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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 8, 2019  
Time of exam: 9:00-14:00

### **Instructions**

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

If you introduce notation not used in the question, please provide definitions. If you find a question ambiguous, please specify your interpretation. Please write legibly. Scientific (but not programmable) calculators are allowed and also dictionaries. 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 three out of four 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, higher wages lead to higher labour supply if...
  - (a) leisure and consumption are perfect complements.
  - (b) leisure is a luxury good.
  - (c) leisure and consumption are good enough substitutes.
  - (d) leisure is a normal good.
  
2. In Dornbusch's model of exchange rates, an increase in the domestic money supply leads to...
  - (a) an immediate depreciation of the domestic currency and an immediate rise in the price level.
  - (b) a sudden increase in the domestic nominal interest rate and a gradual depreciation of the domestic currency.
  - (c) a gradual fall in the domestic interest rate and a gradual rise in inflation.
  - (d) a sudden increase in inflation, an immediate depreciation of the domestic currency followed by a gradual appreciation of the currency.
  
3. In Solow's growth model,
  - (a) convergence to the balanced growth path is faster the higher the depreciation rate is.
  - (b) the depreciation rate has no effect on the level of GDP per head.
  - (c) convergence to the balanced growth path is slower the higher the depreciation rate is.
  - (d) a change in the depreciation rate has no effect on the growth rate of output, even in the short run.

4. The Mortensen-Pissarides model of frictional unemployment predicts that, in response to a rise in the unemployment benefit...
- (a) unemployment will suddenly jump to a new, higher, steady state level and vacancies will suddenly fall to a new, lower, steady state level.
  - (b) the ratio of vacancies to unemployment will gradually fall as vacancies gradually fall and unemployment gradually rises.
  - (c) the wage will gradually rise along with gradually rising unemployment and gradually falling vacancies.
  - (d) vacancies will suddenly drop after which both vacancies and unemployment will gradually rise, keeping the ratio of vacancies to unemployment constant over time.
5. According to standard economic theory, cutting marginal tax rates increases labour supply if...
- (a) government spending is also cut.
  - (b) average tax rates are held constant.
  - (c) total tax revenue is also reduced.
  - (d) the composition of government spending is changed at the same time.
6. If Ricardian equivalence holds then...
- (a) a temporary tax cut has no effect on the current account of the balance of payments.
  - (b) a permanent increase in government spending will lead to a deterioration of the current account of the balance of payments.
  - (c) a temporary government consumption increase has no effect on the current account of the balance of payments.
  - (d) an anticipated future increase in government consumption has no effect on the current account of the balance of payments.
7. 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 0.
  - (c) about  $+1/2$ .
  - (d) close to  $-1$ .

8. When you see a country running a large current account deficit you conclude that this country...
- (a) is probably growing faster than the countries it trades with.
  - (b) is in need of structural reform.
  - (c) may have a lot of middle-aged people.
  - (d) expects to run out of its stock of natural resources soon.

## **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. “Real exchange rates fluctuate a lot, much more so than domestic prices. This suggests that currency markets are controlled by traders whose behaviour resembles that of easily frightened sheep.” Discuss.
2. “The Solow model has nothing to say about economic growth because it predicts that output will converge to a constant.” Discuss.
3. “Standard economic theory suggests that government deficits are likely to be associated with current account deficits.” Discuss.
4. “The Mortensen-Pissarides model predicts a stable relationship between vacancies and unemployment.” Discuss.
5. “The labour supply curve is probably backward-bending.” 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 three 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. Suppose a country exists for two periods. It produces one unit of output in period 1. It can either consume it, invest it at home or invest it abroad 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.

$$c_1 + k + b = 1$$

and

$$c_2 = f(k) + (1 + r)b$$

where  $f(k) = \alpha + \beta k - \frac{1}{2}k^2$ . Preferences are such that consumers choose  $c_1 = c_2$  no matter what.

- (a) Derive a single-equation intertemporal budget constraint for this economy.
- (b) Show that this economy maximally expands its consumption opportunities by choosing  $k$  in such a way that

$$f'(k) = 1 + r.$$

Interpret this condition.

- (c) Suppose  $\alpha = 1$ ,  $\beta = 1.2$  and  $r = 0.2$ . Show that the trade balance in period 1 is zero.
- (d) Suppose  $\alpha = 3.2$ ,  $\beta = 1.2$  and  $r = 0.2$ . Show that the trade balance in period 1 is negative. Explain.
- (e) Suppose  $\alpha = 1$ ,  $\beta = 1.2$  and  $r = 0$ . Show that the trade balance in period 1 is negative. Explain.

2. Consider a discrete-time version of Dornbusch's "overshooting" model of exchange rates, according to which

$$m - p_t = -0.5 \cdot i_t \quad (1)$$

$$i_t = 12 \cdot (e_{t+1} - e_t) \quad (2)$$

$$p_{t+1} - p_t = 0.15 \cdot (e_t - p_t). \quad (3)$$

where  $p_t$  is the log price level,  $e_t$  is the log exchange rate,  $i_t$  is the (domestic) nominal annualized interest rate. We assume that  $i^*$ , the foreign nominal annualized interest rate, is zero. Meanwhile,  $m$  is the log money supply. The initial ( $t = 0$ ) log price level  $p_0$  is exogenously given. Each time period corresponds to one month.

- Explain the economics behind Equation (2).
- Find the steady state values of  $p$  and  $e$  as a function of  $m$ .
- It turns out that the only solution that converges to the steady state can be represented as

$$p_{t+1} = \frac{3}{4} \cdot p_t + \frac{1}{4} \cdot m,$$

$$e_t = -\frac{2}{3} \cdot p_t + \frac{5}{3} \cdot m$$

and

$$i_t = 2 \cdot p_t - 2 \cdot m.$$

Suppose  $m$  was equal to 0 for  $t = -\infty, \dots, -3, -2, -1$  but at  $t = 0$  it suddenly and unexpectedly rises to 1 and stays there, and is expected to stay there, forever.

- What is a reasonable value for  $p_0$ ?
- What do you think  $e_{-1}$  was?
- What is  $e_0$ ? What is  $e_1$ ?
- What happens to  $e_t$  as  $t \rightarrow \infty$ ?

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  $\alpha = 0.4$ ,  $s = 0.25$ ,  $\delta = 0.075$ ,  $n = 0.005$  and  $\gamma = 0.02$ .

- (a) What is the long-run proportional growth rate of output?
- (b) What is the long-run proportional growth rate of output per capita?
- (c) What is the long-run capital/output ratio?
- (d) 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. “High marginal tax rates reduce labour supply.” Do you agree?
2. “A large current account deficit is a cause for concern.” Do you agree?
3. “The Mortensen-Pissarides model is a plausible explanation of short-term but not long-term unemployment.” 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

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