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Example 1.C (cont.): National income model

- From the example 1.B, it is straightforward to solve for all the endogenous equilibrium solutions, Y^*, C^*, Y_d^*.

$Y_d^* = Y^* - T_0$

$C^* = c + bY_d^*$

$C^* = c + b(Y^* - T_0)$

$Y^* = C^* + I_0 + G_0$

$Y^* = c + b(Y^* - T_0) + I_0 + G_0$

- Numerically, if a = 1, T_0 = \$0 I_0 = \$1, G_0 = \$1 and b = 0.5, this yields us,

$Y^* = c + b(Y^* - T_0) + I_0 + G_0$

$Y^* = c + bY^* - bT_0 + I_0 + G_0$

$Y^*(1-b) = c - bT_0 + I_0 + G_0$

$Y = \frac{c - bT_0 + I_0 + G_0}{1-b}$

$= \frac{1 - 0 + 1 + 1}{1 - 0.5} = \frac{3}{0.5} = 6$

$C^* = a + b(Y^* - T_0)$

$= 1 + 0.5(6 - 0)$

$= 4$

$Y_d^* = Y^* - T_0$

$= 6 - 0$

$= 6$

Exercise 2.A:

2.A.1) Given a demand function by $p = a - bQ$, derive the formula for the elasticity of demand, and show that the third property holds

2.A.2) Given the market supply $p = c + dQ$ where $d \geq 0$, show that

(i) elasticity of supply is always greater than 1 if $c > 0$,

(ii) elasticity of supply is always eqaul to 1 if $c = 0$,

(iii) elasticity of supply is always less to 1 if $c < 0$.

1.)

$$E_p = \frac{\Delta Q^d}{\Delta P} \cdot \frac{P}{Q^d}$$

$$= -b \cdot \frac{P}{Q^d}$$

2.)

i.) elastic

ii). unit elastic

iii) inelastic

Example 2.I: A monopolist firm faces the market demand given by P = 10 - Q. Consider the following questions if the cost function C(Q) = 4Q.

- What is the revenue-maximizing level of output?

$$\text{Revenue} = P(q) = (10 - q)q$$

$$= 10q - q^2$$

- What is the break-even output?

$$\text{Total Revenue} = \text{Total Cost}$$

$$10q - q^2 = 4q$$

- What is the profit-maximizing level of output?

$$\Pi = (10 - q)q - 4q$$

$$\Pi = 10q - q^2 - 4q$$

$$\Pi = 6q - q^2$$

Exrcise 2B. Consider a function that relates tax revenues R, in billions of dollars, to the average tax rate t such that $R = 350t - 500t^2$.

(a) What tax rate(s) is consistent with raising tax revenues equal to \$60 billion?

(b) What tax rate(s) is consistent with raising tax revenues equal to \$61.25 billion?

(c) What tax rate is consistent with the maximum tax revenue?

a.) $60 = 350t - 500t^2$

$500t^2 - 350t + 60 = 0$

$50t^2 - 35t + 6 = 0$

$50t^2 - 15t - 20t + 6 = 0$

$5t(10t - 3) - 2(10t - 3) = 0$

$(10t - 3)(5t - 2) = 0$

$t = 3/10, 2/5$

b.) $61.25 = 350t - 500t^2$

$500t^2 - 350t + 61.25 = 0$

$500t^2 - 350t + \frac{245}{4} = 0$

$2000t^2 - 1400t + 245 = 0$

$400t^2 - 280t + 49 = 0$

$(20t - 7)(20t - 7)$

$t = 7/2$

c.) $\Pi = TR - TC$

$R = 350t - 500t^2$

$\frac{dR}{dt} = 350 - 1000t$

$t = \frac{35}{100} = \frac{7}{20}$