Макроэкономика 1 — МИЭФ, 2025 midterm

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SECTION 1

A. Multiple-choice questions — 40 marks

Choose **one** correct answer for each question. Each question is worth **8 marks**. There is no penalty for a wrong answer.

1

A Solow economy without technological progress is in the steady state. Profits π are equal to zero, so the total income of a representative agent, y, is split between capital income, αy, and labour income, $(1-\alpha)y$. All capital income is saved and directed to gross investment $i = sy$, while labour income goes to consumption $c = (1-s)y$, where s is the saving rate. Population grows at a rate n, while capital depreciates at a rate δ. What is the real interest rate?

- (a) n
- (b) $i - \pi$
- (c) $\alpha y^{\frac{\alpha-1}{\alpha}}$
- (d) $\frac{s}{1-s}\left(\frac{s}{n+\delta}\right)^{\frac{1}{s-1}}$

2

In a closed mixed economy with fixed prices and wages, profits constitute a share ϑ of national income. Households' income is not taxed, while firms pay lump-sum taxes to finance government purchases G_0. All after-tax profits are fully distributed as dividends rather than reinvested. The marginal propensity to consume out of all sources of income is $0 < c_1 < 1$. What will be the economy's government-purchases balanced-budget multiplier $\partial Y / \partial G_0$ in the short run if the nominal interest rate is fixed?

- (a) $\frac{1}{1-c_1}$
- (b) $\frac{1}{(1-c_1)(1-\vartheta)}$
- (c) $\frac{1}{1-\vartheta}$
- (d) 1

3

Consider a closed economy at its potential level of output, Y_n. Consumption and investment functions are, respectively,

$$C = c_0 + c_1\big((1-\vartheta)Y - NT\big),$$

$$I(r) = I_0 - br + \vartheta Y.$$

The central bank's flexible-inflation-targeting policy follows the rule

$$r = r^* + \alpha(\pi - \pi^*).$$

The aggregate supply function is

$$\pi = \pi^e + \lambda(Y - Y_n),$$

where inflation expectations π^e are fully rational and non-anchored. What will be the long-run effect of a balanced-budget fiscal expansion $\Delta G = \Delta NT > 0$ on investment if Ricardian equivalence does not hold?

- (a) $\Delta I = 0$
- (b) $0 < |\Delta I| < \Delta G$
- (c) $|\Delta I| = \Delta G$
- (d) $|\Delta I| > \Delta G$

4

A central bank commits to flexible inflation targeting and allows inflation to deviate from the target $\pi^* = 4\%$ by following the nominal-interest-rate rule

$$i = i^* + 1.5(\pi - \pi^*).$$

Last year, when CPI rose from 8% to 10% SAAR, the key rate was raised from 14% to 17%. This year, when CPI rose from 12% to 14% SAAR, the key rate was raised from 19% to 22%. What type of policy was implemented this year compared with the previous one?

- (a) Tight
- (b) Neutral
- (c) Easy

- (d) More aggressive

5

What is the long-run neutral nominal interest rate in Russia according to the most recent estimates?

- (a) 4.0%
- (b) $3.5–4.0\%$
- (c) $6.0–7.0\%$
- (d) $7.5–8.5\%$

SECTION 2

C. Problem — 60 marks + 20 bonus marks

The supply side of the economy is described by the production function

$$Y = \sqrt{KL},$$

where K is physical capital stock that depreciates at rate δ, and L is the fully employed population, which is not growing. The government considers using lump-sum taxes T to finance non-productive government spending G. Private investment I and private consumption C absorb, respectively, constant fractions s and $(1-s)$ of disposable income $Y - T$.

(a) (10 marks) Suppose that the initial steady-state level of GDP per capita y^* was reached by the *laissez-faire* private economy with no government intervention. Derive the expression for y^* and show it in the Solow diagram.

(b) (10 marks) The government introduces a moderate amount of lump-sum taxes, so each worker pays a fixed amount

$$\tau = \frac{T}{L},$$

which is fully directed to public consumption. Derive the capital-formation equation in per-capita terms. Illustrate the new steady-state levels of capital per capita and private consumption per capita in the new Solow diagram.

(c) (10 marks) Show the immediate effects and transition paths of GDP Y and consumption per capita c from the initial steady states defined in (a) to the new steady states defined in (b).

(d) (20 bonus marks) Find the not-so-moderate level of lump-sum taxes $\hat{\tau}$ that would ensure only one non-trivial steady state. Will it be stable? Illustrate your answer in the phase diagram $\dot{k}(k)$.

Consider now the demand-side effects of lump-sum taxes in the medium run. Investment demand is

$$I(r) = I_0 - br,$$

where $b > 0$. The budget remains balanced. The central bank flexibly targets inflation π^* by setting the real interest rate according to

$$r = r^* + \alpha(\pi - \pi^*).$$

The short-run aggregate supply function is

$$\pi = \pi^e + \lambda(Y - Y_n),$$

where $\lambda > 0$, π and π^e are current and expected inflation, and $Y - Y_n$ is the output gap.

(e) (10 marks) Assume that initially, in period 1, people have static inflation expectations:

$$\pi_1^e = \pi_0^e = \pi^*.$$

Illustrate in the four-quadrant $IS - rr - 45^\circ - AD - SAS$ diagram the effect of introducing lump-sum taxes on aggregate output, the real interest rate and inflation. Denote the new medium-run equilibrium in $\pi(Y)$ space as (Y_1, π_1).

(f) (10 marks) In period 2, all people switch to myopic inflation expectations. Illustrate in the same four-quadrant $IS - rr - 45^\circ - AD - SAS$ diagram the effects of further adjustments in aggregate output, the real interest rate and inflation. Denote the new medium-run equilibrium in $\pi(Y)$ space as (Y_2, π_2).

Now consider a neoclassical environment in which economic agents have rational forward-looking expectations that are anchored. All prices, including nominal wages, are fully flexible. Assume that the supply-side adjustments discussed in (c) are over and the economy has reached its new steady state.

(g) (10 marks) Illustrate the ultimate equilibrium (Y_3, π_3) in a **new** $IS - rr - 45^\circ - AD - LRAS$ diagram. Mind the relationship between the new neutral real interest rate and the monetary-policy rule. Carefully label all curves and explain the adjustment process in three or four sentences.