasticity of good X w.r.t. price of good Y is 2

Would an increase in income and a decrease in the price of good Y unambiguously decrease the demand for good X? Why or why not?

- ③ Two drivers—Hardik Pandya and K. L. Rahul—each drive up to a petrol pump. Before looking at the price, each places an order. Mr. Pandya says, “I’d like 10 litres of petrol.” Mr. Rahul says, “I’d like Rs.1000 worth of petrol.” What is each driver’s price elasticity of demand?

4 Consider public policy aimed at smoking:

- Studies indicate that the price elasticity of demand for cigarettes is about 0.4. If a pack of cigarettes currently costs Rs. 2 and the government wants to reduce smoking by 20%, by how much should it increase the price?
- Studies also find that teenagers have a higher price elasticity than do adults. Why might this be true?

5 Smriti has decided always to spend one-third of her income on clothing.

- What is her income elasticity of clothing demand?
- What is her price elasticity of clothing demand?
- If Smriti's tastes change and she decides to spend only one-fourth of her income on clothing, how does her demand curve change? What is her income elasticity and price elasticity now?

6 If a 3% increase in the price of corn flakes causes a 6% decline in the quantity demanded, what is the elasticity of demand?



- 7 Answer in True or False. Also, explain your answers
- The elasticity of demand is the same as the slope of the demand curve.
  - The cross-price elasticity will always be positive.
- 8 Consider the following information and answer the following questions:  
Suppose that business travellers and vacationers have the following demand for airline tickets from Mumbai to Jaipur

Price	Quantity Demanded	
	Business Travellers	Tourist
4000	2100	1000
5250	2000	800
6320	1900	600
7780	1800	400

As the price of tickets rises from 5250 to 6320, what is the price elasticity of demand for (i) business travelers and (ii) tourist?