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# EE312 Macroeconomics, 2/2013 (Sec. 046402)
## Problem Sets 3 : Ch.3 A Closed Economy One-Period Macroeconomic Model

Please submit at the BE office, 5th floor department of Economics building.
Deadline of submission : February 21, 2014, before 15.00 hrs.
Late submission will not be accepted.
*** Exam will consist of essay-type questions only.**

1. Suppose the government increases its spending on consumption goods. Use the Closed-Economy, One-Period Macroeconomic Model to determine the effects of the spending increase on aggregate output, consumption, employment and the real wage. Explain the chain of effects among variables correctly. Describe your analysis in words and use diagrams as needed. ( If the space provided is not enough, please attach a separate paper.)

2. Use the closed-economy, one period macroeconomic model to determine the effects of a decrease in total factor productivity on the aggregate output, consumption, employment and real wage. Explain the chain of effects among variables correctly. Describe your analysis in words and use diagrams as needed. ( If the space provided is not enough, please attach a separate sheet.)

3. Consider a simple one-period, closed-economy model where the representative consumer has utility function $U(C) = C^{1/2}\ell^{1/2}$ and has $h$ available hours to divide between work and leisure. The representative firm has technology given by $Y = zK^{2/3}N^{1/3}$. There is a government that sets its expenditure level at a value $G > 0$.

   (a) Define the consumer budget constraint.

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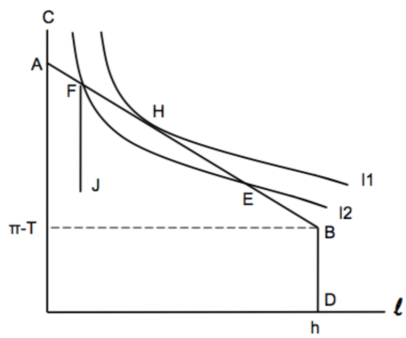
   (b) Define the consumer's utility maximization condition. Solve for labour supply function $N^s(w)$.




The consumer's utility is maximized when the slope of IC is equal to the slope of the budget line.

$$\text{The slope of IC} = \text{The slope of the budget line}$$

$$MRS_{C,\ell} = \text{.............}$$

$$\frac{MU_\ell}{MU_C} = \text{............}$$

$$MU_C = \frac{\partial U}{\partial C} = \frac{1}{2}C^{-1/2}\ell^{1/2}$$

$$MU_\ell = \frac{\partial U}{\partial \ell} = \text{.....................}$$

$$\text{The slope of IC} = \text{The slope of the budget line}$$

$$\frac{MU_\ell}{MU_C} = w$$

$$\frac{\text{.............}}{\frac{1}{2}C^{-1/2}\ell^{1/2}} = w$$

$$\left(\frac{C}{\ell}\right)^{\text{.......}} = w$$

$$C = \text{.........}$$

Substitute $C = w\ell$ into the equation for the budget line

$$C + w\ell = wh + (\pi - T)$$

$$\text{......} + w\ell = wh + (\pi - T)$$

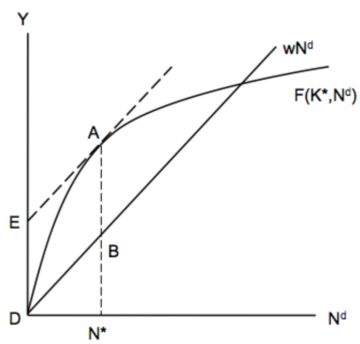
$$\ell = \frac{wh + (\pi - T)}{\text{.........}}$$

From leisure function $\ell(w) = \frac{wh + (\pi - T)}{2w}$. We can find the labour supply function.

$$\begin{aligned} N^s(w) &= \;........ - \ell(w) \\ &= ......... - \frac{wh + (\pi - T)}{2w} \\ &= \frac{-(\pi - T) + .....h}{2w} \\ &= \frac{.....h}{2w} - \frac{\pi - T}{2w} \\ &= \frac{...}{2} - \frac{\pi - T}{2w} \end{aligned}$$

This is the labour supply function. $N^s(w) = \frac{h}{2} + \frac{\pi - T}{2w}$. From the labour supply function, $w \uparrow \Rightarrow N^s$........ ($\uparrow$ or $\downarrow$ ).

(c) Define the firm's profit maximization condition. Solve for labour demand function.




**Profit Maximization**

- $Y$ = revenue;
- $MP_N$ = marginal revenue;
- $wN^d$ = variable cost;
- $w$ = marginal cost;
- Profit = $Y - wN^d$;
- Max profit = AB where $MP_N = w$.

The firm's profit is maximized when the slope of TR $\left(zF(K, N^d)\right)$ is equal to the slope of TC $\left(wN^d\right)$ or MR = MC.

$Y = zK^{2/3}N^{1/3} = zK^{2/3}N^{d1/3}$

$$\begin{aligned} \text{Slope of Y} &= \text{Slope of } wN^d \\ \frac{\partial Y}{\partial N^d} &= \frac{\partial \left(wN^d\right)}{\partial N^d} \\ \frac{1}{3}zK^{2/3}N^{d\,......} &= \;...... \\ N^d &= \;..................... \end{aligned}$$

$N^d = \left(\frac{3w}{zK^{2/3}}\right)^{-3/2} = \left(\frac{z^{3/2}K}{(3w)^{3/2}}\right)$. This is labor demand function. $w \uparrow \Rightarrow N^d$........ ($\uparrow$ or $\downarrow$ ).

(d) Find the competitive equilibrium values given $h = 16$, $z = 1$, $K = 8$, $G = 0$.

$$\begin{aligned} Y &= zK^{2/3}N^{1/3} \\ &= (......)(......)^{2/3}N^{1/3} \end{aligned}$$

$8^{2/3} = \left(\sqrt[3]{8}\right)^2 = 2^2$.

$$Y = 4N^{1/3}. \tag{1}$$

Marginal Product of Capital.

$$MP_N = \frac{\partial Y}{\partial N}$$

$$= (\frac{\cdots\cdots}{\cdots\cdots})4N^{(1/3-\cdots.)}$$

$$= \left(\frac{\cdots\cdots}{\cdots\cdots}\right)N^{\cdots\cdots}$$

$$MP_N = \frac{4}{3}N^{-2/3} = w. \quad (2)$$

From consumer's optimization solution, $C = w\ell$.

$$C = w\ell$$

Substitute $MP_N = \frac{4}{3}N^{-2/3} = w$

$$C = \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$$

$$C = \frac{4}{3}N^{-2/3}\ell \quad (3)$$

As G=0, $Y = C + G$. Then,

$$C = Y$$

From (1),

$$C = 4N^{1/3} \quad (4)$$

Equation (3) = equation (4).
Substitute $\ell = h - N$ into $\ell = 3N$. Let $h = 16$. Solve for N.

$$N^* = \ldots\ldots\ldots\ldots\ldots\ldots$$

Substitute $N = 4$ into $\ell = 16 - N$ and get
$\ell^* = \ldots\ldots\ldots\ldots\ldots$
From equation (4), substitute $N = 4$ and get C*.
$C^* = \ldots\ldots\ldots\ldots\ldots$
From equation (2), substitute $N = 4$ and get w*.
$w^* = \ldots\ldots\ldots\ldots\ldots$
From equation (1), substitute $N = 4$ and get Y*.
$Y^* = \ldots\ldots\ldots\ldots\ldots$