

Final Exam (Open-Book)
Advanced Macroeconomics
Instructed by Xu & Yi
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Tuesday, June/28/2016

Name: _____ **Student ID:** _____

1. (10+10+10=30 points) Consider the following IS-LM framework:

$$\ln Y_t = E_t[\ln Y_{t+1}] - \frac{1}{\theta} r_t, \quad (1)$$

$$\frac{M_t}{P_t} = Y^{\theta/\nu} \left(\frac{1+i_t}{i_t} \right)^{1/\nu}, \quad (2)$$

$$P_t = \bar{P}, \quad (3)$$

where the price level \bar{P} is a constant during all periods.

- (a) Where do equations (1) and (2) come from? What does equation (3) mean? Provide your answers with economic intuitions, **rather than mathematical deductions**.
- (b) Suppose all individuals in the economy, somehow, suddenly believe that the economy will behave much better than they have expected previously. Which equation does this change affect directly? Provide your answer with economic intuitions.
- (c) How does the change in (b) affect the current output? Provide your answers with an IS-LM diagram (similar to Figure 6.2 in your textbook) and economic explanations.

2. (10+10+15=35 points) Recall equations (6.20) and (6.21) in your textbook:

$$W_t = AP_{t-1}, \quad A > 0, \quad (4)$$

$$\begin{aligned} F'(L_t) &= \frac{AP_{t-1}}{P_t} \\ &= \frac{A}{1 + \pi_t}, \end{aligned} \quad (5)$$

where A is a constant and all other variables are defined as in your textbook.

- (a) Equation (5) gives the famous *Phillips Curve*: the higher the inflation rate, the lower the unemployment rate. However, it is said that the Phillips curve is established on

irrational expectations: workers who use equation (4) to determine their nominal wages are irrational individuals. Explain it.

- (b) Combined with *Okun's Law*, the Phillips Curve above implies a positive relationship between inflation rate and output: the higher the inflation rate, the greater the output. However, recall the Expectations-Augmented Phillips Curve:

$$\pi_t = \pi_t^e + \lambda(\ln Y_t - \ln \bar{Y}_t) + \varepsilon_t^S, \quad \lambda > 0, \quad (6)$$

where π_t^e stands for the expected inflation. According to (6), does a higher inflation rate still always lead to a greater output? Why?

- (c) Suppose $\pi_t^e = \pi_{t-1}$ in (6). What is the formal name for this kind of expectation rules? Is it rational? Explain your answers.

3. (10+10+15=35 points) Answer the following questions:

- (a) Recall equations (6.38) and (6.39) in your textbook:

$$U = C - \frac{1}{\gamma} L^\gamma, \quad \gamma > 0, \quad (6.38)$$

$$C = \left[\int_{i=0}^1 C_i^{(\eta-1)/\eta} \right]^{\eta/(\eta-1)}, \quad \eta > 1. \quad (6.39)$$

Find out all the typos (印刷错误) in both equations above.

- (b) Recall equation (6.48) in your textbook:

$$C_i = \left(\frac{P_i}{P} \right)^{-\eta} C. \quad (6.48)$$

What is the formal name for the equation above? Explain the economic intuition behind the equation.

- (c) Consider the statement: the *menu cost* adds nominal rigidity into macro-economy only if the cost to adjust menus is large enough. In other words, if the menu cost is negligible (可忽略不计的), we will have again an economy in which prices are perfectly flexible. **True or False?** Explain your answers.

Solutions and Hints

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Solution hints are given as below, please do me a favor by pointing out the mistakes and typos, if any, that I have made (yiming@hust.edu.cn).

- 1.(a) IS curve, or Euler equation for (1); LM curve for (2). Hint: Equation (3) adds into the economic system price rigidity, which separates short-run economic theories from the long-run growth theories.
- 1.(b,c) Hint: The change affects current consumption demand through equation (1). Intuition: Expectation of Y_{t+1} increases, so the marginal utility received from consumption decreases for the next period, and the Euler equation tells us that individuals would like to transfer some consumptions to the current period.
- 2.(a) Hint: Workers who use (4) to determine their nominal wages are actually taking the realized price level in the previous stage as their best guess for the current stage's price level. This is obviously an adaptive expectation rule, rather than a rational one.
- 2.(b) No. In this case, only the unexpected inflation, $\pi_t - \pi_t^e$, stimulates the output. So even if the central bank maintains a pretty high inflation rate, as long as it is expected by individuals, the inflation rate does not push output above \bar{Y}_t .
- 2.(c) Adaptive expectation. It is irrational. To see why, suppose a monetary authority utilizes this irrational rule by pushing the inflation rate higher and higher every year: By doing this, the central bank always adds unexpected inflation into the economy and can thus always stimulate the output level. But individuals actually suffer from this result: consumers and firms are fooled by the central bank, because they could have arranged better consumption and productions plans, should they know the exact inflation rate in advance. However, although they cannot know each stage's inflation rate perfectly before the inflation happens, they do have the opportunity to observe the central bank's behavioral rules. Given that they have already noticed that the central bank pushed inflation rates higher and higher in the previous stages, why should a rational individual still use $\pi_t^e = \pi_{t-1}$? In other words, this rule is irrational because individuals using this rule are suffering from systematic errors: They could do a better job, by taking into account other information, e.g., the central banks behavioral rules revealed in previous stages.
- 3.(a) The corrected equations should be:

$$U = C - \frac{1}{\gamma} L^\gamma, \quad \gamma > 0, \quad (6.38)'$$

$$C = \left[\int_{i=0}^1 C_i^{(\eta-1)/\eta} di \right]^{\eta/(\eta-1)}, \quad \eta > 1. \quad (6.39)'$$

- 3.(b) Hint: A demand function for a specific firm depends on the relative price, not just the price of its products.
- 3.(c) Hint: False. Term **menu cost** actually emphasizes the fact that small frictions are able to cause great nominal rigidities.