Topics in Macro 2

Week 8 - Second Part - Part II - Exercise I

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TSE

Tuesday (17:00-18:30)

TD Second Part: Fiscal Multipliers (Weeks 6 to 10)

Part I

- Exercise I: Habit Persistence and The Keynesian Multiplier (Week 6)
- Exercise II: A Benchmark Model (Week 7)
- Exercise III: Consumption, Labor Supply and the Multiplier (Week 7)

Part II

- **Exercise I: Taxes on the Labor Input and the Multiplier (Week 8)**
- Exercise II: Public Spending in Utility Function and the Multiplier (Week 8)
- Exercise III: Labor Supply, Public Spending in Utility and the Multiplier (Week 9)

Part III

- Exercise I: Endogenous Public Spending (Week 9)
- Exercise II: Externality in Production and the Multiplier (Week 10)
- Exercise III: Externality in Labor Supply and the Multiplier (Week 10)

Exercise I: Taxes on the Labor Input and the Multiplier

The Economy

Utility:

$$log(c_t) - \eta n_t$$

Budget constraint:

$$c_t \leq w_t n_t + \Pi_t$$

Production:

$$y_t = a n_t$$

Profits:

$$\Pi_t = y_t - (1 + \tau_{w,t}) w_t n_t$$

Government budget constraint:

$$g_t = \tau_{w,t} w_t n_t$$

Market clearing:

$$y_t = c_t + g_t$$

Question 1. Determine the optimality condition of the households and then deduce the Marginal Rate of Substitution (MRS).

$$\mathcal{L} = \log(c_t) - \eta n_t - \lambda_t \left[c_t - w_t n_t - \Pi_t \right]$$

$$\Rightarrow \text{F.O.C.} \quad \frac{1}{c_t} = \lambda_t \,, \quad \eta = \lambda_t w_t$$

$$\Rightarrow \frac{\eta}{1/c_t} = w_t = MRS_{n,c}$$

Answer: $\eta c_t = w_t$.

Question 2. Determine the optimality condition of the firm.

$$\Pi_t = a n_t - (1+\tau) w_t n_t$$

$$= \left[a - (1+\tau) w_t \right] n_t$$

Suppose $a = (1+\tau) w_t \Rightarrow \Pi_t = 0$

Answer: $a = (1 + \tau_{w,t}) w_t$ and $\Pi_t = 0$.

Question 3. Determine the equilibrium output.

Def equil

$C_t = w_t n_t + \Pi_t$ → 0

$C_t = w_t n_t$

$C_t = \eta C_t n_t$

$\Rightarrow n_t = 1/\eta$

$y_t = a n_t$

$y_t = \frac{a}{\eta}$

$\frac{\eta}{1/C_t} = w_t$

$\eta C_t = w_t$

Answer: From budget constraint: $n_t = \frac{1}{\eta}$. Then $y_t = \frac{a}{\eta}$.

Question 4. Determine the value of the output multiplier.

$$y_t = a/\eta \implies \frac{dy_t}{dg_t} = 0$$

Answer: $\frac{dy_t}{dg_t} = 0$.

Question 5. Determine the value of the consumption multiplier.

$$\frac{dC_t}{dg_t} = \frac{dy_t}{dg_t} - 1$$

$$= -1$$

full crowding out.

$$\bar{y} = C + g$$

Answer: $\frac{dc_t}{dg_t} = \frac{dy_t}{dg_t} - 1 = -1$.