Elasticity of Demand

Concept- Elasticity of Demand

Elasticity, as a concept, measures the responsiveness of a change in the dependent variable to a given change in the independent variable.

- **It uses percentages to highlight the relative changes.**
- **For example, the price elasticity of demand measures the % change in Q from a corresponding % change in P.**

Elasticities of Demand

- How responsive is variable "G" to a change in variable "S"

$$E_{G,S} = \frac{\%\Delta G}{\%\Delta S}$$

  + S and G are directly related
  - S and G are inversely related

Price Elasticity of Demand

$$E_{Q_X, P_X} = \frac{\%\Delta Q_X{}^{d}}{\%\Delta P_X}$$

Price elasticity of demand refers to elasticity of demand for a good (Qx) with respect to its own price (Px).

For example, suppose a firm increases the price of its product by 2 % and quantity demanded subsequently decreases by 3 %. The Price Elasticity would be

Ep = -3% / 2% = -1.5

Price Elasticity of Demand

- Negative according to the "law of demand"

Elastic: $\left|E_{Q_X,P_X}\right| > 1$

Inelastic: $\left|E_{Q_X,P_X}\right| < 1$

Unitary: $\left|E_{Q_X,P_X}\right| = 1$

Price Elasticity of Demand

Point Elasticity- Elasticity at a given point on the demand curve. Here we consider extremely small changes in price.

Point Elasticity $$E_P = \frac{\Delta Q / Q}{\Delta P / P} = \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q}$$

Price Elasticity of Demand

Arc Elasticity- Price elasticity of demand between two points on the demand curve.

Arc Elasticity $$E_P = \frac{Q_2 - Q_1}{P_2 - P_1} \cdot \frac{P_2 + P_1}{Q_2 + Q_1}$$

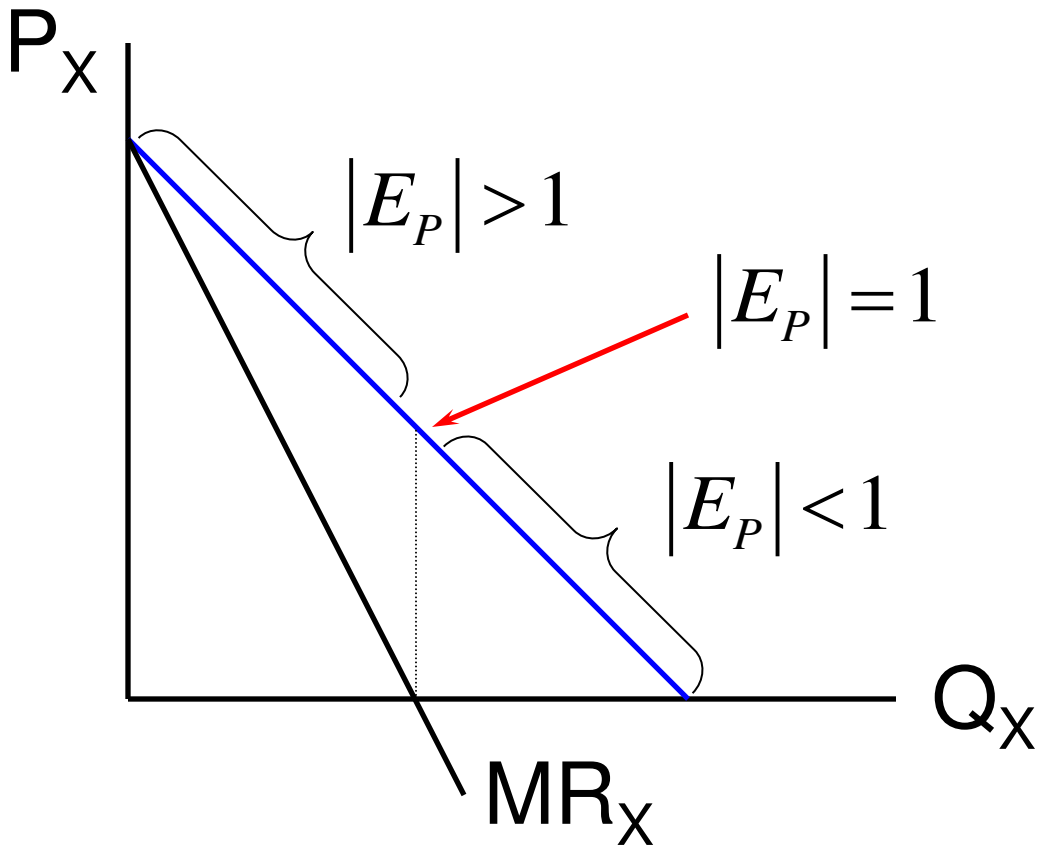
Marginal Revenue and Price Elasticity of Demand

TR= P*Q

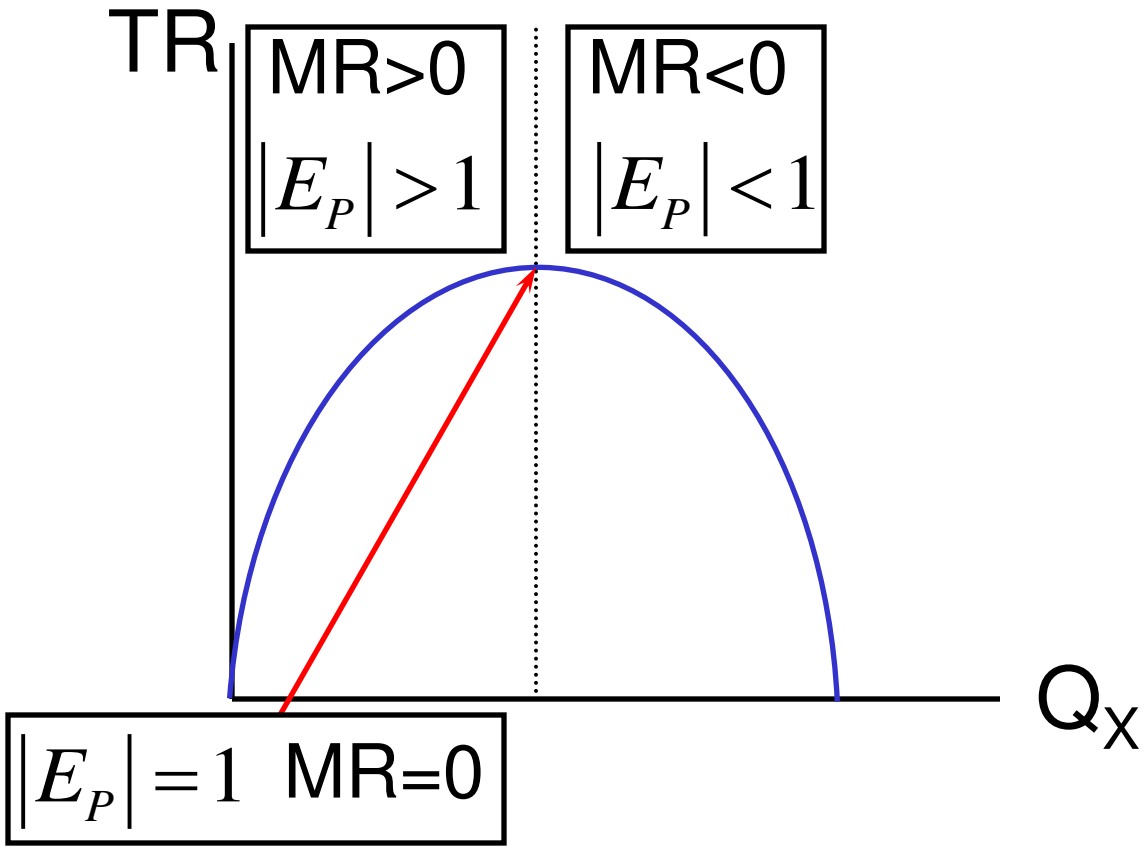
MR = Change in TR with respect to change to Q

$$MR = P\left(1 + \frac{1}{E_P}\right)$$

Marginal Revenue and Price Elasticity of Demand



Marginal Revenue, Total Revenue, and Price Elasticity



Determinants of Price Elasticity of Demand

Demand for a commodity will be **more elastic** if:

- It has many close substitutes
- It is narrowly defined
- More time is available to adjust to a price change

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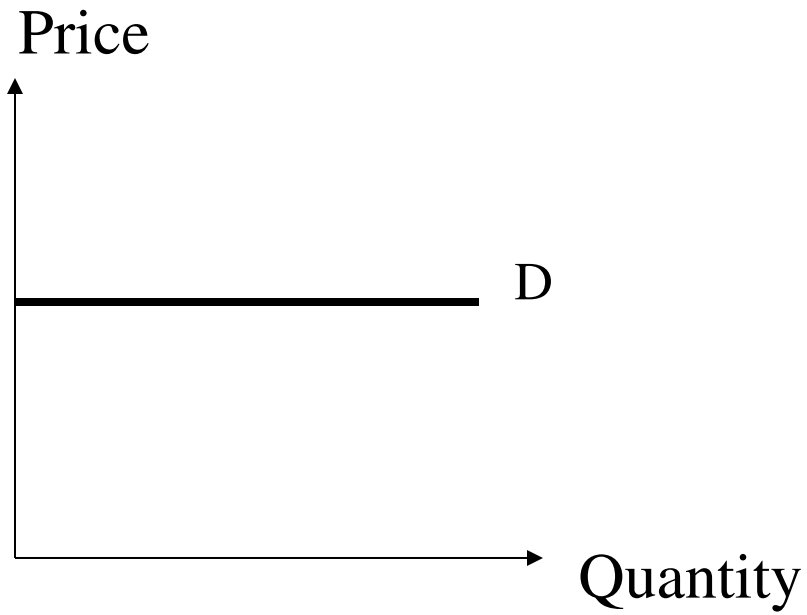
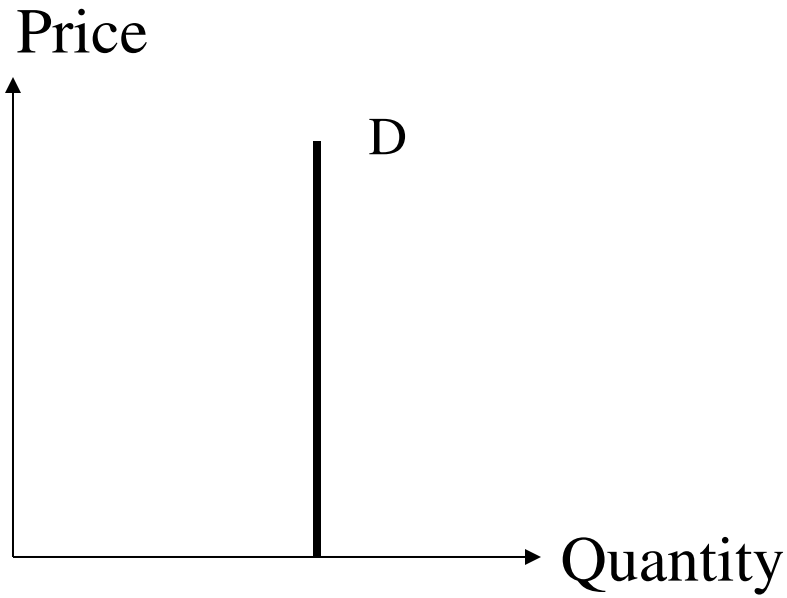
Perfectly Elastic & Inelastic demand



Perfectly Elastic



Perfectly Inelastic

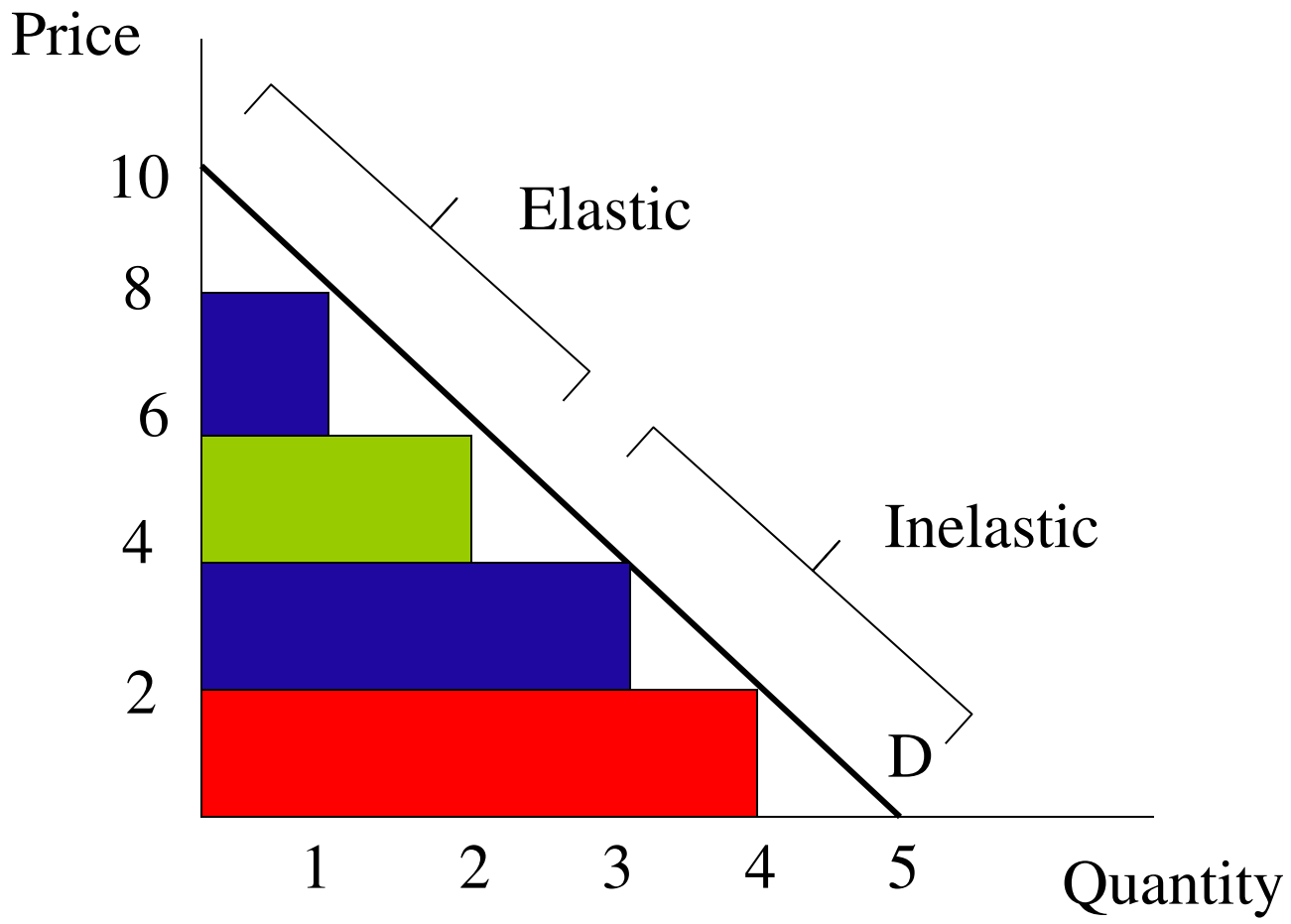
Price Elasticity and Total Revenue

- Elastic
  - Increase (a decrease) in price leads to a decrease (an increase) in total revenue.
- Inelastic
  - Increase (a decrease) in price leads to an increase (a decrease) in total revenue.
- Unitary
  - Total revenue is maximized at the point where demand is unitary elastic.

Look at what happened to total revenue when we decrease price in the elastic and inelastic portions of the curve on the next slide:

When decrease price from 8 to 6, TR rises from 8x1 to 6x2; when decrease price from 4 to 2, TR falls from 4x3 to 2x4

Elasticity, TR, and Linear Demand



Factors Affecting Price Elasticity

- Available Substitutes
  - The more substitutes available for the good, the more elastic the demand.
- Time
  - Demand tends to be more inelastic in the short term than in the long term.
  - Time allows consumers to seek out available substitutes.
- Expenditure Share
  - Goods that comprise a small share of consumer's budgets tend to be more inelastic than goods for which consumers spend a large portion of their incomes.

Income Elasticity of Demand

This measure the percentage change in the demand for the commodity with respect to change in income, holding constant all other variables in the demand function, including price.

Income Elasticity

$$E_{Q_X,I} = \frac{\%\Delta Q_X{}^{d}}{\%\Delta I}$$

+ Normal Good

- Inferior Good

Income Elasticity of Demand

Point Elasticity $$E_I = \frac{\Delta Q / Q}{\Delta I / I} = \frac{\Delta Q}{\Delta I} \cdot \frac{I}{Q}$$

Income Elasticity of Demand

Arc Elasticity $$E_I = \frac{Q_2 - Q_1}{I_2 - I_1} \cdot \frac{I_2 + I_1}{Q_2 + Q_1}$$

Normal Good $E_I > 0$

Inferior Good $E_I < 0$

What can we do with the income elasticity?

- Income elastic goods do better when income is increasing and worse when it is decreasing.
  - So if you have a good that is income elastic, you should be very interested in what happens to the economy (forecasts).

Cross Elasticity of Demand

Demand is also influenced by prices of other goods and services.

The responsiveness of quantity demanded to changes in price of other goods is measured by cross elasticity,

It is defined as the percentage change in quantity demanded of one good caused by 1 percent change in the price of some other good.

Cross Price Elasticity of Demand

$$E_{Q_X, P_Y} = \frac{\%\Delta Q_X{}^{d}}{\%\Delta P_Y}$$

+ Substitutes

- Complements

We use the cross elasticity to determine if two goods are

- **complements (negative sign) or**
- **substitutes (positive sign).**

We also check to see how interrelated two products are.

Cross-Price Elasticity of Demand

Point Elasticity $$E_{XY} = \frac{\Delta Q_X / Q_X}{\Delta P_Y / P_Y} = \frac{\Delta Q_X}{\Delta P_Y} \cdot \frac{P_Y}{Q_X}$$

Cross-Price Elasticity of Demand

Arc Elasticity $$E_{XY} = \frac{Q_{X2} - Q_{X1}}{P_{Y2} - P_{Y1}} \cdot \frac{P_{Y2} + P_{Y1}}{Q_{X2} + Q_{X1}}$$

Substitutes	Complements
$E_{XY} > 0$	$E_{XY} < 0$

Uses of Elasticities

- Pricing
- Managing cash flows
- Impact of changes in competitors' prices
- Impact of economic booms and recessions
- Impact of advertising campaigns
- And lots more!

How Do We Interpret This?

- If $P\downarrow$ and $TR\uparrow$ $E_D > 1$
- If $P\downarrow$ and $TR\downarrow$ $E_D < 1$
- If $P\uparrow$ and $TR\downarrow$ $E_D > 1$
- If $P\uparrow$ and $TR\uparrow$ $E_D < 1$
- If $P\updownarrow$ and $TR\leftrightarrow$ $E_D = 1$

Problems Assignment-1

- Mr. X, Strategic manager working in Tata Automobile since last 5 years. He was assigned to estimate the Demand for Indigo marina. With his research team he has develop the the following Demand function:

$$Qc = 100{,}000 - 100Pc + 2000N + 50\,I + 30\,P_A - 1000\,P_F + 3A + 40000Pi$$

Problems Assignment-1 Cont..

Where

Qc = Qty demanded per year of Indigo marina

Pc = Price of Indigo marina in thousand Rs.

N = Population in higher income group in millions

I = Per capita disposable income in thousand Rs

P_A = Price of Accent Hundai in thousand Rs.

P_F = Price of Fuel Rs. Per gallon

A = Advertising expenditures by Indigo in thousand Rs per year

Pi = Credit incentives to purchase Indigo, in percentage points below the rate of interest on borrowing in the absence of incentives

Problems Assignment-1 Cont..

(a) Indicate the change in number of Indigo purchased per year (Qc) for each unit change in the independent or explanatory variables;

(b) Find the value of Qc if the average value of Pc = Rs. 9000, N= 200 million, I = Rs. 10,000, P_A= Rs. 8000, P_F = Rs. 80, A= Rs. 200,000 and if Pi = 1

Problems Assignment-2

- According to an Financial Report by a Consultant, Air Tel's own price elasticity of demand for long distance services is -8.64.
- Air Tel needs to boost revenues in order to meet its marketing goals.
- To accomplish this goal, should Air Tel raise or lower its price?

Problems Assignment-3

If Air Tel lowered price by 3 percent,

what would happen to the volume of long distance telephone calls routed through Air Tel?

Problems Assignment-4

- According to Report by consultant, Air Tel's cross price elasticity of demand for long distance services is 9.06.
- If Hutch and other competitors reduced their prices by 4 percent, what would happen to the demand for Air Tel services?