Topics in Macro 2

Week 9 - Second Part - Part II - Exercise III

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TSE

Tuesday (17:00-18:30)

Toulouse School of Economics

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 III: Labor Supply, Public Spending in Utility and the Multiplier

The Economy

Utility:

$$log\left(c_t^* - \frac{\eta}{1+\nu}n_t^{1+\nu}\right) \text{ where } c_t^* = c_t + \alpha_g g_t$$

Budget constraint:

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

Production:

$$y_t = a n_t$$

Profits:

$$\Pi_t = y_t - w_t n_t$$

Government budget constraint:

$$g_t = T_t$$

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)

Rewrite utility: $u(c,n) = c_t + \alpha_g g_t - \frac{\eta}{1+\nu} n_t^{1+\nu}$

$$\mathcal{L}(c,n,\lambda) = c_t + \alpha_g g_t - \frac{\eta}{1+\nu} n_t^{1+\nu} - \lambda_t \left[c_t - w_t n_t - \Pi_t + T_t \right]$$

F.O.C.

$$\left.\begin{aligned} c:&\quad 1 = \lambda_t \\ n:&\quad \eta n_t^{\nu} = \lambda_t w_t \end{aligned}\right\} \eta n_t^{\nu} = w_t$$

Answer: $\eta n_t^{\nu} = w_t$.

Question 2. Determine the optimality condition of the firm.

$$\max_{\{n\}} a n_t - w_t n_t$$

Suppose interior solution:

$$a = w_t$$

So $\pi_t = 0$

Answer: $w_t = a$.

Question 3. Determine the equilibrium output.

We Know: $\begin{cases} \eta n_t^{\nu} = w_t \\ a = w_t \end{cases}$

$$\Longrightarrow \quad \eta n_t^{\nu} = a \quad \Longrightarrow \quad n_t = \left(\frac{a}{\eta}\right)^{\frac{1}{\nu}}$$

and $$y_t = a\left(\frac{a}{\eta}\right)^{\frac{1}{\nu}}$$

Answer: $n_t = \left(\frac{a}{\eta}\right)^{\frac{1}{\nu}}$ and $y_t = a\left(\frac{a}{\eta}\right)^{\frac{1}{\nu}}$.

Question 4. Compute the output and consumption multiplier and discuss the result.

We know $y_t = a\left(\frac{a}{\eta}\right)^{1/\nu} \Rightarrow \frac{dy_t}{dg_t} = 0$ and $\frac{dc_t}{dg_t} = \frac{dy_t}{dg_t} - 1$

$= -1$

- Multiplier is zero.
- Total crowding out of consumption.
- No income effects for labor supply (depends only on $w_t = a$).
- Constant income.