

Chapter Two

Theory of Demand and Supply

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Theory of demand

- Demand is the different quantities of goods and services a consumer is willing and able to purchase at alternative price levels holding other things constant (Ceteris paribus).
- **Law of demand:** states price of a commodity and its quantity demanded are inversely related.

i.e., as price of a commodity increases (decreases) quantity demanded for that commodity decreases (increases), ceteris paribus.

➤ Demand Representation

- Demand schedule:-** is representing the relationship between price and quantity purchased of a commodity by using table.

Eg:- Individual household demand for orange

Combinations	A	B	C	D	E
Price	5	4	3	2	1
Quantity demanded	5	7	9	11	13

ii. Demand curve is a graphical representation of the relationship between different quantities of a commodity demanded by an individual at different prices per time period.

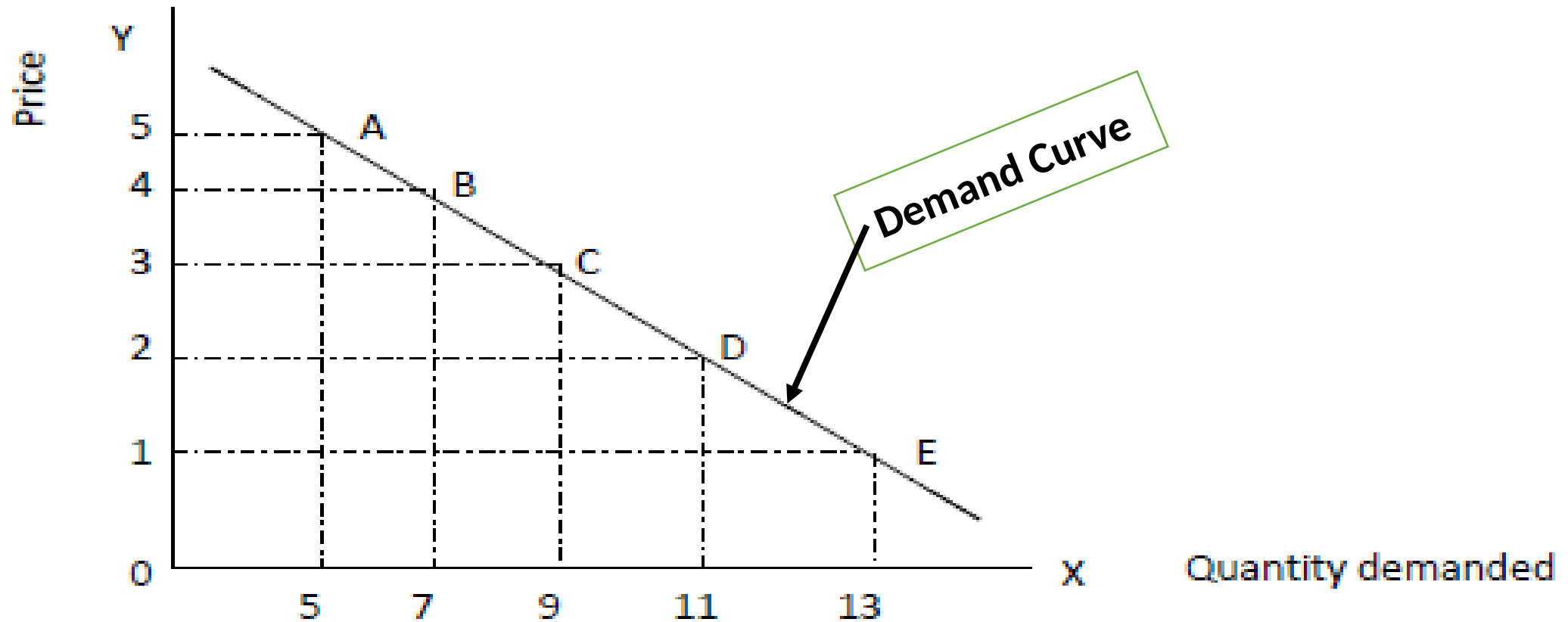


Figure 2.1: Individual demand curve

iii. Demand function:- Is a mathematical relationship between price and quantity demand.

- where Q is quantity demanded and P is price of the commodity

For example:

Let the demand function be $Q = a + bP$

$Q = a - 2P$, to find a , substitute price either at point A or B.

$$7 = a - 2(4), a = 15$$

Therefore, $Q = 15 - 2P$ is the demand function for orange in the above numerical example.

- **Market Demand:** The market demand schedule, curve or function is derived by horizontally adding the quantity demanded for the product by all buyers at each price.

Price	Individual demand			Market demand
	Consumer-1	Consumer-2	Consumer-3	
8	0	0	0	0
5	3	5	1	9
3	5	7	2	14
0	7	9	4	20

Numerical Example: - suppose the individual demand function of a product is given by: $P = 10 - \frac{1}{2}Q$ and there are about 100 identical buyers in the market.

Then the market demand function is given by:

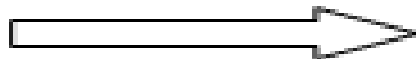
$$P = 10 - \frac{1}{2}Q$$

$$\frac{1}{2}Q = 10 - P$$

$$Q = 20 - 2P$$

$$Q_m = (20 - 2P)100 = 2000 - 200P$$

$$Q_d = 2000 - 200P$$

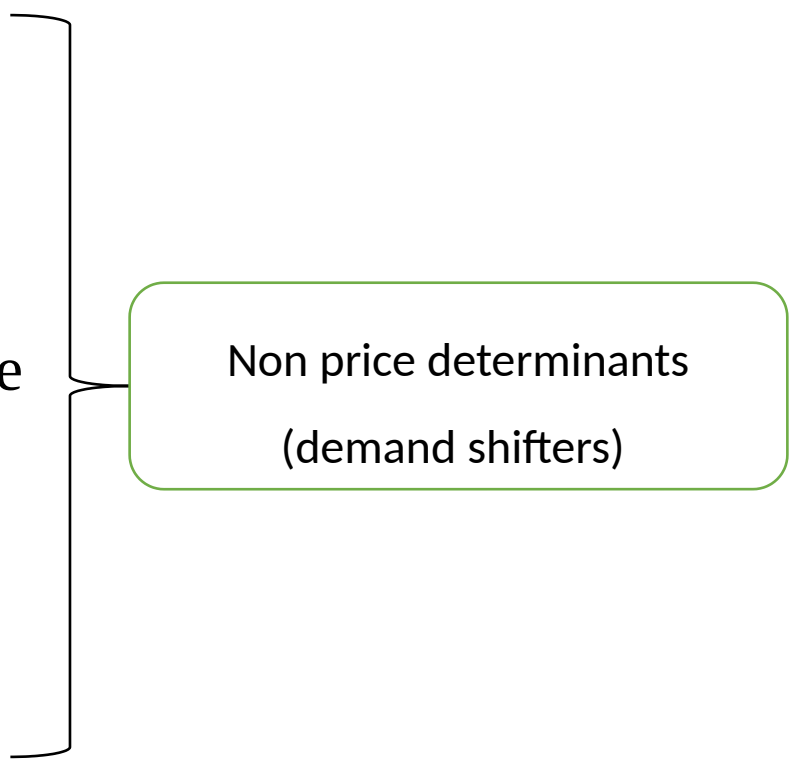


Market demand function

Determinants of Demand

➤ The demand for a product is influenced by many factors. Some of these factors are:

- i. Price of the product (own price determinant)
- ii. Taste or preference of consumers
- iii. Income of the consumers
- iv. Price of related goods
- v. Consumers expectation of income and price
- vi. Number of buyers in the market
- vii. Others (weather, religion



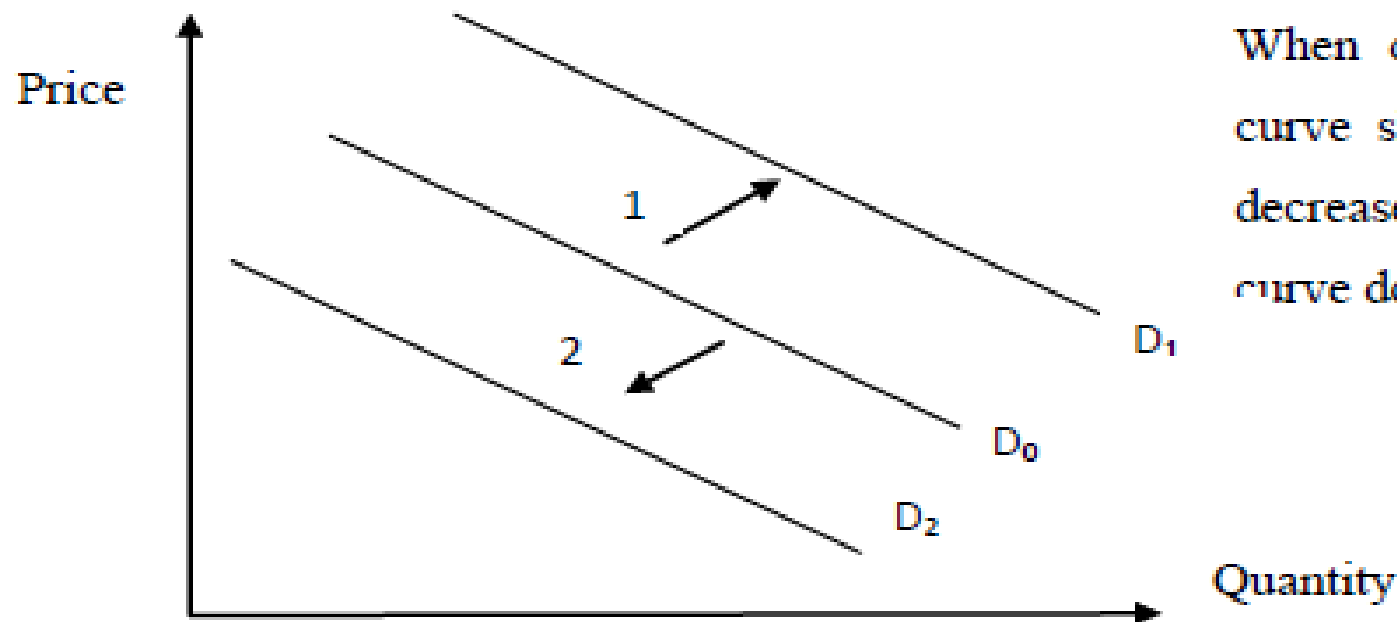
Non price determinants
(demand shifters)

- **Change in quantity demanded:** occurs when **only price** of the product changes.

i.e., movement along the same demand curve.

- **Change in demand:-** happens when any of the **non-price determinants** of the good changes.

i.e., shift in demand curve.



When demand increases, demand curve shifts upward (D_1) while a decrease in demand shifts demand curve downwards (D_2).

Theory of supply

Supply:- Indicates the various quantities of goods and services that sellers (producers) are **willing** and **able** to provide (offer) at various prices in a given period of time, other things remain unchanged.

- **The law of supply:** states that, ceteris paribus, as price of a product increase, quantity supplied of the product increases, and as price decreases, quantity supplied decreases.
- It tells us there is a **positive** relationship between price and quantity supplied.

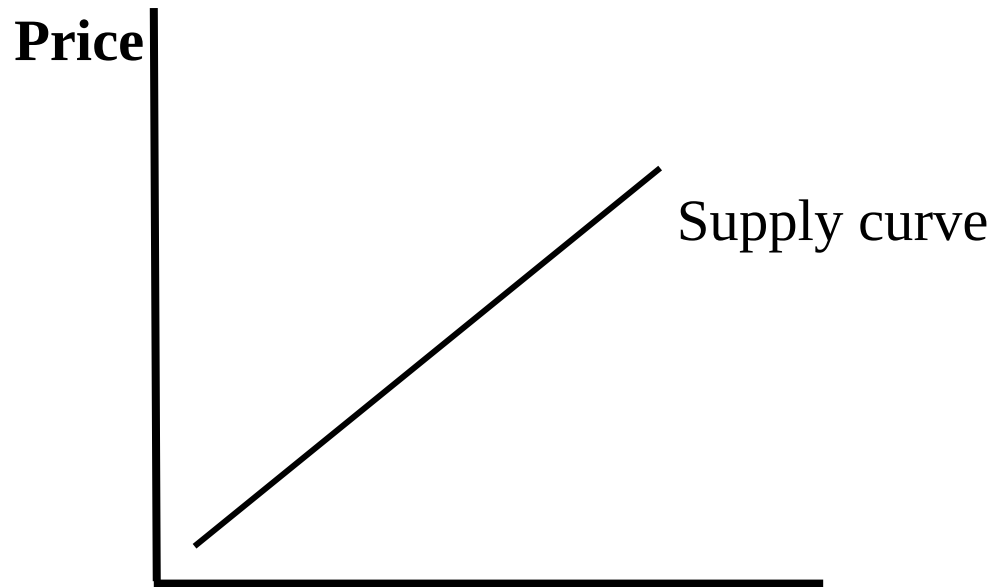
Supply representation:

- **Supply schedule, Supply curve and Supply function**

- A supply schedule is a tabular statement that states the different quantities of a commodity
- offered for sale at different prices.

Price (birr per kg)	30	25	20	15	10
Quantity supplied kg/week	100	90	80	70	60

- A ***supply curve*** conveys the same information as a supply schedule with the help of graph.



- **Supply function** – is a mathematical relationship between price and quantity supplied.
- $S = f(P)$, where S is quantity supplied and P is price of the commodity.
- **Market supply:** It is derived by horizontally adding the quantity supplied of the product by all sellers at each price.

For Example: Consider that there are only three sellers supplying good X in the market.

Price per unit	Quantity supplied by seller 1	Quantity supplied by seller 2	Quantity supplied by seller 3	Market supply per week
5	11	15	8	34
4	10.5	13	7	30.5
3	8	11.5	5.5	25
2	6	8.5	4	18.5
1	4	6	2	12

Determinants of Supply

The supply of a particular product is determined by:

Causes change in quantity supplied i) price of the product

Non- price determinants

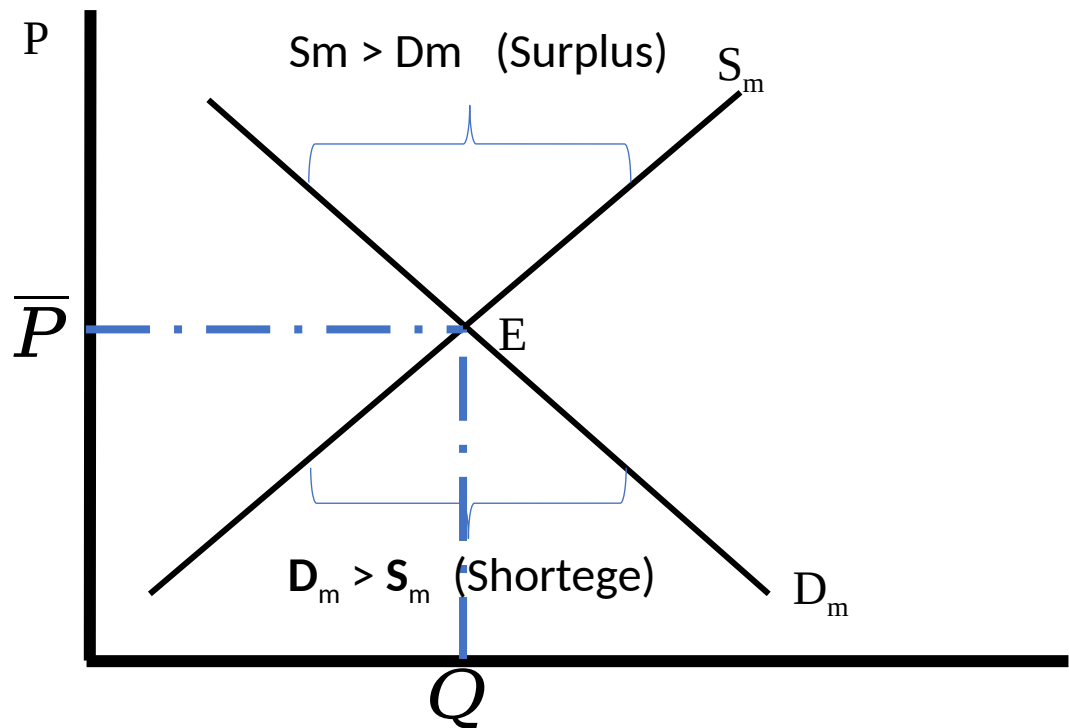
Causes change in

Supply

- ii) price of inputs (cost of inputs)
- iii) Technology
- iv) prices of related goods
- v) sellers' expectation of price of the product.
- vi) Taxes & subsidies
- vii) Number of sellers in the market
- viii) Weather, etc.

Market Equilibrium

Now let's bring demand and supply together so as to see how the market price of a product is determined. **Market equilibrium occurs when market demand equals market supply.**



- At point 'E' market demand equals market supply (equilibrium point)
- $\bar{P}$ is the market equilibrium (market clearing) price
- $\bar{Q}$ is the market equilibrium (market clearing) quantity.

- **Numerical example:** Given market demand: $Q_d = 100 - 2P$, and market supply:

$$P = (\frac{1}{2}Q_s) + 10$$

a) Calculate the market equilibrium price and quantity

b) Determine, whether there is surplus or shortage at $P = 25$ and $P = 35$.

- **Solution:**

a) At equilibrium, $Q_d = Q_s$

$$100 - 2P = 2P - 20$$

$$4P = 120$$

$$P = 30, \text{ and } Q = 40$$

b) $Q_d(\text{at } P = 25) = 100 - 2(25) = 50$ and $Q_s(\text{at } P = 25) = 2(25) - 20 = 30$

Therefore, there is a shortage of: $50 - 30 = \mathbf{20 \text{ units}}$

$Q_d(\text{ at } P=35) = 100 - 2(35) = 30$ and $Q_s(\text{ at } p = 35) = 2(35) - 20 = 50$, a surplus of **20 units**

Effects of changes in Demand and supply on Equilibrium price and Quantity

- When we calculate the equilibrium price and quantity, we assumed that the other determinants of demand and supply(except own price) of a product were kept constant. But what would happen to the equilibrium price and quantity when one or more determinants of supply and /or demand changes?
- Let us see the following conditions.
 - i. **when demand changes while supply remain unchanged**
 - a. When demand increases.
 - b. When demand decreases.
 - ii. **When Supply changes while Demand remain unchanged**
 - a. When supply increases
 - b. When supply decreases

iii. **When both Supply and Demand changes**

- a. When demand increase and supply decreases
- b. When demand decrease and supply increase
- c. When both demand and supply increases
- d. When demand and supply decreases

Elasticity of Demand and Supply

- **Elasticity:** - is a measure of responsiveness of a dependent variable to changes in an independent variable. In economics we use the concept of elasticity of demand or supply to measure the responsiveness of consumers or sellers to changes in price or other determinants of demand or supply.

➤ Elasticity of demand

- Elasticity of demand measures responsiveness of buyers to changes in price or other determinates of demand. Here we shall discuss *three types of elasticities of demand*.
- **Price Elasticity of Demand:-** is a measure of buyers' responsiveness to changes in price. It is given by :

$$E_d^p = \frac{\% \Delta Q_d}{\% \Delta P}, \quad \text{where } \% \Delta Q_d = \frac{Q_1 - Q_0}{Q_0} \times 100$$

$$\text{And } \% \Delta P = \frac{P_1 - P_0}{P_0} \times 100$$

Thus,

$$E_d^P = \frac{\frac{Q_1 - Q_0}{Q_0} \times 100}{\frac{P_1 - P_0}{P_0} \times 100} = \frac{Q_1 - Q_0}{P_1 - P_0} \cdot \frac{P_0}{Q_0} = \frac{\Delta Q}{\Delta P} \cdot \frac{P_0}{Q_0}$$

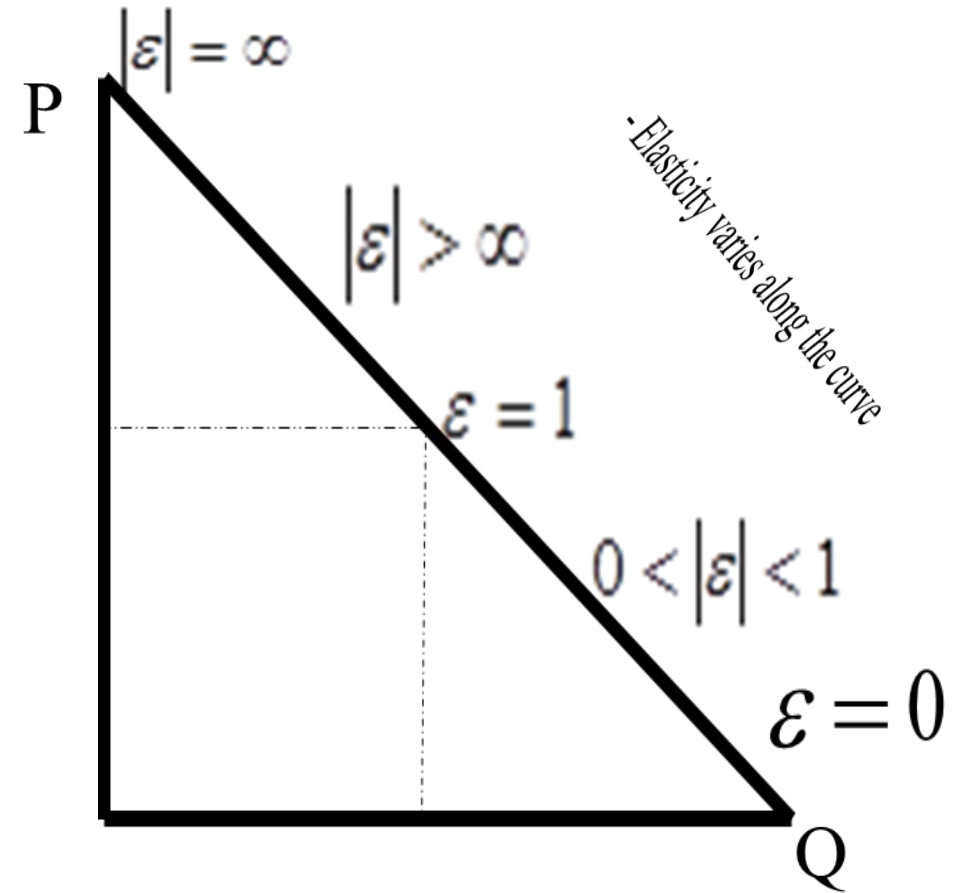
Point price elasticity of demand

Note that :

- Elasticity of demand is **unit free** because it is a ratio of percentage change.
- Elasticity of demand is usually a **negative** number because of the **law of demand**.

➤ Elasticity Coefficients

- If** demand is said to be **elastic**
- If** demand is **inelastic**
- If** demand is **unitary elastic**.
- If** , demand is said to be **perfectly inelastic**.
- If** demand is said to be **perfectly elastic**.



Example: Given

Example: Given market demand : $Q_d = 80 - 2P$, and

Market supply: $Q_s = -20 + 8P$, find price elasticity of demand at the equilibrium point?

Solution: At equilibrium, $Q_d = Q_s$

$$80 - 2P = -20 + 8P$$

$$10P = 100$$

$$P = \underline{10} \text{ and } Q = \underline{60}$$

$$\text{Therefore, } E = \frac{\Delta Q}{\Delta P} \cdot \frac{P_0}{Q_0} = -2 \frac{10}{60} = -\frac{1}{3} = -\underline{\underline{0.33}}$$

- ✓ **Interpretation:** an elasticity of -0.33 means that for a 1% increase (decrease) in the price of a product, quantity demand will decrease (increase) by 0.33%.

Arc (Average) price Elasticity of demand

- If the change in price is large, it does matter. Thus, to measure elasticity between two points, we take the average of the two

$$\text{Thus, } \bar{\varepsilon} = \frac{\frac{Q_1 - Q_0}{Q_1 + Q_0} \times 100}{\frac{\frac{P_1 - P_0}{P_1 + P_0} \times 100}{2}} = \boxed{\frac{Q_1 - Q_0}{P_1 - P_0} \cdot \frac{P_1 + P_0}{Q_1 + Q_0}} \text{ Arc price elasticity of demand.}$$

Example:

Suppose at a price of 400, 300 tickets are demanded to fly from Addis to Jimma. Now the price rises to birr 600 and only 250 tickets are demanded. Calculate the price elasticity of demand?

Solution

P	Q
400	300
600	250

$$\bar{\varepsilon} = \left(\frac{250 - 300}{600 - 400} \right) \cdot \frac{600 + 400}{300 + 250} = - \underline{\underline{0.45}}$$

Determinants of price Elasticity of Demand

The following factors make price elasticity of demand elastic, inelastic & unitary elastic other than changes in the price of the product.

- 1) **The availability of substitutes:-** the more substitutes available for a product, the more **elastic** will price elasticity of demand.
- 2) **Time:** In the long- run, price elasticity of demand tends to be elastic. Because:
 - i) More substitute goods could be produced.
 - ii) People tend to adjust their consumption pattern.
- 3) **The proportion of income consumers spend for a product:-**the smaller the proportion of income spent for a good, the less price elastic will be.
- 4) **The importance of the commodity in the consumers' budget :-**
 - Luxury goods $\Rightarrow$ tends to be more **elastic**, *eg. gold.*
 - Necessity goods $\Rightarrow$ tends to be **less elastic** , *eg. Salt.*

Example: Given the following data on changes in quantity demand of Y in response to changes in the price of good X:

<u>Unit price of X</u>	<u>Quantity demanded of Y</u>
10	1500
15	1000

Calculate the cross price elasticity of demand between the two goods?

What can you say about the two goods?

$$\varepsilon_{xy} = \frac{\Delta Q_y}{\Delta P_x} = \left(\frac{1000 - 1500}{15 - 10} \right) \cdot \frac{10 + 15}{1500 + 1000} = \frac{-500}{5} \cdot \frac{25}{2500} = \underline{\underline{-1}}$$

Therefore the two goods are complements

Price Elasticity of Supply

- The law of supply states only the nature of relationship between the change in the price of a commodity and the quantity supplied.
- The quantitative relationship is measured by the price elasticity of supply.
- Price elasticity of supply is the measure of responsiveness of the quantity supplied of a product to the changes in its market price. The formula of supply elasticity is given as:

$$\epsilon_p = \frac{\text{\% change in quantity supplied (Q)}}{\text{\% change in price (P)}}$$

$$\epsilon_p = \frac{\Delta Q/Q}{\Delta P/P} = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

- **Note that:** the formula for measuring the price elasticity of supply is the **same** as that of measuring the price elasticity of **demand**.
- **The difference is only:**
 - Price elasticity of supply is always **positive** and varies between 0 and ∞ .
 - Price elasticity of demand is always **negative** and varies between 0 and ∞ .

END OF CHAPTER TWO