

Managerial Economics
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Lecture - 22
Theory of Demand (Contd...) – II

So, we will try to now, if you look at, we discussed about price elasticity of demand which talks about the relationship between quantity demanded, and price. What happens to change in the quantity demanded, when there is a change in the price? Then we discuss about the income in our elasticity of demand, which talks about the change in the quantity demanded due to change in the income. Then, we discussed the cross price of the elasticity of demand which reflects the change in the quantity demanded due to change in the price of the related goods. And, finally we discussed the advertising, and advertisement, promotion elasticity of demand which talks about the change in the quantity demanded, when, due to change in the promotional activity and the advertisement expenditure.

Now, what we will do? We will solve some numerical taking each kind of the elasticity of demand. So, if you remember in case of price elasticity of demand, we discussed two types of price elasticity of demand, one is point elasticity and the second one is the arc elasticity.

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Numerical -1

Demand Schedule

Price	Quantity Demanded
3	20
4	15
5	11
6	9
7	7

Compute point price elasticity of demand for decrease in price from Rs 6 to 5.
Compute point price elasticity of Demand for a increase in price from Rs 5 to 6.

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So, in the first case, we will see how we will calculate the point elasticity of demand? So, the demand schedule is given here. When price is 3, the quantity demanded is 20 ; when price is 4, quantity demanded is 15; when price is 6, quantity demanded is 9 ; when price is 7, quantity demand is 7. We need to compute the point price elasticity of demand for decrease in price from 6 to 5. And we, we have to compute the point price elasticity of demand for increase in price from 5 to 6. So, we will see how we can do the point elasticity in both those cases.

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The image shows a hand pointing to a whiteboard with the following handwritten text:

$$\begin{aligned}
 & \text{Price} = 5, Q_d = 11 \\
 & \text{Price} = 6, Q_d = 9 \\
 & \Delta Q = 2, \Delta P = -1 \\
 & P = 6, Q_d = 9 \\
 & E_p = \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q} \\
 & = \frac{2}{-1} \cdot \frac{6}{9} \\
 & = \boxed{-1.33}
 \end{aligned}$$

So, in the first case, even the movement is from 5 to 6, the original price is 5, the original quantity demanded is 11. The movement is from price 5 to 6, and the quantity demanded 11 to 9. Now, what is the change in the Q? When the price moves from 6 to 5, What is the change in the quantity demanded? Quantity demanded is change from 9 to 11. So, quantity demanded is 2. What is the change in the price? The change in the price that is the decrease from 6 rupees to 5 rupees; so this is minus 1; so and what is our original price? Our original price is 6, original quantity demanded is 9.

Now, how we will find out the price elasticity of demand? Price elasticity of demand, if you remember the formula, this is $\frac{\Delta Q}{\Delta P}$ multiplied by $\frac{P}{Q}$. So, in this case, what is ΔQ ? ΔQ is 2; what is ΔP ? ΔP is minus 1; P is 6, and Q is 9 . So, if you solve for this, you get a value which is 1.33. So, the price elasticity of demand is minus 1.33, if there is a decrease in the price from rupees 6 to 5.

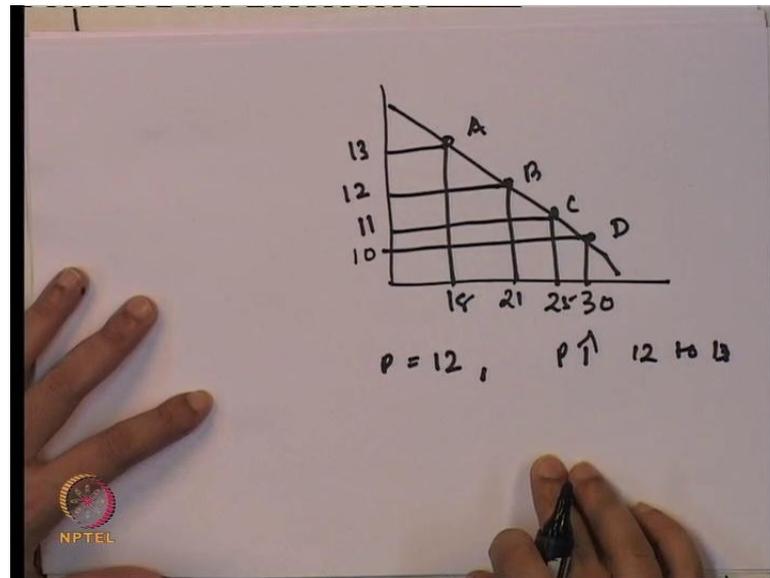
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$$\begin{aligned} P &= 5, Q_d = 11 \\ P &= 6, Q = 9 \\ \Delta Q &= -2, \Delta P = 1 \\ P &= 5, Q = 11 \\ E_p &= \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q} \\ &= \frac{-2}{1} \cdot \frac{5}{11} \\ &= \boxed{-0.9} \end{aligned}$$

Now, let us see the other one like, whether there is in the price from rupees 5 to 6; whether it is the same elasticity of demand or the different elasticity of demand. So, in this case, price is 5 quantity demanded is, price is 5, quantity demanded is 11; price is 6, quantity demanded is 9. Increase in the price from 5 to 6, quantity demanded decreases from 11 to 9. What is the change in the Q? Change in the Q is minus 2, change in the P is, change in the P is 1; P is equal to 5, and Q is equal to 11. If you find the price elasticity of demand now, it comes to ΔQ by ΔP , multiplied by P by Q . So, in this case, ΔQ is minus 2, ΔP is 1; P is 5, Q is 11. So, the final value comes as 0.9.

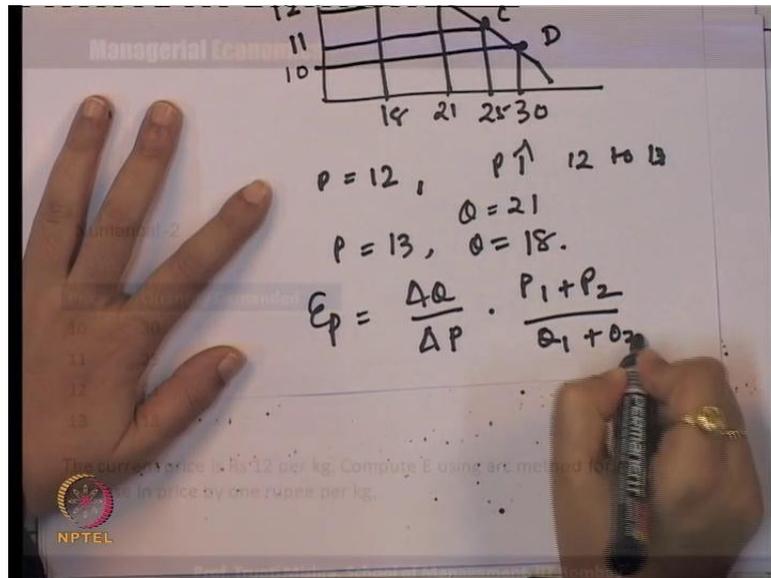
So, if you look at, even if in the same demand schedule, when we move from one to, one point to another point, whether price 6 to price 5, or whether price 5 to price 6. The elasticity of demand is not same, because it is from the different direction, if it is increasing, or if it is decreasing. It means, if the case of increase, or in case of decrease, the demand may be different; sometimes the demand may be inelastic, and sometimes may be elastic.

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Now we will take the case with respect to the arc elasticity of demand. So, if you remember arc elasticity of demand, where you measure the elasticity of demand in a segment. So, if you consider here, the different point of price and quantity combination, so price is, suppose price is 10, quantity demanded is 30; price is 11, quantity demanded is 25; price is 12, quantity demanded is 21; price is 13, quantity demanded is 18. Suppose point A, point B, point C, and point D. The current price is rupees 12. Now, if there is a increase in the price by 1 rupee, suppose from, price increases from 12 to 13, we will calculate how much is the, change in the quantity demanded. So, now, we have to calculate the price elasticity of demand in the segment or in the arc.

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Now, how we are going to do this? So, when price is 12, quantity demanded is 21. Price increases from 12 to 13, quantity demanded will decrease from 21 to 18. Now in case of arc elasticity of demand, what is the formula? ΔQ by ΔP , multiplied by P_1 plus P_2 , on Q_1 plus Q_2 .

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The slide is titled "Managerial Economics" and contains the following content:

Numerical -2

Price	Quantity Demanded
10	30
11	25
12	21
13	18

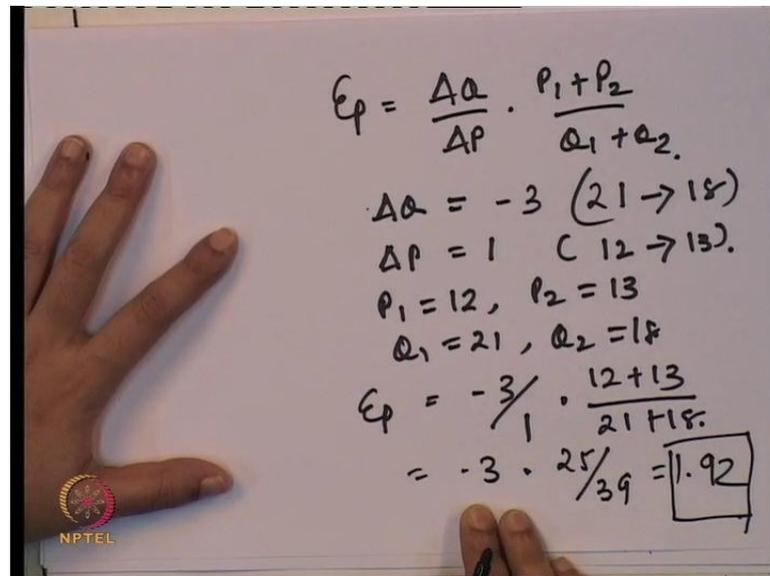
The current price is Rs 12 per kg. Compute E using arc method for an increase in price by one rupee per kg.

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Since, we are calculating this in a segment; we always take the average price, for, find out what is the original price and what is the original quantity.

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The image shows a hand-drawn calculation on a whiteboard. The formula for price elasticity of demand is written as $E_p = \frac{\Delta Q}{\Delta P} \cdot \frac{P_1 + P_2}{Q_1 + Q_2}$. Below this, the values are substituted: $\Delta Q = -3$ (from 21 to 18), $\Delta P = 1$ (from 12 to 13), $P_1 = 12$, $P_2 = 13$, $Q_1 = 21$, and $Q_2 = 18$. The final calculation is $E_p = \frac{-3}{1} \cdot \frac{12+13}{21+18} = -3 \cdot \frac{25}{39} = 1.92$, with the result 1.92 boxed.

$$E_p = \frac{\Delta Q}{\Delta P} \cdot \frac{P_1 + P_2}{Q_1 + Q_2}$$
$$\Delta Q = -3 \quad (21 \rightarrow 18)$$
$$\Delta P = 1 \quad (12 \rightarrow 13)$$
$$P_1 = 12, P_2 = 13$$
$$Q_1 = 21, Q_2 = 18$$
$$E_p = \frac{-3}{1} \cdot \frac{12+13}{21+18}$$
$$= -3 \cdot \frac{25}{39} = 1.92$$

So, if elasticity of demand is ΔQ by ΔP multiplied by P_1 plus P_2 , and Q_1 plus Q_2 . Let us find out what is ΔQ ? So ΔQ is minus 3, because if you remember the quantity demanded decreases from 21 to 18. What is ΔP ? ΔP is equal to 1, because the price increases from 12 to 13. What is P_1 ? P_1 is 12, P_2 is 13; Q_1 is 21, Q_2 is 18. So, if you put all the value now, then ΔQ is minus 3, ΔP is 1, multiplied by 12 plus 13, upon 21 plus 18, which leads to minus 3, multiplied by 25 by 39 leads to 1.92. So, elasticity of demand is equal to 1.9, which is greater than 1, it means the percentage change in the quantity demanded is greater than percentage change in the price. And this generally happens in case of the, in case of, if you remember in case of, which type of goods the quantity demanded is more than change in the price, in case of the elastic good; any small change in the price leads to greater change in the quantity demanded.

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Managerial Economics

Numerical -3

Government announces a 10 percent dearness allowances to its employees. As a result, average monthly salary of employees increases from 150 liters to 165 liters per month.

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Now, we will take the case of a numerical, in case of a income elasticity of demand. So, if you look at, the government announces the 10 percent dearness allowance to each of its employee. So, in this case, if there is a increase in the DA that leads to increase in the income. Now, we need to see, what is the corresponding change in the quantity demanded, or by which magnitude the quantity demanded is changing, when there is a change in the income of the consumer.

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10% ↑ DA.
→ ↑ salary.. Rs. 20,000
Rs. 22,000.

↳ consumption has
been has increased
150 lt. → 165 lt.

$$E_y = \frac{\Delta Q}{Q} \cdot \frac{Y}{\Delta Y}$$
$$= \frac{15 \cdot \Delta Y}{2000} \cdot \frac{20,000}{150}$$

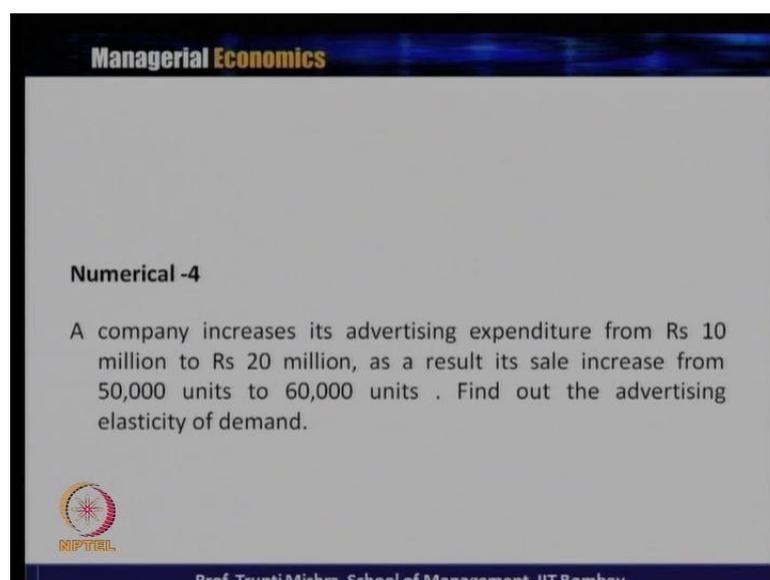
= 1

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So, 10 percent increase in the dearness allowances is announced by the government. As a result, the, as a result the monthly consumption of the petrol, that leads to increase in the salary. So, 10 percent increase in the DA leads to increase of salary of the, increase of salary of the employee. That leads to the fact that the consumption of fuel has increased, because there is a increase in the income. Now, what is the increase? Increase, earlier they used to consume 150 litres of fuel, now they are consuming 165 litre of fuel per month. In this case, what we will do? We will find out what is the income elasticity of demand. For this, what we require? We require the change in the quantity; we require the change in the income; we require the original income; we require the original quantity.

So, what is the increase in the salary, when the increase in the 10 percent DA. Earlier they were getting rupees 22000, and earlier they were getting rupees 20,000, now they are getting rupees 22,000. So, what is the change in the income? The change in the income is 2000; the change in the quantity demanded is, what is the quantity demanded change? That is 15. And, what is the change in the, what is the original income? Original income is 20,000. What is the original quantity? Original quantity is 150. If you simplify this, you get a value which is equal to 1; and that leads to the fact that increase in the income, is just equal to the increase in the quantity demanded.

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Numerical -4

A company increases its advertising expenditure from Rs 10 million to Rs 20 million, as a result its sale increase from 50,000 units to 60,000 units . Find out the advertising elasticity of demand.

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Now, we will take a numerical with respect to the cross price elasticity of demand, or may be the first with the advertising elasticity of demand. So, the company increases the advertising expenditure from rupees 10 million to 20 million, and as a result the sales increases from, sales increases from 50,000 unit to 60,000 unit. We need to find out, what is the advertising elasticity of demand.

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Adv. exp. ↑.
 Rs 10 million - 20 million
 ↓.
 Increase in Sale from
 50,000 units to 60,000 units

$$E_p = \frac{\Delta Q}{\Delta A} \cdot \frac{A}{Q}$$

$$\Delta A = 20 \text{ ml} - 10 \text{ ml} = 10 \text{ ml}$$

$$\Delta Q = 60,000 - 50,000 = 10,000$$

So, advertisement expenditure is increasing, that is rupees 10 million to 20 million. This leads to increase in sale from 50,000 units to 60,000 units. Now we will find out, the advertising elasticity of demand. So, advertising elasticity of demand generally captures the relationship between the change in the advertisement expenditure and change in the quantity demanded of the sales. So, what is the formula for this? Change in the Q, with respect to change in the advertisement expenditure; the original advertisement expenditure and the original quantity demanded. Now what is the change in the advertisement expenditure? That is 20 million to 10 million. 10 million to 20 million increases. So, what is the change? The change is 10 million. What is the change in the quantity demanded? The change in the quantity demanded is 60,000 to 50,000. So, the change is 10 thousand, the difference between 60,000 and the 50,000.

So, we know the change in the advertisement expenditure, we know the change in the quantity demanded; we know what is the original advertisement expenditure, we know what is the original sales.

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The image shows a whiteboard with a handwritten calculation for the advertising elasticity of demand. The formula is written as $\epsilon_p = \frac{\Delta Q}{\Delta A} \cdot \frac{A}{Q}$. Below this, the values are substituted: $= \frac{10,000}{10} \times \frac{10}{50,000}$. The final result is boxed as 0.2, with the label 'Adv. eld.' written next to it. A hand is visible on the left side of the whiteboard, and an NPTEL logo is in the bottom left corner.

$$\begin{aligned}\epsilon_p &= \frac{\Delta Q}{\Delta A} \cdot \frac{A}{Q} \\ &= \frac{10,000}{10} \times \frac{10}{50,000} \\ &= 0.2 \quad \text{Adv. eld.}\end{aligned}$$

Now, we will find out, what is the advertising elasticity of demand? So, ΔQ by ΔA . So, ΔQ is 10,000, this is 10 million multiplied by 10; this is 50,000. So, 10,000 is the change in the quantity demanded, because there is a increase in the sales from 50,000 unit to 60,000 unit. So, 10,000 is the increase in the unit quantity demanded, change in the quantity demanded. Earlier 10 million was the advertisement expenditure, now 20 million is the advertisement expenditure. So, 10 is the change in the advertisement expenditure. 10 is the original advertisement expenditure, 50,000 is the original sales. So, if you do this, then it will lead to 0.2, is the advertisement expenditure, advertising elasticity of demand. It means, 1 percent increase in the advertisement expenditure leads to point 2 percent increase in the sales. And if you look at, this is the case of a relative in elastic because the change in the quantity demanded is less than the change in the advertisement expenditure.

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Managerial Economics

Session Summary

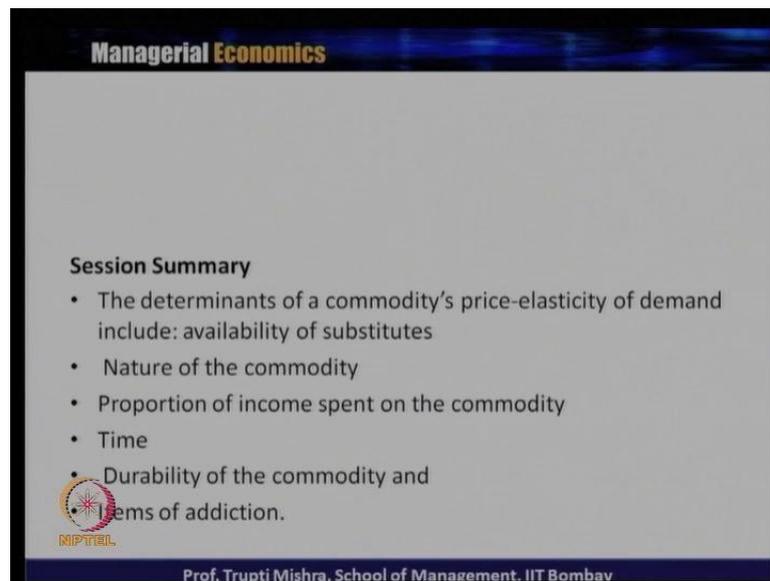
- The -price elasticity of demand is generally defined as the degree of responsiveness of demand for a commodity to changes in its own price.
- It is the percentage change in quantity demanded as a result of *one percent change in the price of the commodity*.

 The own-price elasticity can be measured between two points on a demand curve (for *arc elasticity*) or on a point (for *point elasticity*).

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So, if you summarize, whatever we have discussed in today's class, and also what we discussed previously on the price elasticity of demand. The price elasticity of demand is generally defined as the degree of responsiveness of the demand for a commodity to change on its own price. It is the percentage change in the quantity demanded, as a result of one percent change in the price of the commodity. So, if there is one percent change in the price, what is the corresponding percentage change in the quantity demanded? So, through price elasticity of demand we generally measure the sensitiveness of the buyers due to change in the price, if there is a increase or if there is a decrease. So, the price elasticity on demand measure in two points, one is on point and other there is in the arc elasticity of demand. So, if it is in the segment, generally this is known as the arc elasticity of demand; if it is measure in a point, it is generally known as the point elasticity of demand.

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Managerial Economics

Session Summary

- The determinants of a commodity's price-elasticity of demand include: availability of substitutes
- Nature of the commodity
- Proportion of income spent on the commodity
- Time
- Durability of the commodity and items of addiction.

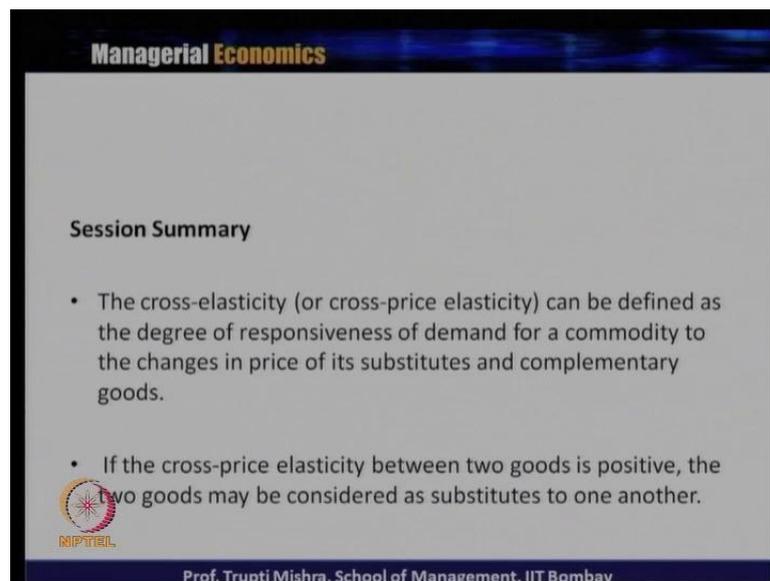
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Now, what are the determinants that influence the price elasticity of demand? The first one is the, the nature of the commodity. The second one is the availability of the substitute; more substitutes in the market, more is the price elasticity of demand. Then nature of the commodity; whether it is a luxury, whether it a is necessity, whether it is a semi luxury. Then, what is the proportion of income spent on the commodity? If it is more, generally it is more elastic, because when the consumer is spending sufficient amount of money on a commodity, when the price changes they always look for the alternate.

What is the time of, time for adjustment available to the consumer? The longer is the time, more elastic is the demand; shorter is the time, less elastic is the demand. What is the durability of the commodity? If it is more durable, it is more elastic, if it is less durable, it is less elastic. Item of addiction, generally this is not considered as the normal consumer because the people they are addicted to more, and in this case the demand is inelastic.

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Managerial Economics

Session Summary

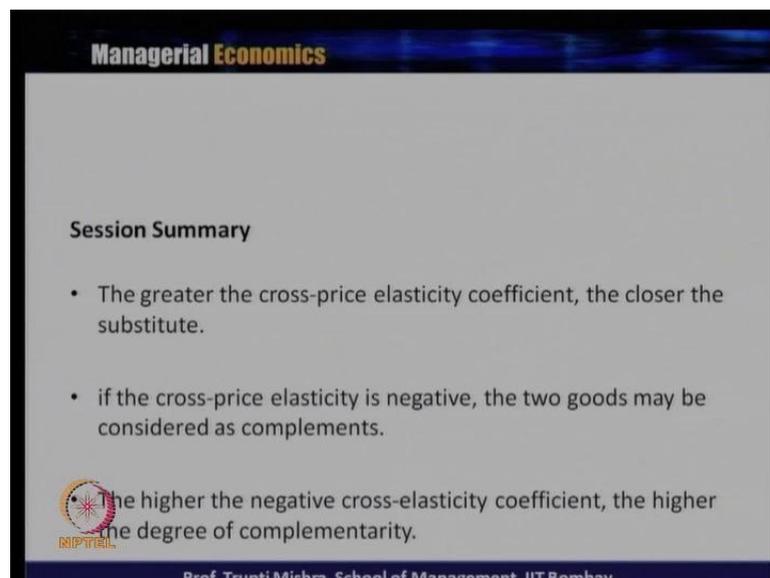
- The cross-elasticity (or cross-price elasticity) can be defined as the degree of responsiveness of demand for a commodity to the changes in price of its substitutes and complementary goods.
- If the cross-price elasticity between two goods is positive, the two goods may be considered as substitutes to one another.

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Then, we discussed about the cross price elasticity of demand. So cross price elasticity of demand is the degree of responsiveness of demand for a commodity, to change in the price of its substitute and complementary goods. And, if the cross price elasticity of demand between two goods is positive, then two goods may be considered as the substitute goods; and if it is negative, two goods may be considered as complement.

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Managerial Economics

Session Summary

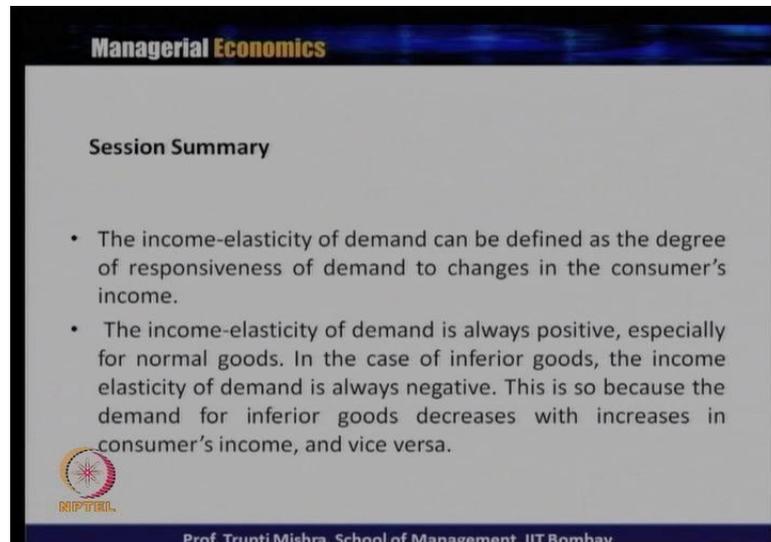
- The greater the cross-price elasticity coefficient, the closer the substitute.
- if the cross-price elasticity is negative, the two goods may be considered as complements.

 The higher the negative cross-elasticity coefficient, the higher the degree of complementarity.

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The greater is the cross price elasticity of co-efficient, the closer is the substitute. And the higher is the negative cross elasticity coefficient, the higher is degree of the complementarity.

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Managerial Economics

Session Summary

- The income-elasticity of demand can be defined as the degree of responsiveness of demand to changes in the consumer's income.
- The income-elasticity of demand is always positive, especially for normal goods. In the case of inferior goods, the income elasticity of demand is always negative. This is so because the demand for inferior goods decreases with increases in consumer's income, and vice versa.

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Then, we discussed about the income elasticity of demand. It can be defined as the degree of responsiveness of the demand to change in the consumer income. The income elasticity of demand is always positive, specifically in the case of the normal goods. But in case of inferior good, the income elasticity of demand is always negative, because the demand for a inferior good decreases with the increase in consumers income, and vice versa

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Managerial Economics

Session Summary

The concept of advertisement elasticity is found useful in the determination of optimum level of advertisement expenditure. This concept assumes a greater significance in deciding advertisement expenditure than other decision variables.

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Then, we discussed the advertisement elasticity of demand, and found it is useful in the determination of the optimum level of advertisement expenditure. And, it helps the producer to decide, that what is the right kind of production they have to do it in the future, so, that it affects the over production and under production.

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Managerial Economics

Session References

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Managerial economics – Christopher R Thomas, S Charles Maurice and Sumit Sarkar
Managerial economics – Geetika, Piyali Ghosh and Purba Roy Choudhury
Managerial economics- Paul G Keat, Philip K Y Young and Sreejata Banerjee
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And for this typical topic, this elasticity of demand, these are the reference, what are being followed for preparing this specific session.