# Topics in Macro 2

## Week 7 - Second Part - Exercise III

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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)

# Exercice III: Consumption, Labor Supply and the Multiplier

# The model

Utility:

$$U(c_t, n_t) = \frac{c_t^{1-\sigma}}{1-\sigma} - \frac{\eta}{1+\nu} n_t^{1+\nu}, \text{ where } \eta > 0, \ \sigma > 0$$

Budget constraint:

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

Technology:

$$y_t = a n_t$$

Profits:

$$\Pi_t = y_t - w_t n_t$$

Government:

$$T_t = g_t$$

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).

Answer: $w_t = \frac{\eta n_t^{\nu}}{c_t^{-\sigma}}$.

**Question 2.** Determine the optimality condition of the firm.

Answer: Interior solution if $w_t = a$.

**Question 3**. Determine the equilibrium output.

Definition of a **competitive equilibrium**: An equilibrium are quantities _____ and prices ___ such that:

1. _____ solve the consummer's problem.
2. _____ solve the firm's problem.
3. Government budget balance: _____.
4. Goods and labor market clearing: _____ and _____.

Equilibrium output:

Answer: $\frac{y_t^{\nu}}{(y_t - g_t)^{-\sigma}} = \frac{a^{\nu+1}}{\eta}$.

**Question 4.** Compute the log-linearization of equilibrium output around the determinist steady-state.

Answer: $[\nu(1 - s_g) + \sigma]\hat{y}_t = \sigma s_g \hat{g}_t$.

**Question 5**. Compute the output multiplier and discuss the value of this multiplier with respect to $\nu$ and $\sigma$.

Answer: $\frac{dy_t}{dg_t} = \frac{d\hat{y}_t}{d\hat{g}_t}\frac{\bar{y}}{\bar{g}} = \frac{\sigma}{\nu(1-s_g)+\sigma}$.

**Question 6.**. Compute the consumption multiplier and discuss the value of this multiplier with respect to $\nu$ and $\sigma$.

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