# Макроэкономика 2 — Совбак ВШЭ и РЭШ, 2025 final

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PROBLEM 1

## Debt sustainability — 20 points

Suppose the debt-to-GDP ratio evolves according to

$$b_t = \frac{1 + r_t}{1 + g_t} b_{t-1} - s_t.$$

The government runs a constant primary surplus,

$$s_t = \bar{s},$$

and the real interest rate and GDP growth rate are constant:

$$r_t = \bar{r}, \qquad g_t = \bar{g}.$$

Prices are flexible.

1. **(6 points)** What primary surplus is required to keep debt constant at level $\bar{b}$? Derive your answer.

2. **(8 points)** Suppose the primary surplus initially keeps debt stable, but the economy is hit by a recession caused by a TFP shock. Show the shock's impact in an IS–LM diagram, assuming the recession does not affect expectations. What happens to $g_t$, $r_t$, and $s_t$ if there are automatic stabilizers, such as income taxes? Does debt remain sustainable?

3. **(6 points)** Suppose the government uses seigniorage to return debt to its stable level. Explain seigniorage and how the monetary base is linked to budget deficits. What macroeconomic consequences and risks are associated with this policy? Show its impact in IS–LM and AD–AS diagrams.

PROBLEM 2

## Investment trap — 30 points

Consider a closed economy in the short run with a fixed price level. The economy faces high uncertainty about the future, firms are reluctant to invest, and investment is completely insensitive to the interest rate.

The goods market is described by

$$C = 40 + 0.75(Y - T), \qquad T = 40, \qquad I = 70, \qquad G = 60.$$

The money market is described by

$$\frac{M}{P} = 0.5Y - 10r,$$

with

$$\frac{M}{P} = 100.$$

1. **(6 points)** In a diagram with $r$ on the vertical axis and $S, I$ on the horizontal axis, plot the saving and investment schedules and show the equilibrium. Using the diagram, explain the slope of the IS curve.

2. **(3 points)** Confirm your result by deriving the IS curve algebraically. Derive the LM curve and find the short-run equilibrium.

3. **(5 points)** Suppose pessimism about the future also affects households, reducing consumption at every income level. The consumption function becomes

$$C = 20 + 0.75(Y - T).$$

Explain what effect this represents. Describe the shift of the IS curve and find the new equilibrium output.

4. **(5 points)** The Central Bank wants to return the economy to its previous output level and raises real money balances to

$$\frac{M}{P} = 120.$$

Find the new equilibrium and compute the monetary-policy multiplier

$$\frac{\Delta Y}{\Delta(M/P)}.$$

Illustrate graphically and explain why the absence of an investment response to the interest rate is called an investment trap.

5. **(4 points)** Suppose instead that the government increases government expenditure. Determine the increase in $G$ required to return output to its previous equilibrium level. Compute the fiscal-policy multiplier

$$\frac{\Delta Y}{\Delta G}.$$

Explain why fiscal policy is effective and illustrate graphically.

6. **(3 points)** Now suppose consumption responds to the interest rate:

$$C = 40 + 0.75(Y - T) - 5r.$$

Investment remains unchanged. Is this economy still in an investment trap? Explain the intuition and illustrate your argument with a diagram.

7. **(4 points)** Name two other situations in which monetary policy may be ineffective in the short run and briefly explain the reason in each case.

PROBLEM 3

# Oil price shock in an open economy — 50 points

Consider an economy in which firms use oil as an input in production. The oil price is determined in the international market and is exogenous to the domestic economy. Firms observe their own production costs but have imperfect information about the aggregate price level.

Short-run aggregate supply is

$$Y = \bar{Y} + \alpha(P - P^e) - \gamma s,$$

where $s$ is the oil price, $\alpha > 0$, and $\gamma > 0$.

At the start of the period, the economy is in general equilibrium and expected inflation is zero. Assume throughout that potential output $\bar{Y}$ is not affected by the oil shock. Production technology is fixed in the short run, and firms cannot substitute away from oil.

Use this framework first for a closed economy and then for a small open economy.

## 1. Closed economy

**(a) (3 points)** Plot the short-run aggregate-supply curve in $(Y, P)$ space and explain how an increase in the oil price affects it.

**(b) (6 points)** Using an AD–AS diagram and an IS–LM diagram, analyze the effect of the oil shock on output and the price level. Explain the economic intuition.

**(c) (4 points)** Suppose the Central Bank responds to the oil shock. Using both AD–AS and IS–LM diagrams, explain what happens if monetary policy fully stabilizes the price level. What happens to output, the price level, the interest rate, and the money supply?

**(d) (2 points)** Define the sacrifice ratio as the amount of lost output required to reduce inflation by one unit. Find the sacrifice ratio in this setting.

## 2. Small open economy

Now consider a small open economy with perfect capital mobility and a flexible exchange rate. Exchange-rate expectations are adaptive, so expected depreciation or appreciation is always zero.

The country imports oil. The world oil price $s^*$ is determined internationally and is denominated in dollars. The domestic-currency oil price is

$$s = s^* - e,$$

where an increase in $e$ is an appreciation.

Firms' production costs depend on the domestic-currency price of oil. Firms cannot substitute away from oil, but expenditure switching operates in aggregate demand.

**(a) (4 points)** Explain how net exports are affected by an increase in $s^*$. Holding the exchange rate fixed, show the effect on the IS curve.

**(b) (8 points)** Add the supply-side effect of the oil shock. Using $(Y, P)$ and $(Y, r)$ diagrams, find the intermediate equilibrium before exchange-rate adjustment. To remove ambiguity, assume the shift in IS is larger than the shift in LM and SRAS is relatively flat, though still upward-sloping, with high $\alpha$.

**(c) (5 points)** What happens to the exchange rate? Explain the roles of trade and capital flows. Which channel is dominant and why?

**(d) (8 points)** Return to the $(Y, P)$ diagram and consider the price response after exchange-rate adjustment. Compare the output and price responses with those in the closed economy. Is the closed-economy framework likely to understate or overstate the severity of inflation?

**(e) (5 points)** Suppose the Central Bank intervenes to keep the price level stable. Explain the exchange-rate channel of monetary policy in this setting.

**(f) (5 points)** Compare the sacrifice ratio in the open economy with that in the closed economy. Is it likely to be larger, smaller, or ambiguous? Explain. A formal derivation is not required.

*Hint: Draw a line between the pre-stabilization and post-stabilization points in the AD–AS diagram to check the answer graphically.*