

# Final Exam

(December 15, 2023, **1 hour 15 minutes**)

Macroeconomics (Fall 2023)

Professor: Wonmun Shin

\* Write up your answers as **clearly, precisely, and concisely** as possible. Your grade will be reduced if your answer is unreasonably difficult to follow.

\* Label the axes and curves when you draw graphs.

1. **(Total 30 points) Essay questions:** Write up your answers to the following questions, based on the models and the theories we learned and what we discussed in the class.

(a) **(10 points)** Milton Friedman said “*Inflation is, always and everywhere, a monetary phenomenon*”. Discuss the above quote in the view of the CLASSICAL and the KEYNESIAN, respectively.

(b) **(5 points)** John Maynard Keynes said “*In the long run we are all dead*”. What is different between the short run and the long run? Why does the Keynesian argue that the short run is important?

(c) **(5 points)** Winston Churchill said “... *when the government(s) borrows in the money market it becomes a new competitor with industry and engrosses to itself resources which would otherwise have been employed by private enterprises, and in the process raises the rent of money to all who have need of it*”. Explain what his speech implies about the impact of government spending.

(d) **(10 points)** Paul Krugman said “*We live in the Age of the Central Banker, in which monetary policy is generally believed to be so effective ... It is therefore ironic as well as unnerving that monetary policy is ineffective at recession-fighting ... So far only Japan has actually found itself in this condition*”. (i) Discuss why he mentioned “*the Age of the Central Banker*”. That is, how monetary policy is effective against a recession in the short run? (ii) Explain his concern of ineffective monetary policy. That is, when monetary policy is ineffective even in the short run and why?

2. **(Total 55 points)** In this question, we consider a tax on marginal product of capital. Let us imagine that the neoclassical firms (with a one-period time-to-build technology) have to pay a **TAX** equivalent a fraction  $\tau$  of the revenues obtained every period. The tax is levied on the sales of output produced but not on the sales of (depreciated) machinery or capital. Note that the real and nominal interest rates are fixed as  $r$  and  $i$ , respectively. And prices at period  $t$  and period  $t + 1$  are given as  $P_t$  and  $P_{t+1}$ , respectively.

Consider first the investment decision of a firm that uses its own cash to finance its investment.

(a) **(10 points)** How will firms make an optimal decision to invest comparing gains and costs? In order to find the optimal condition for investment, answer the following questions:

i. A capital good purchased at  $t$  becomes productive at  $t + 1$  due to the time-to-build technology. If a firm sells the marginal product of 1 unit of capital good at the price of  $P_{t+1}$  at  $t+1$ , what is the firm's **AFTER-TAX** gain from the extra production? Express in terms of  $MP_{K,t+1}$ ,  $P_{t+1}$  and  $\tau$ . (Note: If  $\tau$  is 0.5 and a pretax gain is \$100, the after-tax gain is \$50.)

ii. In addition to the sales of output, a firm re-sells the used 1 unit of capital good (with depreciation rate  $\delta$ ) at  $P_{t+1}$  at  $t + 1$ . What is the firm's gain from resales? Express in terms of  $P_{t+1}$  and  $\delta$ .

iii. Does there exist any cost a firm should pay when the firm uses its own cash to buy 1 unit of capital good? If there does not, write down "NO". If there exists, write down "YES" with intuitive explanation and express the cost using the symbols given in the question.

iv. Write down an equation of the optimal condition for investment (or desired level of capital). (Note: You might use a definition of inflation  $\pi = P_{t+1}/P_t - 1$  and a Fisher equation  $1 + i = (1 + r)(1 + \pi)$ .)

(b) **(5 points)** Draw a diagram that represents how the optimal  $K_t$  is determined.

(c) **(5 points)** What interest rate affects the investment decision: nominal or real? How does the desired capital stock at time  $t$  depend on the interest rate? Explain using a diagram. Also, draw an investment demand function on the plane whose horizontal axis is  $I$  (investment) and vertical axis is an interest rate.

(d) **(5 points)** How does the desired capital stock at time  $t$  and investment demand function depend on the tax rate ( $\tau$ )? Explain using diagrams.

Consider now the investment decision of a firm that needs to borrow money from the bank at the nominal interest rate.

(e) **(5 points)** The above mentioned new situation is what we discussed in the class. Find the optimal condition for investment (or desired level of capital). (Note: You don't have to write down the derivation process.)

(f) **(5 points)** How do your answers for (c) and (d) change? Why? Explain.

(g) **(10 points)** Suppose that the government wants to stimulate the economy so it reduces the tax rate  $\tau$ . How will this tax policy affect the macroeconomy in a **CLASSICAL** general equilibrium world? Discuss the impacts on output ( $Y$ ), price level ( $P$ ), interest rate ( $r$ ), consumption ( $C$ ) and investment ( $I$ ) using diagram(s). (Note: Aggregate demand consists of consumption and investment. That is, the government is just an authority that determines tax rate. Also, let's assume that consumption function does not shift at all.)

(h) **(10 points)** How will the tax cut affect the macroeconomy in a **KEYNESIAN** world? Discuss the **SHORT-RUN** and **LONG-RUN** impacts on output ( $Y$ ) and price level ( $P$ ), comparing with the initial levels, using diagram(s).

3. **(Total 15 points)** The Keynesian consumption function can be expressed in the following form:

$$C = \bar{C} + \alpha(Y - T)$$

where  $C$  is consumption expenditure,  $(Y - T)$  is disposable income (where  $Y$  is income,  $T$  is tax payment), and  $\bar{C}$  is a constant which reflects autonomous consumption (*i.e.* the amount of consumption expenditure at zero level of disposable income). Lastly,  $\alpha$  is a constant between zero and one. Let us assume that  $\bar{C} = 200$ ,  $T = 100$ , and  $\alpha = 0.5$ .

(a) **(5 points)** Imagine that income is low at a recession ( $Y_R = 500$ ) and income is high at a boom ( $Y_B = 1,000$ ). Calculate MPC (marginal propensity to consume) and APC (average propensity to consume) for a recession and for a boom, respectively.

(b) **(5 points)** Are the MPCs from decreasing, increasing, or constant in income  $Y$ ? Are the APCs decreasing, increasing, or constant in income  $Y$ ?

*(Bonus Question; + 5 points)* Explain what the “consumption puzzle” is. How the puzzle is explained by the PIH (permanent income hypothesis) or LCH (life cycle hypothesis)?

(c) **(5 points)** The aggregate demand is  $Y = C + I + G$  and the government budget constraint is  $G = T$ . When the consumption function is given as above and the amount of government spending  $G$  is 500, Calculate how much the aggregate demand ( $Y$ ) is affected (Note: Let’s assume that investment  $I$  is constant).

**(End of Exam, Total 3 Pages)**