Elasticities

Recap- Price Elasticity of Demand

- **Price Elasticity of Demand (PED):** is a measure of the responsiveness of the quantity of a good demanded to changes in its price.

  - **PED = %ΔQ$_D$ ÷ %ΔP**

Value of PED	Classification	Interpretation
Frequently Encountered Cases		
0 < PED < 1	Inelastic demand	Price insensitive
1 < PED < ∞	Elastic demand	Price sensitive
Special Cases		
PED = 1	Unitary elastic demand	%ΔQ$_D$ = %ΔP
PED = 0	Perfectly inelastic demand	Fixed quantity
PED = ∞	Perfectly elastic demand	Fixed price

- There are several factors that determine whether the demand for a good is elastic or inelastic.

  - **1) Number and closeness of substitutes**
  - **2) Necessities versus luxuries**
  - **3) Length of time**
  - **4) Proportion of income spent on a good**

- Along any *downward-sloping*, *straight-line demand curve*, the PED varies as we move along the curve.

  - Demand is price elastic at high-prices and low-quantities

  - Demand is price inelastic at low prices and large-quantities

  - At the midpoint of the demand curve, there is unit elastic demand

PED- Calculations

- **Example;** Tesla Motors Model S retails for $85,000 in Canada in August. Approximately, 100 Model S vehicles were sold in August.

- In September, the government implemented a rebate program of $5,000 for electric vehicles. Estimates indicate 110 vehicles will be sold in September.

- **PED = %ΔQ$_D$ ÷ %ΔP**
  = [(Q$_{NEW}$ − Q$_{OLD}$)/Q$_{OLD}$] ÷ [(P$_{NEW}$ − P$_{OLD}$)/P$_{OLD}$]
  = [(110 − 100)/100] ÷ [($80,000 − $85,000)/$85,000]
  = 10% ÷ 5.8824%
  = 1.70

- This indicates that the demand for the Model S is *price elastic,* since the **PED > 1** and a decrease in price will increase Tesla's revenues.

Cross-Price Elasticity of Demand

- **Cross-Price Elasticity of Demand (XED):** is a measure of the responsiveness of demand for one good to a change in the price of another good.

- It involves demand curve shifts and provides information on whether demand increases or decreases, and on the size of the demand curve shifts

  o **$XED = \%\Delta Q_X \div \%\Delta P_Y$**

Value of XED	Classification	Example
XED > 0	Substitutes	Coca-Cola & Pepsi
XED < 0	Complements	Ice-Cream & Cones

XED- Calculations

- **Example;** Suppose a convenience store decides to increase the price of a 500 mL bottle of Coca-Cola from $1.50 to $1.80.

- The store maintains their prices for Pepsi and the quantity demanded for the product increases from 1,000 to 1,140 bottles in a particular month.

  o **XED = %ΔQ_X ÷ %ΔP_Y**
  $$= [(Q_{NEW} - Q_{OLD})/Q_{OLD}] \div [(P_{NEW} - P_{OLD})/P_{OLD}]$$
  $$= [(1{,}140 - 1{,}000)/1{,}000] \div [(\$1.80 - \$1.50)/\$1.50]$$
  $$= 14\% \div 20\%$$
  $$= 0.70$$

- This indicates that Coca-Cola and Pepsi have a high degree of *substitutability* since **XED > 0** and relatively close to 1.

Income Elasticity of Demand

- **Income Elasticity of Demand (YED):** is a measure of the responsiveness of demand to changes in income.

- It involves demand curve shifts and provides information on the direction of change of demand given a change in income and on the size of the change.

  o **YED = %$\Delta Q_D \div$ %ΔY**

Value of YED	Classification	Interpretation
YED < 0	Inferior Good	Quantity falls with income
YED > 0	Normal Good	Quantity increases with income
0 < YED < 1	Necessities	Income inelastic demand
YED > 1	Luxuries	Income elastic demand

YED- Calculations

- **Example;** Your income increases from £1,000 a month to £1,200 a month. As a result, the frequency that you dine-out at restaurants increases from 4 to 6 times per month.

  - $YED = \%\Delta Q_D \div \%\Delta Y$
    $= [(Q_{NEW} - Q_{OLD})/Q_{OLD}] \div [(Y_{NEW} - Y_{OLD})/Y_{OLD}]$
    $= [(6 - 4)/4] \div [(£1,200 - £1,000)/£1,000]$
    $= 50\% \div 20\%$
    $= 2.50$

- This indicates that dining-out at restaurants has *income elastic demand* and is a *normal good* since **XED > 1**

Recap- Price Elasticity of Supply

- **Price Elasticity of Supply (PES):** is a measure of the responsiveness of the quantity of a good supplied to changes in its price.

  o **PES = %ΔQ$_S$ ÷ %ΔP**

Value of PES	Classification	Interpretation
Frequently Encountered Cases		
0 < PES< 1	Inelastic supply	Price insensitive
1 < PES < ∞	Elastic supply	Price sensitive
Special Cases		
PES = 1	Unitary elastic supply	%ΔQ$_S$ = %ΔP
PES = 0	Perfectly inelastic supply	Fixed quantity
PES = ∞	Perfectly elastic supply	Fixed price

- There are several factors that determine whether the supply for a good is elastic or inelastic.

- **1) Length of time**
  - The amount of time firms have to adjust their inputs and the quantity supplied in response to changes in price

- **2) Mobility of the factors of production**
  - The ease and speed with which firms can shift resources and production between different products

- **3) Spare capacity of firms**
  - The greater the spare capacity the more elastic the supply

- **4) Ability to store stocks**
  - Firms that have an ability to store stocks are likely to have a more elastic supply than firms that cannot store stocks

PES- Calculations

- **Example;** Suppose that the price of oil increases from $100 to $110 as a result of instability in the Middle East.

- In response, the quantity of oil supplied by Canadian producers increases from 1.25 to 1.30 million barrels of oil per day.

- $\mathbf{PED = \%\Delta Q_S \div \%\Delta P}$
  $\mathbf{= [(Q_{NEW} - Q_{OLD})/Q_{OLD}] \div [(P_{NEW} - P_{OLD})/P_{OLD}]}$
  $= [(1.30 - 1.25)/1.25] \div [(\$110 - \$100)/\$100]$
  $= 4\% \div 10\%$
  $= 0.4$

- This indicates that the supply of oil from Canadian sources is *price inelastic,* since the **PES < 1**.

Summary of Key Characteristics

Elasticity	Values		Description
Price elasticity of demand $\text{PED} = \%\Delta Q_D \div \%\Delta P$ **Price elasticity of supply** $\text{PES} = \%\Delta Q_S \div \%\Delta P$	PED = 0	PES = 0	Perfectly inelastic
	PED < 1	PES < 1	Price inelastic
	PED = 1	PES = 1	Unit elastic
	PED > 1	PES > 1	Price elastic
	PED = ∞	PES = ∞	Perfectly elastic
Cross-price elasticity of demand $\text{XED} = \%\Delta Q_X \div \%\Delta P_Y$	XED > 0		Substitutes
	XED = 0		Unrelated
	XED < 0		Complements
Income elasticity of demand $\text{YED} = \%\Delta Q_D \div \%\Delta Y$	YED < 0		Inferior good
	YED > 0		Normal good
	0 < YED < 1		Income inelastic (Necessity)
	YED > 1		Income elastic (Luxury)

Study Questions

o **1.** If the XED between Coca-Cola and Pepsi is 0.7, how will the demand for Coca-Cola change if the price of Pepsi increases by 5%?

o **2.** Your income increases from £1000 a month to £1200 a month. As a result, you increase your purchases of pizza from 8 to 12 per month, and decrease your purchases of chees sandwiches from 15 to 10 per month.

o **A.** Calculate your income elasticity of demand for pizzas and for cheese sandwiches.

o **B.** What kind of goods are pizzas and cheese sandwiches for you?

o **C.** Show using diagrams the effect of your increase in income on your demand for pizzas and cheese sandwiches.