Intermediate Macroeconomics: Midterm Exam

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Instructions

- This exam is out of 100 points.
- You have **120** minutes to complete the exam.
- **Write down your answers on the provided answer sheets, in either English, Chinese, or a combination of both**. Don't forget to write down your name.
- No calculators, phones, notes or books of any kind are permitted.

Good Luck!

1. True/False/Uncertain (20 points, or 5 points each)

Assess whether the following statements are true, false or uncertain and justify your answers. Points are given for explanations only.

a. (Credit: Jia W., Spring 2022) In a two-period endowment economy with N identical agents and no production sector, a tax on interest from savings will result in a decrease in the consumption ratio $\frac{C_1}{C_0}$.

b. (Credit: Yuting T., Spring 2024) Under a fixed exchange regime, a tariff that restricts imports will have the same effect on income levels as an expansionary monetary policy.

c. (Credit: Peilan F., Spring 2023) Increasing government spending will increase GDP by at least the same amount.

d. A household would consider having ΔT additional hours each day and obtaining $w\Delta T$ worth of extra goods daily as being equivalent.

2. An Algebraic Mundell-Fleming Model (25 points)

Consider the following Mundell-Fleming model of a small open economy. Assume that the consumption, investment, and net export functions are given by

$$C = a + b(Y - T) \tag{1}$$

$$I = c - dr \tag{2}$$

$$NX = n_0 - n_1 e \tag{3}$$

Note that r and e are the interest rate and exchange rate respectively. The country's liquidity demand is assumed to be

$$L(r, Y) = \phi_0 + \phi_1 Y - \phi_2 r$$

Assume the global interest rate is $r = r^*$, and government expenditure is G.

Questions:

a. (6 points) Derive the IS^* curve, using the equation $Y = C + I + G + NX$.

b. (6 points) Using the relationship that $M/P = L(r, Y)$ and $r = r^*$, derive the LM^* curve.

c. (8 points) Consider a scenario where the government increases its expenditure from G to $G + \Delta G$. Calculate (1) the change of exchange rate e under a floating exchange rate regime and (2) the change of output Y under a fixed exchange rate system, as expressions of ΔG and model parameters.

d. (5 points) Suppose the global interest rate rises from r^* to $r^* + \Delta r$. Calculate the effect of this shock on the exchange rate e and output Y under a floating exchange rate system, as expressions of Δr and model parameters.

3. Can I Borrow from You? - II (40 points)

"Patience is bitter, but its fruit is sweet." - Jean-Jacques Rousseau

Consider a two-period model with two types of agents, where both types have the same utility function over two periods:

$$U^A = u(c_0^A) + \beta_A u(c_1^A), \quad U^B = u(c_0^B) + \beta_B u(c_1^B)$$

where U^i, c_t^i represent utility and consumption of type i agent, respectively. The two types differ in their discount factors, with $0 < \beta_B < \beta_A < 1$. Both types of agents receive the same real income y_0 in period 0 and y_1 in period 1, and there is no production sector in this economy.

Type i agents can save/borrow b_1^i with a real interest rate r, which they take as given. **Assume equal numbers of type A and type B agents**, and their utility functions $u(\cdot)$ satisfy $u' > 0, u'' < 0$. The budget constraint for type i agents in period $t = 0$ is:

$$c_0^i + b_1^i = y_0, \quad i = A, B$$

Questions:

a. (6 points) Based on the information above, write down type A and type B agents' budget constraints in $t = 1$.

b. (4 points) Write down the intertemporal budget constraints for type A and type B agents, which should take the form:

$$c_0^i + \frac{c_1^i}{1+r} = ?$$

c. (5 points) Define the optimization problem for type A agents, and write down the corresponding Lagrangian function. **Hint: you may use either the intertemporal budget constraint or two separate constraints from two periods in the Lagrangian function.**

d. (5 points) Using the first order condition with respect to $[c_0^A]$ and $[c_1^A]$, derive the Euler Equation for the type A agent.

From part e) onwards, assume the utility function takes the logarithmic form: $u(c) = \ln c$

e. (4 points) Using your answers in b) and d), solve c_0^A as a function of y_0, y_1, r and β_A.

f. (6 points) **For this part only, assume $\mathbf{y_0 = y_1 = 1}$, $\mathbf{\beta_A = 1}$, $\mathbf{\beta_B = 0.5}$.** Calculate the interest rate level r^* at the general equilibrium, when both types of agents optimize their utility functions subject to budget constraints, and all markets clear.

g. (5 points, **Hard**) Show that type A agents would lend to type B agents in period 0 as long as $\beta_A > \beta_B$.

h. (5 points, **Hard**) Instead of assuming equal numbers of type A and type B agents, now assume that the proportion of type A agents is x and the proportion of type B agents is $1 - x$. Show that $\frac{\partial r}{\partial x} < 0$.

4. Short Answer (15 points)

Using what you have learned from this class so far, discuss whether you agree with the statement below, as carefully and thoroughly as possible.

Statement: cutting interest rates is likely to increase consumption, at least in the short run.