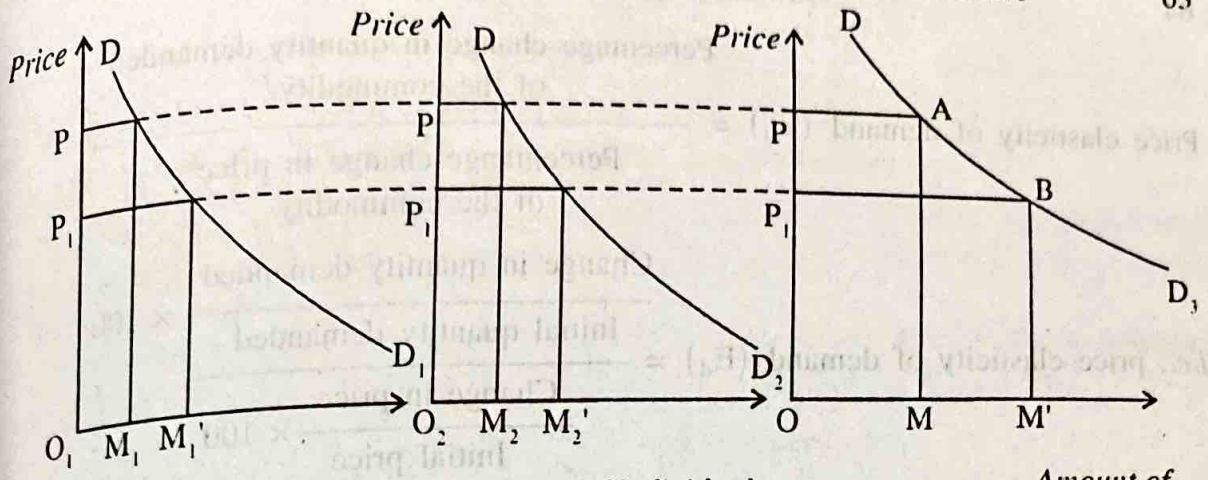

Amount of individual demand (Consumer X) — *Fig : 2.5.*

Amount of individual demand (Consumer Y) — *Fig : 2.6.*

Amount of market demand — *Fig : 2.7.*

Fig 2.7 by the point B. The locus DD_3 is obtained through the point A and B. Here the locus DD_3 is the market demand curve. From the diagram it is seen that the market demand curve DD_3 is downward sloping. Therefore the market demand curve will be downward sloping if the individual demand curve is downward sloping.

2.3. Elasticity and its Application

Concept of elasticity of demand is an important matter of the analysis of consumer behaviour. For this different aspects of elasticity of demand are analysed in this section.

• 2.3.1. Concepts of Elasticity of Demand : Demand for any commodity depends on many factors. The factors which determine demand are price of the commodity, income of the consumer, price of the related commodities etc. These factors are called independent variable because these factors can change independently. The demand for the commodity is changed due to change in the value of the independent variable. The relation between the percentage change in demand and the percentage change in any one of the independent variable is expressed with the help of elasticity of demand. This means that the percentage change in the amount of demand due to one per cent change in any one of the demand determind independent variable is called **elasticity of demand.**

In economics, elasticity of demand mainly considered from three angles.

(1) Own price elasticity of demand or direct price elasticity of demand or price elasticity of demanmd.

(2) Cross price elasticity of demand.

(3) Income elasticity of demand.

❖ 2.3.1.1. Own Price Elasticity of Demand or Direct Price Elasticity of Demand or Price Elasticity of Demand : Other things remaining constant, the percentage change in quantity demanded of any commodity due to one per cent change in the price of that commodity is called **own price elasticity of demand or direct price elasticity of demand or price elasticity of demand** of that commodity. It may be mentioned that own price elasticity of demand is called **elasticity of demand.** Therefore

$$\text{Price elasticity of demand } (E_d) = \frac{\text{Percentage change in quantity demanded of the commodity}}{\text{Percentange change in price of the commodity}}$$

$$\text{i.e., price elasticity of demand } (E_d) = \frac{\dfrac{\text{Change in quantity demanded}}{\text{Initial quantity demanded}} \times 100}{\dfrac{\text{Change in price}}{\text{Initial price}} \times 100}$$

Price elasticity of demand is now expressed with the help of symbols. Let

q = initial quantity demanded.

Δq = small change in quantity demanded. (Δ = small change, this symbol is called delta)

p = initial price.

Δp = small change in price.

$$\text{Therefore, price elasticity of demand } (E_d) = \frac{\frac{\Delta q}{q} \times 100}{\frac{\Delta p}{p} \times 100} = \frac{\Delta q}{q} \times \frac{p}{\Delta p} = \frac{\Delta q}{\Delta p} \cdot \frac{p}{q}.$$

There are different types of price elasticity of demand.

(1) **Unit Elasticity of Demand :** If the percentage change in quantity demanded of the commodity is equal to the percentage change in price then it is called unit elasticity of demand. Here $E_d = 1$.

For example, if the percentage change in price is 5% and as a result the percentage change in quantity demanded of the commodity is 5%, then it is called unit elasticity of demand.

$$\text{Here price elasticity of demand } (E_d) = \frac{5\%}{5\%} = 1.$$

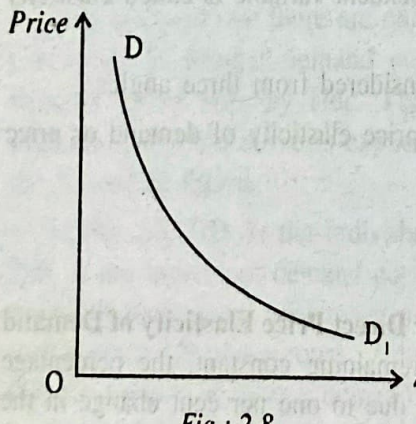

Fig : 2.8.

In Fig. 2.8., DD_1 is the unit elasticity demand curve. Every point on this demand curve, the value of the elasticity of demand is equal to one. The shape of this demand curve is **rectangular hyperbola.**

(2) **Elastic Demand :** If the percentage change in quantity demanded of the commodity is greater than the percentage change in price, then it is called elastic demand. Here $E_d > 1$.

For example, if the percentage change in price is 5% and as a result the percentage change in quantity demanded is 25% then it is called elastic demand.

Here, price elasticity of demand $(E_d) = \frac{25\%}{5\%} = 5 > 1$.

So the value of the elasticity of demand is greater than one.

(3) **Inelastic Demand :** If the percentage change in quantity demanded of the commodity is less than the percentage change in price, then it is called inelastic demand. Here $E_d < 1$.

For example, if the percentage change in price is 5% and as a result the percentage change in quantity demanded is 3%, then it is called inelastic demand.

Here price elasticity of demand $(E_d) = \frac{3\%}{5\%} = \frac{3}{5} < 1$.

So the value of the elasticity of demand is less than one.

(4) **Perfectly Elastic Demand :** If the price of the commodity remain constant *i.e.*, if the percentage change in price of the commodity is zero even though there is a change in demand then it is called perfectly elastic demand. Here $E_d = \infty$ (infinity). Here the value of the elasticity of demand is infinity.

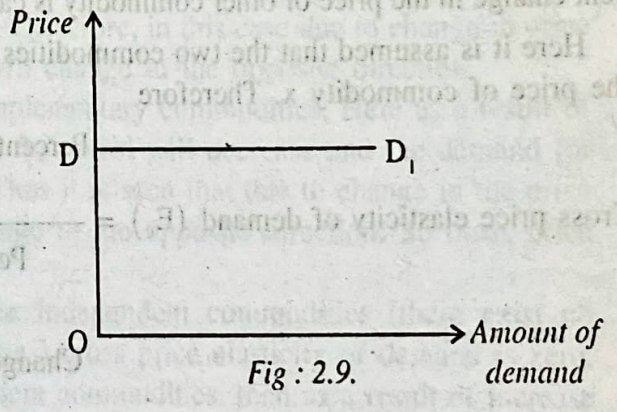

Fig : 2.9.

In Fig. 2.9., DD_1 is the perfectly elastic demand curve. This demand curve is parallel to the horizontal axis. This is because even though price remain constant there is a change in demand. This means that consumer purchases commodity at a fixed price.

(5) **Perfectly Inelastic Demand :** If there is a change in price of the commodity even though there is no change in demand *i.e.*, if the percentage change in quantity demanded is zero, then it is called perfectly inelastic demand. Here $E_d = 0$ (Zero). Here the value of the elasticity of demand is zero.

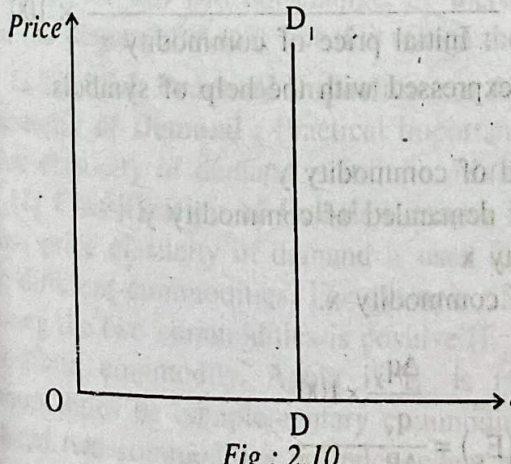

Fig : 2.10.

In Fig. 2.10., DD_1 is the perfectly inelastic demand curve. This demand curve is parallel to the vertical axis. This is because even though there is a change in price, demand remain constant at a particular level.

Five types of price elasticity of demand which we discuss above can be expressed with the help of Fig. 2.11.

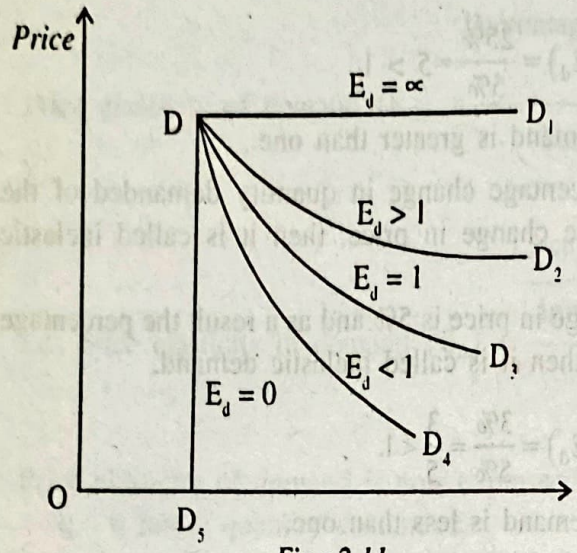

Fig : 2.11.

In Fig 2.11., DD_1 is the perfectly elastic demand curve ($E_d = \infty$). DD_2 is the elastic demand curve ($E_d > 1$). DD_3 is the unit elasticity demand curve ($E_d = 1$). DD_4 is the inelastic demand curve ($E_d < 1$) and DD_5 is the perfectly inelastic demand curve ($E_d = 0$).

❖ 2.3.1.2. Cross Price Elasticity of Demand : Other things remaining constant, the percentage change in quantity demanded of any commodity due to one per cent change in the price of other commodity is called cross price elasticity of demand.

Here it is assumed that the two commodities are x and y and there is a change in the price of commodity x. Therefore

$$\text{Cross price elasticity of demand } (E_c) = \frac{\text{Percentage change in quantity demanded of commodity y}}{\text{Percentange change in price of commodity x}}$$

$$= \frac{\dfrac{\text{Change in quantity demanded of commodity y}}{\text{Initial quantity demanded of commodity y}} \times 100}{\dfrac{\text{Change in price of commodity x}}{\text{Initial price of commodity x}} \times 100}$$

i.e., cross price elasticity of demand $(E_c) = \dfrac{\dfrac{\text{Change in quantity demanded of commodity y}}{\text{Initial quantity demanded of commodity y}} \times 100}{\dfrac{\text{Change in price of commodity x}}{\text{Initial price of commodity x}} \times 100}$

Cross price elasticity of demand is now expressed with the help of symbols. Let,

q_y = initial quantity demanded of commodity y
Δq_y = small change in quantity demanded of commodity y.
P_x = initial price of commodity x
ΔP_x = small change in price of commodity x.

Therefore, cross price elasticity of demand $(E_c) = \dfrac{\dfrac{\Delta q_y}{q_y} \times 100}{\dfrac{\Delta P_x}{P_x} \times 100}$

$$= \frac{\Delta q_y}{q_y} \times \frac{P_x}{\Delta P_x} = \frac{\Delta q_y}{\Delta P_x} \times \frac{P_x}{q_y}$$

The sign of the cross price elasticity of demand are different.

(a) **Substitute commodities :** For substitute commodities, cross price elasticity of demand is positive. This is because if x and y are substitute commodities then as a result of increase in the price of commodity x, the demand for commodity x will decrease but the demand for commodity y will increase. This means that due to increase in the price of commodity x the demand for commodity y will increase. Therefore in this case due to change in price of one commodity the demand for other will also change in the same direction (both increase).

For example, tea and coffee are substitute commodities. Here as a result of increase in price of tea, the demand for tea will decrease but the demand for coffee will increase. Thus it is seen that due to change in price of tea the demand for coffee will also change in the same direction. So cross price elasticity of demand is positive.

(b) **Complementary commodities :** For complementary commodities, cross price elasticity of demand is negative. This is because if x and y are complementary commodities, then as a result of increase in the price of commodity x, the demand for commodity x will decrease and the demand for commodity y will also decrease simultaneously. This means that due to increase in the price of commodity x the demand for commodity y will decrease. Therefore, in this case due to change in price of one commodity demand for other will change in the opposite direction.

For example, car and petrol are complementary commodities. Here as a result of increase in price of petrol, the demand for petrol will decrease and the demand for car will also decrease simultaneously. Thus it is seen that due to change in the price of petrol, the demand for car will change in the opposite direction. So cross price elasticity of demand is negative.

(c) **Independent commodities :** For independent commodities (there exist no relation between the uses of commodities) cross price elasticity of demand is zero. This is because if x and y are independent commodities, then as a result of increase in the price of commodity x, the demand for commodity x will decrease but the demand for commodity y will not change. Therefore in this case due to change in price of one commodity the demand for other will not change. For example milk and salt are independent commodities. Here as a result of increase in price of milk, the demand for salt will not change. So there is no relation between the price of milk and the demand for salt. For this reason the cross price elasticity of demand is zero.

□ **2.3.1.2.1. Practical Importance or Application of the Concept of Cross Price Elasticity of Demand :** Practical importance or application of the concept of cross price elasticity of demand is infinite. Main items are discussed here.

(1) **Classification of Relation among Different Commodities :** The concept of cross price elasticity of demand is used for the classification of the relation among the different commodities. For example, if the cross price elasticity of demand (E_c) among the two commodities is positive ($E_c > 0$) then the related two commodities be substitute commodity. Again if E_c is negative ($E_c < 0$) then the related two commodities be complementary commodity. But if E_c is zero (*i.e.* $E_c = 0$) then the related two commodities be independent commodity *i.e.* there is no relation among the two commodity. But according to Prof. Hicks, it is not rational to classify among different commodities on the basis of cross price elasticity of demand.

(2) **Determination of the Price of Related Commodity :** Concept of cross price elasticity of demand is used to determine the prices of related commodities when any firm produces some related commodities. For example, Gillete company produces

both razor and razor blade. These two commodities are complementary commodity. Here if the Gillete company reduces the price of its razor then along with the increase in demand for razor, the demand for razor blade also increases. But how much amount of demand of the two commodities will increase depend on the value of cross price elasticity of demand. So the concept of cross price elasticity of demand is very important to determine the price of related commodity.

(3) **To Take Decision regarding the Production of New Product :** Cross price elasticity of demand can help to take decisions of any firm regarding the production of new product. For example, if the value of cross price elasticity of demand of the new product which the firm want to produce is positive and very high in value then it represents that the new product which the firm wants to produce has large number of substitute product. As a result, it is essential to consider the matter very seriously before the firm takes decisions regarding that. So, the concept is important to take decision regarding the production of new product.

(4) **To Determine the Border Line of Industry :** Concept of cross price elasticity of demand helps to determine the border line of industry. Some time it is very difficult to determine which commodities are within a specific industry. The commodities where cross price elasticity of demand is positive and high in value can be taken as close substitute commodity of a specific industry from practical side.

Thus it is seen that cross price elasticity of demand is very important.

❖ **2.3.1.3. Income Elasticity of Demand :** Other things remaining constant, the percentage change in quantity demanded of any commodity due to one per cent change in income of the consumer is called **income elasticity of demand.** Therefore,

$$\text{Income elasticity of demand } (E_i) = \frac{\text{Percentage change in quantity demanded of the commodity}}{\text{Percentange change in income of the consumer}}$$

$$\textit{i.e.,}\ \text{Income elasticity of demand } (E_i) = \frac{\dfrac{\text{Change in quantity demanded}}{\text{Initial quantity demanded}} \times 100}{\dfrac{\text{Change in income}}{\text{Initial income}} \times 100}$$

Income elasticity of demand is now expressed with the help of symbols.

Let, q = initial quantity demanded.

Δq = small change in quantity demanded.

M = initial income.

ΔM = small change in income.

$$\text{Therefore, Income elasticity of demand } (E_i) = \frac{\dfrac{\Delta q}{q} \times 100}{\dfrac{\Delta M}{M} \times 100} = \frac{\Delta q}{q} \times \frac{M}{\Delta M}$$

$$= \frac{\Delta q}{\Delta M} \times \frac{M}{q}$$

There are different types of income elasticity of demand.

(1) **Normal commodity :** For normal commodity income elasticity of demand is positive. This is because for normal commodity, due to increase in income of the consumer the demand for the commodity also increase. Therefore in case of normal commodity, due to change in income of the consumer the demand for the commodity also changes in the same direction (both increase). For this here income elasticity of demand is positive.

(2) **Inferior commodity :** For inferior commodity income elasticity of demand is negative. This is because for inferior commodity due to increase in income of the consumer the demand for the commodity decrease. Therefore in case of inferior commodity due to change in income of the consumer the demand for the commodity changes in the opposite direction. For this here income elasticity of demand is negative.

(3) **Luxury commodity :** For luxury commodity income elasticity of demand is generally greater than one ($E_i > 1$). This is because in case of luxury commodity the percentage change in quantity demanded is generally greater than the percentage change in income.

(4) **Necessary commodity :** For necessary commodity income elasticity of demand is generally less than one ($E_i < 1$). This is because in case of necessary commodity the percentage change in quantity demanded is generally less than the percentage change in income.

(5) **Special type of Necessary commodity :** For special types of necessary commodity (*e.g.*, pin, pencil, etc.) income elasticity of demand is generally zero ($E_i = 0$). This is because the demand for this commodity is not generally dependent on the income of the consumer. As a result, generally there is no change in demand even though the income of the consumer is changed.

□ 2.3.1.3.1. Relation between Income Elasticity of Demand and the Proportion of Income Spent : Keeping price of the commodity remain constant consumer can purchase more or less amount of any commodity due to increase in income. As a result the amount of money spent of that commodity may increase or decrease. Again as a result change in the amount of money spent of the commodity the ratio of income spent upon that commodity is also changed. There exist a relation among this ratio with income elasticity of demand.

The matter is now discussed with the help of symbol.

Let,

M = initial income of the consumer,

q = amount of initial purchase of the commodity,

P_1 = price of the commodity,

So initially, the amount of expenditure of the consumer upon the commodity = $P_1 \cdot q$.

So initially the ratio of income spent upon the commodity $= \frac{P_1 \cdot q}{M}$.

Here it is assumed that income of the consumer increases by the amount ΔM. So income of the consumer is increased to $M + \Delta M$ and it is assumed that the demand for the commodity is increased by the amount Δq as a result of increase in income of the consumer.