# Barick Chung

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Research paper:
Chung, Barick, "Two Level Price Discrimination and Vertical Relationship" (March 05, 2012). Available at SSRN: http://ssrn.com/abstract=1997070.

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# ECO 2011 (Sections L07-10) Basic Microeconomics

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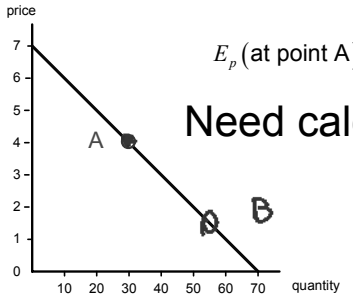
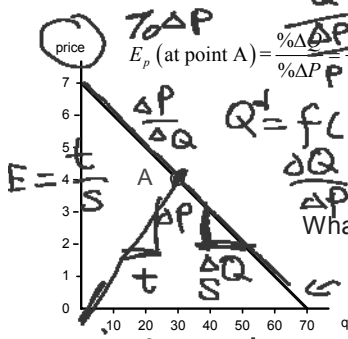



$E_p(\text{at point A}) \cong -1.333$

## Need calculus ??

$$E_p(\text{at point A}) = \frac{\%\Delta Q}{\%\Delta P} = \frac{\frac{\Delta Q}{Q}}{\frac{\Delta P}{P}} = \frac{P}{Q} \times \frac{1}{\frac{\Delta P}{\Delta Q}}$$

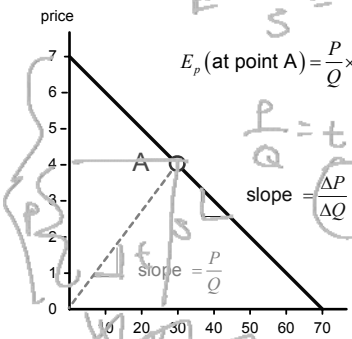



What are $\frac{P}{Q}$ and $\frac{\Delta P}{\Delta Q}$?

inverse demand curve



$$E_p(\text{at point A}) = \frac{P}{Q} \times \frac{1}{\frac{\Delta P}{\Delta Q}} = \frac{4}{30} \times \frac{1}{-\frac{7}{70}} \cong -1.333$$

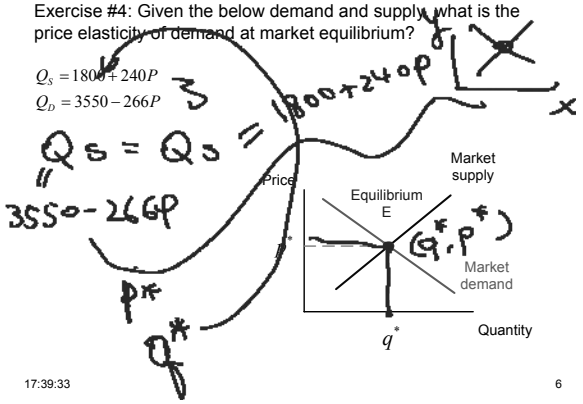





Exercise #4: Given the below demand and supply, what is the price elasticity of demand at market equilibrium?

$Q_S = 1800 + 240P$

$Q_D = 3550 - 266P$



Pindyck and Rubinfeld, 2013, pp.37-39.

$Q_S = 1800 + 240P$

$Q_D = 3550 - 266P$

To find $\frac{\Delta Q}{\Delta P}$:

$Q_D = 3550 - 266P$

$Q_D' = 3550 - 266(P+1) = 3550 - 266P - 266$

$Q_D' - Q_D = \frac{\Delta Q}{\Delta P} = -266 \Rightarrow \frac{\Delta P}{\Delta Q} = \frac{-1}{266}$

To find $P$ and $Q$:

Solve: $\begin{cases} Q_S = 1800 + 240P \\ Q_D = 3550 - 266P \\ Q_S = Q_D \end{cases}$

Obtain: $\{P = \$3.46 \text{ per bushel}; Q^* = 2630 \text{ million bushels}\}$

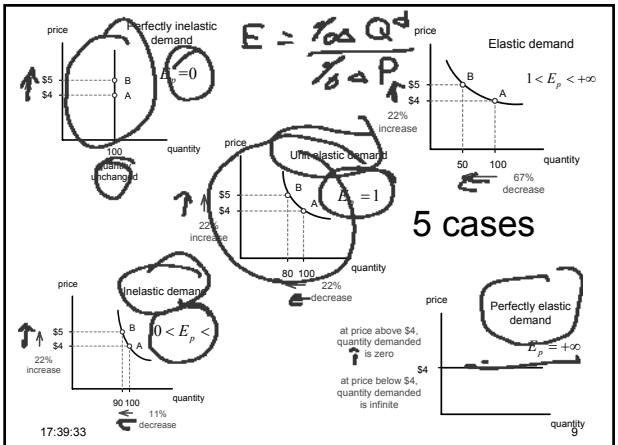
$\left(E_P^D\right)^* = \frac{P^*}{Q^*} \times \frac{1}{\frac{\Delta P}{\Delta Q}} = \frac{3.46}{2630} \times (-266) \approx -0.35$

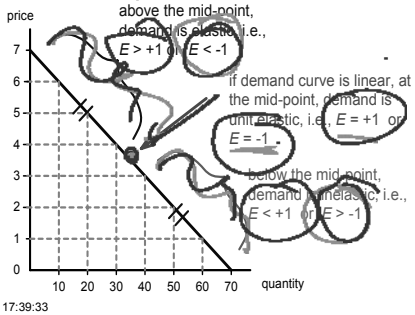
Demand is said to be **inelastic** when the elasticity is less than +1

Demand is said to be **unit elastic** when the elasticity is +1

Demand is said to be **elastic** when the elasticity is greater than +1







Pindyck and Rubinfeld, 2013, p. 35:

**Income elasticity** is the percentage change in the quantity demanded resulting from a 1-percent increase in income.

$$E_I = \frac{\%\Delta Q}{\%\Delta I} = \frac{\frac{\Delta Q}{Q}}{\frac{\Delta I}{I}} = \frac{I}{Q} \times \frac{1}{\frac{\Delta I}{\Delta Q}}$$

Pindyck and Rubinfeld, 2013, p. 35:

**Cross-price elasticity** is the percentage change in the quantity demanded of one good resulting from a 1-percent increase in the price of another.

$$E_{AB} = \frac{\%\Delta Q_A}{\%\Delta P_B} = \frac{\frac{\Delta Q_A}{Q_A}}{\frac{\Delta P_B}{P_B}} = \frac{P_B}{Q_A} \times \frac{1}{\frac{\Delta P_B}{\Delta Q_A}}$$

Pindyck and Rubinfeld, 2013, p. 36:

**Price elasticity of supply** is the percentage change in the quantity supplied resulting from a 1-percent increase in price.

$$E_p^S = \frac{\%\Delta Q^S}{\%\Delta P} = \frac{\frac{\Delta Q^S}{Q^S}}{\frac{\Delta P}{P}} = \frac{P}{Q^S} \times \frac{1}{\frac{\Delta P}{\Delta Q^S}}$$

$\{P, Q^S\}$

1% ↑ ??%



Suppose the demand function for good X is:

$Q_x^d = F(P_x, P_y, P_z, \text{Income}, \text{Taste}, \ldots)$

$Q_A^d = f(P_A, P_D, P_B, I, T, \ldots)$

Price of good x

Income

Quantity demanded of good x

Price of other goods

Demand function



Suppose the demand function for good X is:

$Q_x^d = F(P_x, P_y, P_z, \text{Income}, \text{Taste}, \ldots)$

**Income elasticity** of demand measures the responsiveness of quantity demanded ($Q_x^d$) to changes in its income (I)

$$E_I = \frac{\text{\% change in quantity demanded}}{\text{\% change in income}}$$

$E_I = \frac{\%\Delta Q^d}{\%\Delta I} = \frac{I}{Q^d} \times \frac{\Delta Q^d}{\Delta I}$ ($I > 0$, $Q^d > 0$, $> 0$)

$E_I \gtreqless 0$ iff $\frac{\Delta Q^d}{\Delta I} \gtreqless 0$

**Income Elasticity** of Demand

A good is a **Normal Good** if (and only if): **income elasticity** is positive,

A good is an **Inferior Good** if (and only if): **income elasticity** is negative

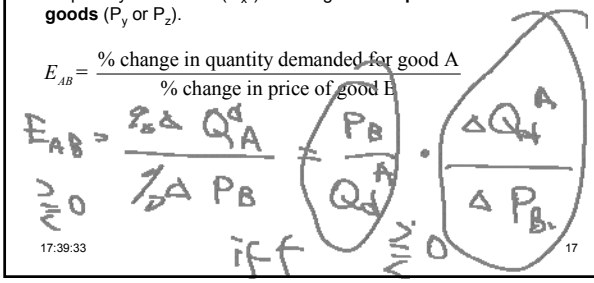


The demand function is:

$Q_x^d = F ( P_x, P_y, P_z, \text{Income, Taste, ...} )$

**Cross-price elasticity** of demand measures the responsiveness of quantity demanded ($Q_x^d$) to changes in the **price of other goods** ($P_y$ or $P_z$).

$$E_{AB} = \frac{\text{\% change in quantity demanded for good A}}{\text{\% change in price of good B}}$$





**Cross-price elasticity** of demand

A pair of goods are **Substitutes** if (and only if): the **cross-price elasticity** of demand is positive

A pair of goods are **Complements** if (and only if): the **cross-price elasticity** of demand is negative

Example #1:

A company finds that quantity demands is a function of:

$$Q_x^d = f(P_x, P_y, I, A)$$

where $I$ is the income of people, $P_y$ is the price of a related good, and $A$ is the advertising level of the good.



Example #1:

$$\ln Q_x^d = 10 - 1.2 \times \ln P_x + 1.7 \times \ln P_y + 3 \times \ln I + 2 \times \ln A$$