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## **Retake Exam**

Course name: Intermediate Macroeconomics  
Course code: EC2201  
Examiner: Paul Klein  
Number of credits: 7.5  
Date of exam: December 3, 2017  
Time of exam: 9:00-14:00

### **Instructions**

Please write your student identification number on each paper and cover sheet.

Use only one cover sheet per question. Read each question carefully. If you find a question ambiguous, please specify your interpretation. Answer the specific question rather than give a general account of the topic. Please write legibly. Scientific (but not programmable) calculators are allowed. All questions must be answered in English except the essay question, which may be answered in English, Swedish, Norwegian or Danish.

The exam consists of four parts as follows. I. Multiple choice. II. Short answers. III. Mathematical problems. IV. Essay. Each part may offer a choice of which question or questions to answer. Each part accounts for a quarter of your total grade. The maximum total score is 100.

For the grade E, 45 points are required; for D, 50; for C, 60; for B, 75; and for A, 90 points.

If you have submitted acceptable answers to four out of five assignments, please solve one of the mathematical problems in part III. Otherwise, solve two.

**Good luck!**

## Part I. Multiple choice questions.

### Instructions

For each question, please indicate the best alternative. Each correct answer yields 3 points. Full marks yields a bonus point. The maximum total score for this part is 25.

1. According to standard economic theory, labour supply is an increasing function of the wage if...
  - (a) leisure is a normal good.
  - (b) there is no unearned income.
  - (c) leisure and consumption are good enough substitutes.
  - (d) leisure and consumption are good enough complements.
  
2. According to Solow's growth model,
  - (a) a permanent change in the ratio of investment to GDP has no long-run effect on the growth rate of GDP.
  - (b) a permanent change in the ratio of investment to GDP has no effect on the growth rate of GDP, even in the short run.
  - (c) a permanent change in the ratio of investment to GDP has no long run effect on GDP.
  - (d) a permanent change in the ratio of investment to GDP has no effect on GDP, even in the short run.
  
3. In the Kydland-Prescott real business cycle model, people work harder in response to an above-expected level of technology because...
  - (a) people expect technology to remain a above trend forever.
  - (b) people do not expect technology to remain above trend forever.
  - (c) the income effect always dominates the substitution effect.
  - (d) consumption and leisure are assumed to be complements.

4. In the Lucas monetary misperceptions model, a shock to the money supply has a bigger effect on output...
- (a) the more unpredictable monetary policy is.
  - (b) the more predictable monetary policy is.
  - (c) the longer it is expected to last.
  - (d) the sooner it is expected to go away.
5. The Dornbusch model predicts that nominal exchange rates are more volatile than the underlying fundamentals...
- (a) because consumer prices are sticky and investors have rational expectations.
  - (b) because consumer prices are flexible and investors are irrational.
  - (c) because purchasing power parity must hold.
  - (d) because the demand for money is inelastic.
6. If preference shocks were the only driving force behind the business cycle, the correlation between hours worked and output per hour would be...
- (a) close to +1.
  - (b) close to -1.
  - (c) close to 0.
  - (d) about +1/2.
7. When you see a country running a large current account deficit you conclude that this country...
- (a) has just signed a free trade treaty.
  - (b) might recently have discovered that it is abundant in natural resources.
  - (c) is inhabited by irresponsible, spendthrift people.
  - (d) may have large share of its population in the 35-60 age range.
8. In the Mortensen-Pissarides model, the Beveridge curve depicting the relationship between unemployment (on the horizontal axis) and vacancies (on the vertical axis) shifts up and to the right when...
- (a) unemployment starts to increase.
  - (b) unemployment starts to decrease.
  - (c) the bargaining power of workers is strengthened.
  - (d) the bargaining power of workers is weakened.

## **Part II. Short answer questions.**

### **Instructions**

This part contains five questions. Please choose three of them and answer only those.

Each answer should cover no more than half a page.

Each answer carries a maximum score of 8, though a particularly good answer may score a bonus point. The maximum total score for this part is 25.

1. “Ricardian equivalence is an irrelevant concept because the conditions under which it holds are unrealistic.” Discuss.
2. “High taxes lead to low employment.” Discuss.
3. “Solow’s growth model is appropriate for analyzing the long run but not the short run.” Discuss.
4. “The current account of the balance of payments is an important indicator of the health of an economy.” Discuss.
5. “Education is the key to prosperity.” Discuss.

## Part III. Mathematical problems.

### Instructions

This part contains three questions. Please choose one of them (if you have received passing grades on at least four of your assignments) or two (if you have not). If you answer more questions than required, you will be graded on the basis of those answers that come first. This part carries a maximum score of 25 points.

1. Consider an economy with a Phillips curve given by

$$y = a(\pi - \pi^e)$$

where  $a > 0$  is a parameter,  $y$  is log output,  $\pi$  is the inflation rate and  $\pi^e$  is the subjectively expected inflation rate. A policy-maker sets monetary policy, but inflation cannot be controlled with perfect accuracy. Specifically,

$$\pi = \pi^p + \varepsilon$$

where  $\pi^p$  is the inflation target and  $\varepsilon$  is a random variable such that  $E[\varepsilon] = 0$ . The private sector has rational expectations and the policy-maker sets  $\pi^p$  so as to minimize expected loss, which is

$$E[(y - \bar{y})^2 + \pi^2].$$

Here is the timeline of events: (i) the private sector sets  $\pi^e$ , (ii) the policy-maker sets  $\pi^p$ , (iii) the value of the shock  $\varepsilon$  is revealed and inflation and output are determined.

- (a) Find the rational expectations equilibrium values of expected inflation  $E[\pi]$  and expected log output  $E[y]$  in terms of parameters.
- (b) Solve for the rational expectations equilibrium values of  $y$  and  $\pi$  in terms of parameters and  $\varepsilon$ . What is the predicted slope of the empirical Phillips curve  $\frac{\Delta y}{\Delta \pi}$ ?

2. Suppose a country exists for two periods. It produces  $y_1$  units of output in period 1. It can either spend it on consumption (denoted by  $c_1$ ), investment at home (denoted by  $k$ ), or investment abroad (denoted by  $b$ ) or a combination of all these. There are diminishing returns to investing at home, but a constant rate of return  $r \geq 0$  on investing abroad. Mathematically, the country faces the following constraints.

$$\begin{cases} c_1 + k + b = y_1 \\ c_2 = y_2 + (1+r)b \\ y_2 = f(k) \end{cases}$$

where  $f(k) = \alpha + \beta k - \frac{1}{2}k^2$ . Consumer preferences are represented by the following utility function:

$$u(c_1, c_2) = \ln c_1 + \frac{1}{2} \ln c_2.$$

- (a) Derive a single-equation intertemporal budget constraint for this economy.
- (b) Write down the other equations that must hold in equilibrium.
- (c) Suppose  $y_1 = 1$ ,  $r = 1$ ,  $\alpha = 1$  and  $\beta = 2$ . Show that the trade balance in period 1 is zero.
- (d) Suppose  $y_1 = 2$ ,  $r = 1$ ,  $\alpha = 1$  and  $\beta = 2$ . Show that there is a trade surplus in period 1. Explain why.
- (e) Suppose  $y_1 = 1$ ,  $r = 0$ ,  $\alpha = 1$  and  $\beta = 2$ . Show that there is a trade deficit in period 1. Explain why.

3. Consider an economy governed by Solow's growth model in continuous time. The capital stock at the instant  $t$ ,  $K(t)$ , evolves according to the following law of motion:

$$\dot{K}(t) = sY(t) - \delta K(t)$$

where the flow rate of output  $Y(t)$  satisfies

$$Y(t) = K(t)^\alpha [A(t) \cdot N(t)]^{1-\alpha},$$

population  $N(t)$  evolves according to

$$\dot{N}(t) = nN(t)$$

and labour productivity  $A(t)$  evolves according to

$$\dot{A}(t) = \gamma A(t).$$

You may take for granted that the law of motion for  $k(t)$ , defined via

$$k(t) := \frac{K(t)}{A(t) \cdot N(t)},$$

is as follows:

$$\dot{k}(t) = sk^\alpha(t) - (\delta + \gamma + n)k(t).$$

Suppose  $\alpha = 1/3$ ,  $s = 0.26$ ,  $\delta = 0.07$ ,  $n = 0.01$  and  $\gamma = 0.02$ .

- (a) What is the long-run proportional growth rate of output?
- (b) What is the long-run capital/output ratio?
- (c) Consider an instant  $t = t_0$  such that  $K(t_0)/Y(t_0) = 2.0$ .
  - (i) What is the instantaneous proportional growth rate of the capital stock at  $t = t_0$ ?
  - (ii) What is the instantaneous proportional growth rate of output at  $t = t_0$ ?

## **Part IV. Essay questions.**

### **Instructions**

This part contains three questions. Please answer just one of them. your answer should not exceed one page. This part carries a maximum score of 25 points.

1. “The main cause of the business cycle, and a sufficient cause, seems to be the fact that technical and commercial progress ... sometimes speeds up and sometimes slows down.” (Knut Wicksell)  
Do you agree?
2. “The root causes of the vast differences in output per head across countries are not well understood.” Do you agree?
3. “The main reason why hours worked per person differ across countries and across time is that taxes rates on labour income and on consumption differ.”  
Do you agree?



# FORMELSAMLING

- $x^\alpha \cdot x^\beta = x^{\alpha+\beta}$ ;  $(x^\alpha)^\beta = x^{\alpha\beta}$ ;  $x^\alpha y^\alpha = (xy)^\alpha$ .
- If  $h(x) \equiv f(g(x))$  then  $h'(x) = f'(g(x))g'(x)$ .
- If  $h(x) \equiv f(x)g(x)$  then  $h'(x) = f'(x)g(x) + f(x)g'(x)$ .
- If  $h(x) \equiv f(x)/g(x)$  then  $h'(x) = [f'(x)g(x) - f(x)g'(x)]/g^2(x)$ .
- If  $y = x/(1 - x)$  then  $x = y/(1 + y)$ .
- The Slutsky equation when income  $m$  is fixed:

$$\frac{\partial x_i}{\partial p_i} = \frac{\partial h_i}{\partial p_i} - \frac{\partial x_i}{\partial m} \cdot x_i.$$

- The Slutsky equation when  $m = \mathbf{p} \cdot \boldsymbol{\omega}$ :

$$\frac{dx_i}{dp_i} = \frac{\partial h_i}{\partial p_i} + \frac{\partial x_i}{\partial m} \cdot (\omega_i - x_i).$$

- The Cobb-Douglas (Wicksell) production (or utility) function:

$$f(\mathbf{x}) = x_1^{\alpha_1} x_2^{\alpha_2} \dots x_n^{1-\alpha_1-\alpha_2-\dots-\alpha_{n-1}}.$$

- If  $Z(t) \equiv X(t) \cdot Y(t)$  then

$$\frac{\dot{Z}(t)}{Z(t)} = \frac{\dot{X}(t)}{X(t)} + \frac{\dot{Y}(t)}{Y(t)}.$$

- If  $Z(t) \equiv X(t)/Y(t)$  then

$$\frac{\dot{Z}(t)}{Z(t)} = \frac{\dot{X}(t)}{X(t)} - \frac{\dot{Y}(t)}{Y(t)}.$$

- More generally, if  $Z(t) \equiv X^\alpha(t)Y^\beta(t)$  then

$$\frac{\dot{Z}(t)}{Z(t)} = \alpha \frac{\dot{X}(t)}{X(t)} + \beta \frac{\dot{Y}(t)}{Y(t)}.$$