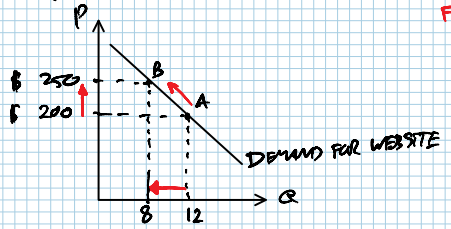
Elasticity (Continued)
- Arc price elasticity of demand (Midpoint formula)
- Determinants of Elasticity
  - Necessity Vs. Luxury
  - Longrun Vs. Short run
  - Broadly defined good Vs. Narrowly defined good
- Point price elasticity of demand: slope of demand curve is constant but E is not
- Geometry of Elasticity
- Elasticity and Total Revenue
- Other elasticities

ELASTICITY (CONTINUED)



FROM A → B

$$E = \frac{\%\Delta Q}{\%\Delta P} = \frac{\frac{Q_2 - Q_1}{Q_1} \times 100}{\frac{P_2 - P_1}{P_1} \times 100} = \frac{\frac{8-12}{12} \times 100}{\frac{250-200}{200} \times 100} = -\frac{33}{25} = -1.33$$

ELASTICITY IS UNIT-FREE

$|E| = 1.33$

- DEMAND IS PRICE-ELASTIC ($\%\Delta Q > \%\Delta P$)
- AS PRICE RISES BY 1%, Q^D FALLS BY 1.33%, CETERIS PARIBUS

LET'S CALCULATE E_p WHEN MOVING FROM D → A (PRICE REDUCTION)

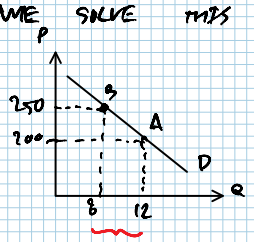
FROM B → A: $E = \frac{\%\Delta Q}{\%\Delta P} = \frac{\frac{12-8}{8} \times 100}{\frac{200-250}{250} \times 100} = \frac{+50\%}{-20\%}$

$E = -2.5$

$|E| = 2.5$

NOW, WE HAVE A PROBLEM; OVER THE SAME RANGE, THE CALCULATION PRODUCES DIFFERENT VALUE, DEPENDING ON WHERE YOU START.

WE SOLVE THIS PROBLEM BY "MIDPOINT METHOD"



$$E = \frac{\%\Delta Q}{\%\Delta P} = \frac{\frac{\Delta Q}{\left(\frac{Q_1+Q_2}{2}\right)} \times 100}{\frac{\Delta P}{\left(\frac{P_1+P_2}{2}\right)} \times 100}$$

$$\%\Delta Q = \frac{8-12}{\left(\frac{8+12}{2}\right)} \times 100 = -40\%$$

$$\%\Delta P = \frac{250-200}{\left(\frac{200+250}{2}\right)} \times 100 = +22.22\%$$

$E = 1.8$

$$E = \frac{\%\Delta Q}{\%\Delta P} = \frac{-40\%}{+22.22\%} = -1.8$$

$|E| = 1.8$

DETERMINANTS OF PRICE ELASTICITY OF DEMAND

EXAMPLE 1 RICE CRACKERS Vs Sunscreen.

SUPPOSE THAT THE PRICE S OF BOTH GOODS

RISE BY 20%.

Q: FOR WHICH GOOD DOES Q^D DROP THE MOST?

A: RICE CRACKERS (WHY?)

LESSON: PRICE ELASTICITY IS HIGHER WHEN CLOSE SUBSTITUTES ARE AVAILABLE.

EXAMPLE 2 "BLUE JEANS" Vs "CLOTHING"

WE ASK THE SAME QUESTION ABOVE.

A. BLUE JEANS

LESSON PRICE ELASTICITY IS HIGHER FOR NARROWLY DEFINED GOODS THAN BROADLY DEFINED GOODS.

EXAMPLE 3 INSULIN Vs. CARIBBEAN CRUISES

A: CARIBBEAN CRUISE

LESSON PRICE ELASTICITY IS HIGHER FOR LUXURIES THAN FOR NECESSITIES.

EXAMPLE 4 GASOLINE IN THE SHORT RUN Vs. GASOLINE IN THE LONG RUN.

A: GASOLINE IN THE LONG RUN

LESSON: PRICE ELASTICITY IS HIGHER IN THE LONG RUN THAN IN THE SHORT RUN.

(WHY?)
- NOT MUCH THINGS YOU CAN DO IN THE SHORT RUN, OTHER THAN RIDE THE BUS OR CARPOOL.
- BUT IN THE LONG RUN, YOU CAN CHANGE YOUR WORKPLACE OR YOUR HOME, OR BUY A SMALL CARS.

SO FAR,
- E_p (DEFINITION)
- CALCULATION BY USING $E_p = \frac{\%\Delta Q}{\%\Delta P}$.
- VARIOUS TYPES OF DEMAND CURVE
- MIDPOINT APPROACH
- DETERMINANTS OF E_p.

NEXT, PRICE ELASTICITY ALONG THE DEMAND CURVE

INVERSE DEMAND FUNCTION

$P = a - bQ$

SLOPE OF DEMAND CURVE $= \frac{\Delta P}{\Delta Q} = -b$

SLOPE OF THE DEMAND CURVE

$Q^D = f(P)$ (DEPENDENT VARIABLE, EXPLANATORY VARIABLE)

$P = 0$,

$Q = a - bQ$

$Q = \frac{a}{b}$.

$E = \frac{\%\Delta Q}{\%\Delta P} = \frac{\frac{\Delta Q}{Q} \times 100}{\frac{\Delta P}{P} \times 100}$

$= \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q}$

$E = \left(\frac{1}{\text{SLOPE}}\right) \cdot \frac{P}{Q}$

P CONSTANT

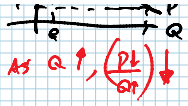
HIGH

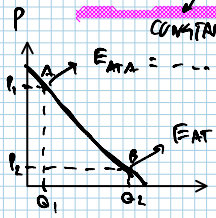
LOW

AS $Q \uparrow$, $\left(\frac{P}{Q}\right) \downarrow$

$E = \frac{1}{\text{SLOPE}} \cdot \frac{P}{Q}$

CONSTANT



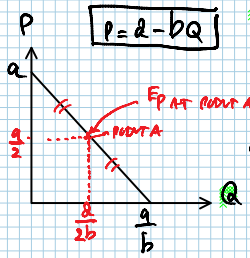


$E_{AT\ A} =$ ...

$E_{AT\ B} =$

- PRICE ELASTICITY OF DEMAND VARIES ALONG A LINEAR DEMAND CURVE.
- AT HIGH PRICE, E_p IS RELATIVELY HIGH.
- AT LOW PRICE, E_p IS RELATIVELY LOW.

$P = a - bQ$



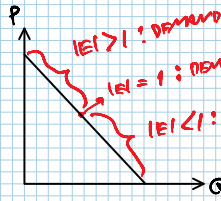
E_p AT POINT A = ?

AT A, $E_p = \frac{1}{\text{SLOPE}} \cdot \frac{P}{Q}$

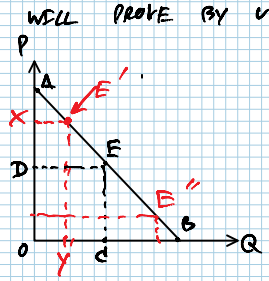
$= \frac{1}{-b} \cdot \frac{\frac{a}{2}}{\frac{a}{2b}}$

$= -1$

AT THE MIDDLE OF THE CURVE $E_p = -1$ OR $|E_p| = 1$.



* WE WILL PROVE BY USING GEOMETRY.



LET'S CALCULATE E_p BY GEOMETRY:

$E = \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q}$ OR $\frac{1}{\text{SLOPE}} \cdot \frac{P}{Q}$

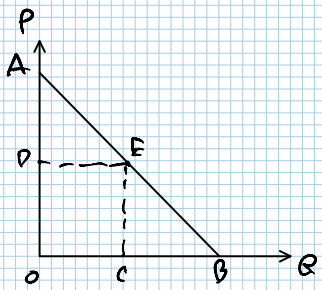
$\text{SLOPE} = \frac{AD}{DE}$

$\frac{1}{\text{SLOPE}} = \frac{DE}{AD}$

$E = \frac{1}{\text{SLOPE}} \cdot \frac{P}{Q} = \frac{DE}{AD} \cdot \frac{OD}{OC}$ SINCE OD = OC.

$E = \frac{OD}{AD} = \frac{\text{INSIDE}}{\text{OUTSIDE}}$

"VERTICAL AXIS FORMULA"



$E_{AT\ E} = \frac{1}{\text{SLOPE}} \cdot \frac{P}{Q}$

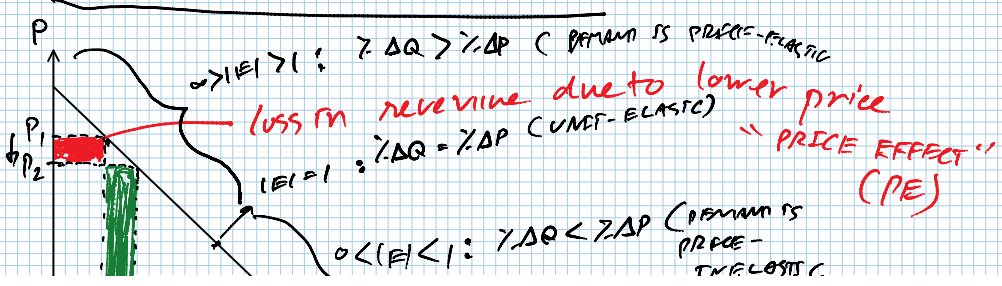
$= \frac{CB}{EC} \cdot \frac{OD}{OC}$

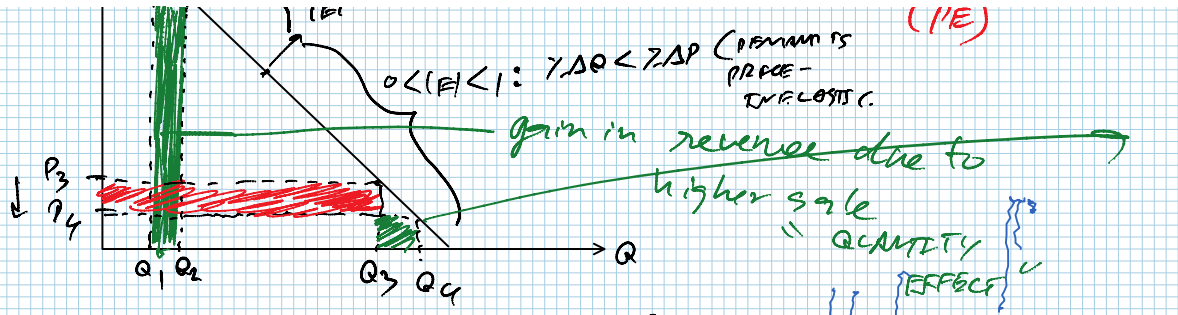
$= \frac{CB}{OC} = \frac{\text{OUTSIDE}}{\text{INSIDE}}$

$\text{SLOPE} = \frac{EC}{CB}$

"HORIZONTAL AXIS FORMULA"

ELASTICITY & TOTAL REVENUE





AT PRICE P_1 ⇒ TOTAL REVENUE $TR_1 = P_1 \times Q_1$

AT PRICE P_2 ⇒ $TR_2 = P_2 \times Q_2$

$TR_2 > TR_1$ BECAUSE QE (green) > PE (red)

RESULT #1 WHEN DEMAND IS PRICE-ELASTIC, REDUCTION IN PRICE LEADS TO HIGHER REVENUE

AT PRICE $= P_3$, $TR_3 = P_3 \times Q_3$

AT PRICE $= P_4$, $TR_4 = P_4 \times Q_4$

$TR_4 < TR_3$

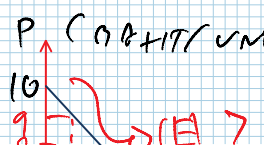
RESULT #2 WHEN DEMAND IS PRICE INELASTIC REDUCTION IN PRICE LEADS TO LOWER REVENUE.

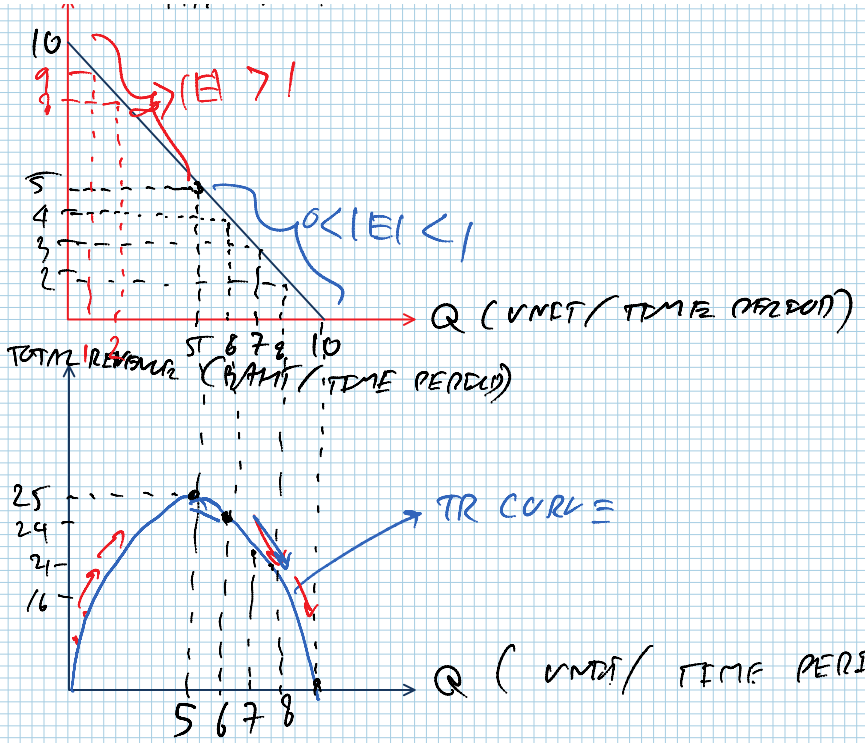
RESULT #3 WHEN DEMAND IS PRICE-ELASTIC, INCREASE IN PRICE LEADS TO

(WHEN P RISES FROM P_2 TO P_1)

RESULT #4 WHEN DEMAND IS PRICE-INELASTIC, INCREASE IN PRICE LEADS TO

WHEN PRICE RISES FROM P_4 TO P_3





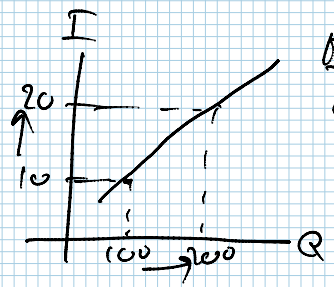
OTHER ELASTICITIES

- INCOME ELASTICITY OF DEMAND

$$E_I = \frac{\% \Delta Q^D}{\% \Delta I} = \frac{\text{PERCENTAGE CHANGE IN } Q^D}{\text{PERCENTAGE CHANGE IN INCOME}}$$

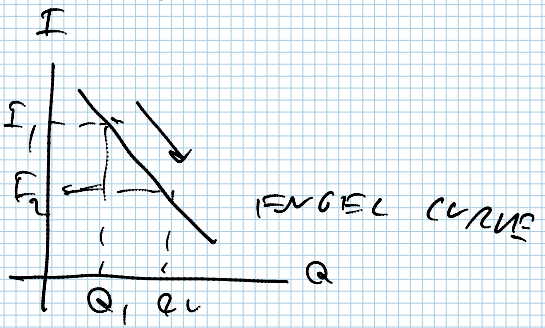
IF $E_I > 0$ $\Rightarrow$ WHEN I ↑, Q^D ↑ AND WHEN I ↓, Q^D ↓

FOR (NORMAL GOOD)



IF $E_I < 0$ $\Rightarrow$ WHEN I ↑, Q^D ↓ AND I ↓, Q^D ↑

(FOR INFERIOR GOOD)



- CROSS-PRICE ELASTICITY OF DEMAND

CONSIDER 2 GOODS : X & Y

IF $P_Y \uparrow$, $\Delta Q^D_X \uparrow$ OR $\downarrow$?

$$E_C = \frac{\%\ \Delta Q^D_X}{\%\ \Delta P_Y}$$

- IF $P_Y \uparrow$ AND $Q^D_X \uparrow$, X & Y ARE SUBSTITUTES.

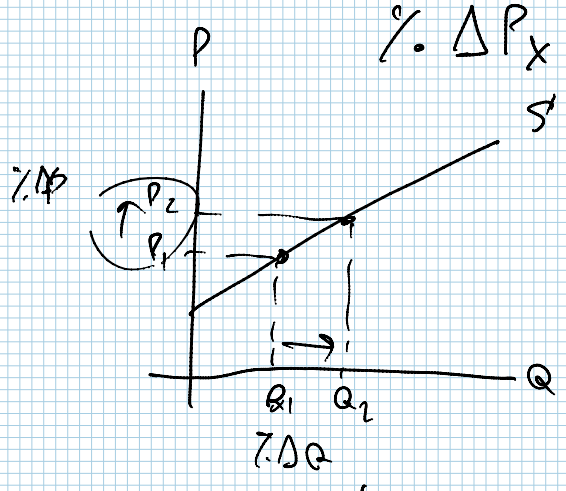
  $E_C > 0$

- IF $P_Y \uparrow$ AND $Q^D_X \downarrow$, X & Y ARE COMPLEMENTS

  Ex: X = POP-CORN
  Y = MOVIES

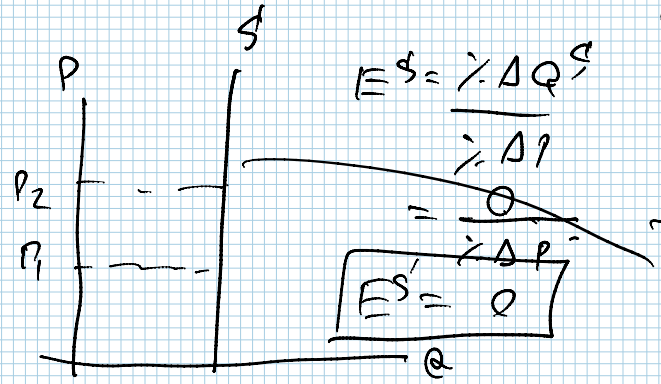
- PRICE ELASTICITY OF SUPPLY

$$E^S = \frac{\%\ \Delta Q^S_X}{\%\ \Delta P_X} \quad (+)$$



Ex: $E^S = 3$

IT IMPLIES THAT INCREASE IN PRICE BY 10% LEADS TO AN INCREASE IN Q^S_X BY MORE THAN 10% (HERE, 30%), OTHER THINGS BEING EQUAL.

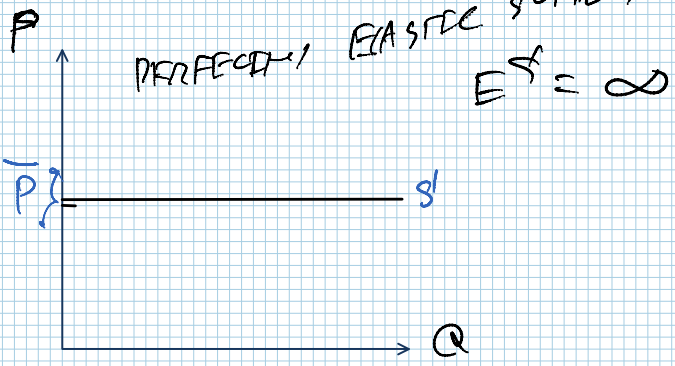


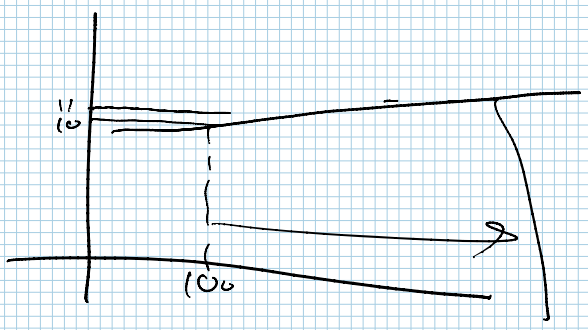
$$E^S = \frac{\%\ \Delta Q^S}{\%\ \Delta P} = \frac{0}{\%\ \Delta P}$$

$E^S = 0$

"PERFECTLY INELASTIC SUPPLY CURVE"

LAND IN TRIANGLER AREA





• WHAT ARE DETERMINANTS OF SUPPLY ?

- AVAILABILITY OF INPUTS
- TIME
- ETC. → (SEE FROM YOUR TEXTBOOK)

CONSUMER SURPLUS, PRODUCER SURPLUS, AND MARKET EFFICIENCY.

CONSUMER SURPLUS = WILLINGNESS TO PAY (WTP) − PRICE ACTUALLY PAID FOR (P)

SUPPOSE:

WTP = 300 BAHT

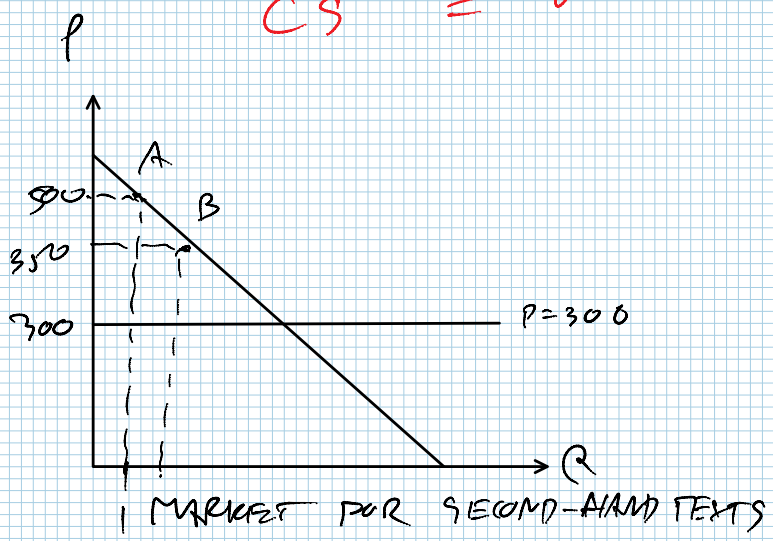
↓

MAXIMUM PRICE A CONSUMER IS WILLING TO PAY TO GET THE GOOD. (RESERVATION PRICE)

P = 200 BAHT

CS = WTP − P = 300 − 200 = 100

$CS = WTP - P = 300 - 200 = 100$



CONSUMER	WTP
A	500
B	350
C	200
D	100

$P = 300$