Макроэкономика 1 — Совбак ВШЭ и РЭШ, 2025 final

Совбак ВШЭ и РЭШ | Макроэкономика 1 | 2025 | final

PROBLEM 1

Long-run equilibrium in a small open economy — 2 points

Consider a small open economy with a linear consumption function depending on the real interest rate:

$$C(Y-T,r) = c_0 + c_1(Y-T) - c_2 r,$$

where c_0, c_1, and c_2 are constants.

The investment demand function is

$$I(r) = i_0 - i_1 r.$$

Real money demand is an increasing function of real income, Y, and a decreasing function of the nominal interest rate, i:

$$L(Y,i) = m_1 Y - m_2 i.$$

Inflation expectations are fixed at

$$\pi^e = 1.$$

The nominal money supply is

$$M = 3000.$$

The world real interest rate is

$$r^* = 4,$$

and the world price level is fixed at

$$P^* = 3.$$

Net exports are given by

$$NX(\varepsilon) = nx_0 - nx_1 \varepsilon,$$

where ε is the real exchange rate.

Assume

$$c_0 = 500, \quad c_1 = 0.5, \quad c_2 = 100,$$

$$i_0 = 400, \quad i_1 = 100, \quad m_1 = 0.5, \quad m_2 = 100,$$

$$nx_0 = 600, \quad nx_1 = 50, \quad Y = 1200, \quad T = 200, \quad G = 200.$$

1. Compute private saving, public saving, national saving, consumption, the real interest rate, investment, net exports, and the real exchange rate. Illustrate using graphs. **(0.5 point)**

2. Compute the nominal interest rate and real money demand. What are the long-run equilibrium values of the price level and the nominal exchange rate of domestic currency in terms of foreign currency? Explain. **(0.5 point)**

3. Suppose a fall in oil prices decreases export revenues, so nx_0 falls from 600 to 500. Compute private saving, public saving, national saving, consumption, the real interest rate, investment, net exports, and the real and nominal exchange rates in the new equilibrium. Illustrate using graphs and explain. **(1 point)**

PROBLEM 2

The Solow model with capital utilization — 3 points

Consider an economy with production function

$$Y = (uK)^{\alpha} L^{1-\alpha},$$

where $0 \leq u \leq 1$ is capital utilization and $0 < \alpha < 1$.

Assume that the depreciation rate is an increasing function of capital utilization:

$$\delta(u) = \delta_0 + \delta_1 u^2,$$

where

$$0 < \delta_0 < \delta_1 < 1$$

and

$$\delta_0 + \delta_1 < 1.$$

More intensive use of capital therefore causes faster depreciation. Population is constant, there is no technological progress, and the saving rate is s.

1. Derive the steady-state levels of per-capita capital, per-capita output, and per-capita consumption in terms of s, u, α, δ_0, and δ_1. **(1 point)**

2. Calculate the capital-utilization rate u that maximizes steady-state per-capita output. Explain. **(1 point)**

3. Calculate the saving rate that maximizes steady-state per-capita consumption, that is, the Golden Rule saving rate. Does it depend on capital utilization? **(1 point)**

PROBLEM 3

Famine in the Malthusian model — 2 points

Suppose a harsh climate increases the subsistence level of consumption, that is, the minimum level of per-capita consumption required for people to survive and maintain a constant population.

Use the Malthusian model to explain how this increase affects:

- per-capita consumption;
- per-capita land;
- the population level;
- population growth;

both immediately after the event and in the long run.

Include diagrams in your explanation.

PROBLEM 4

Long-run equilibrium in a two-country model — 3 points

Consider a world with two countries, North and South. Each country has one representative consumer, and the world lasts for two periods. Each consumer has utility

$$U(C_1, C_2) = \sqrt{C_1} + \sqrt{C_2}.$$

This is an endowment economy in which the two-period endowment is (Y_1, Y_2). North receives

$$(16, 9),$$

while South receives

$$(9, 16).$$

The consumption good cannot be stored, and there is no government.

1. Set up and solve the consumer's problem. Find consumption demand in both periods,

$$C_1(r, Y_1, Y_2)$$

and

$$C_2(r, Y_1, Y_2),$$

as well as first-period saving,

$$S_1(r, Y_1, Y_2).$$

(1 point)

2. Suppose initially that both countries are in autarky. Compute the equilibrium. What are the interest rates in North and South? What is welfare in each country? **(1 point)**

3. Suppose North and South open to intertemporal trade, creating a world credit market. Compute the free-trade equilibrium. What is the equilibrium world interest rate? What are the current accounts of North and South in period 1? Compute welfare in each country and compare it with welfare under autarky. **(1 point)**