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Department of Economics

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Exam

Course name: Intermediate Macroeconomics
Course code: EC2201
Examiner: Paul Klein
Number of credits: 7.5
Date of exam: October 31, 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. 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.

Your results will be available on your Ladok account (www.student.ladok.se) on November 18 at the latest. The exam review will be held on November 19, 13:00-15:00 in Hörsal 2.

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 is a normal good.
 - (b) leisure is an inferior good.
 - (c) leisure is a luxury good.
 - (d) leisure and consumption are perfect complements.

2. According to standard economic theory, higher taxes on labour income lead to lower labour supply if the increase in revenue is used for...
 - (a) funding the SSC (Swedish Space Corporation).
 - (b) increased housing benefit (bostadsbidrag).
 - (c) improving public transport.
 - (d) increased spending on defence.

3. In Solow's growth model,
 - (a) the capital share has no effect on the level of GDP per head.
 - (b) convergence to the balanced growth path is faster the higher the capital share is.
 - (c) convergence to the balanced growth path is slower the higher the capital share is.
 - (d) a change in the capital share has no effect on the growth rate of output, even in the short run.

4. The Mortensen-Pissarides model of frictional unemployment predicts a Beveridge curve that...
- (a) is stable over time.
 - (b) shifts to the right when unemployment is rising.
 - (c) shifts to the right when unemployment is falling.
 - (d) is horizontal.
5. Consider the following aphorisms.
- (i) "With law shall the land be built." (Karl XV)
 - (ii) "An imbalance between rich and poor is the oldest and most fatal ailment of all republics." (Plato)
 - (iii) "Republics have a longer life and enjoy better fortune than principalities." (Macchiavelli)
 - (iv) "Learning, whether speculative or practical, is... the natural source of wealth and honour." (Franklin)
- Which two aphorisms capture the two most important truths about how a country best achieves prosperity?
- (a) (i) and (ii).
 - (b) (ii) and (iii).
 - (c) (i) and (iv).
 - (d) (iii) and (iv).
6. Ricardian equivalence means that...
- (a) government deficits do not matter.
 - (b) government deficits stimulate output and employment.
 - (c) government deficits depress output and employment.
 - (d) government deficits stimulate consumption.
7. If shocks to technology 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.
8. When you see a country running a large current account deficit you conclude that this country...

- (a) may have a lot of young and old people.
- (b) expects to run out of its stock of natural resources soon.
- (c) should impose capital controls to stem the outflow of capital.
- (d) may have a lot of middle-aged people.

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. “The Solow model is useful for understanding the experience of West Germany in the aftermath of the Second World War but not that of South Korea after the Korean war.” Discuss.
2. “Japan has for a long time had a current account surplus and the United States a deficit. This shows that the Japanese are more frugal¹ than the Americans.” Discuss.
3. “High unemployment benefits lead to high unemployment because they destroy incentives to search for a job.” Discuss.
4. “Basic economic theory dictates that demand curves slope down. Labour supply is available time minus the demand for leisure. Therefore, the labour supply curve slopes up.” Discuss.
5. “Norway will probably be running a current account deficit by the year 2100.” Discuss.

¹*Frugal* betyder sparsam.

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. Consider Solow's growth model in continuous time where output is produced according to

$$Y(t) = K^\alpha(t)L^{1-\alpha}(t)$$

where labour input is equal to labour productivity A times population N so that

$$L(t) = A(t)N(t).$$

We assume that population $N(t) = N$ is constant and that labour productivity $A(t)$ grows at the constant proportional rate 0.02 so that

$$\frac{\dot{A}(t)}{A(t)} = 0.02.$$

The depreciation rate is $\delta = 0.08$. Capital's share of income α is 0.4. The investment rate s is 0.3.

- (a) What is the long-run capital/output ratio in this model? (Your answer should be a number.)
- (b) Consider an instant $t = t_0$ such that the capital/output ratio at that instant is 2.0, i.e. $K(t_0)/Y(t_0) = 2.0$.
 - (i) Is the economy below or above its balanced growth path at $t = t_0$?
 - (ii) Find the (instantaneous) growth rate of output at $t = t_0$.
 - (iii) What is the growth rate of output as $t \rightarrow \infty$?

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

$$m(t) - p(t) = -\frac{1}{2}i(t) \quad (1)$$

$$i(t) = i^* + \dot{e}(t) \quad (2)$$

$$\dot{p}(t) = e(t) - p(t) \quad (3)$$

where $p(t)$ is the log price level, $e(t)$ is the log exchange rate, $i(t)$ is the (domestic) nominal interest rate, i^* is the foreign nominal interest rate and $m(t)$ is the log money supply. Provided that $m(t) = m$ is constant and t_0 is any given instant, every solution to the system of differential equations given by Equations (1)-(3) can be written as

$$e(t) = i^*/2 + m + c_1 \cdot \exp\{-2(t - t_0)\} + 2 \cdot c_2 \cdot \exp\{t - t_0\} \quad (4)$$

$$p(t) = i^*/2 + m - c_1 \cdot \exp\{-2(t - t_0)\} + c_2 \cdot \exp\{t - t_0\} \quad (5)$$

$$i(t) = i^* - 2 \cdot c_1 \cdot \exp\{-2(t - t_0)\} + 2 \cdot c_2 \cdot \exp\{t - t_0\}. \quad (6)$$

for some constants c_1 and c_2 .

- (a) Explain the economics behind Equations (1)-(3).
- (b) Explain why convergence to a steady state (as $t \rightarrow \infty$) implies $c_2 = 0$.
- (c) Suppose $i^* = 0$, that $m(t) = 1$ for all $t < t_0$ and that $m(t) = 0$ for all $t \geq t_0$. The change at t_0 comes as a complete surprise, but it is (correctly) believed to be permanent.
 - (i) Keeping in mind that $p(t_0)$, because prices are sticky, is determined by history and *cannot* immediately respond to news, determine $p(t_0)$.
 - (ii) Keeping in mind that the exchange rate is flexible and hence *can* respond immediately to news, determine c_1 and hence $e(t_0)$.
 - (iii) What is $\lim_{t \rightarrow \infty} e(t)$?
 - (iv) Notice that $e(t_0)$ is below its long-run value. Explain the economic logic behind this “undershooting” phenomenon.

Note: By $\exp\{x\}$ I mean the exponential function, which is often, though not always, denoted by e^x . In this case I don't want to use the latter notation, because e stands for the (log) exchange rate.

3. Consider an economy where every consumer i maximizes

$$\alpha \ln c_i + (1 - \alpha) \ln(1 - h_i)$$

where c_i is consumption and h_i is the fraction of available time spent in paid employment. Suppose there is a labour income tax τ and a transfer payment T so that every consumer's budget constraint is

$$c_i = (1 - \tau)wh_i + T.$$

where w is the (real) wage. We assume that w is fixed throughout this question. The parameter α satisfies $0 < \alpha < 1$. Define H as the average value of h_i over all the i s. The government must fund government purchases per person equal to G .

(a) Explain why

$$\tau wH = T + G \tag{7}$$

must hold in equilibrium.

- (b) Suppose $T = 0$ and suppose τ is whatever it needs to be to satisfy the above equation given G . Solve for the equilibrium value of H in terms of α , w and G . Does either w or G matter for H ? Why or why not?
- (c) Suppose $w = 1$, $\alpha = 0.2$, $G = 0.0125$, $\tau = 0$ and that T is whatever it needs to be to satisfy Equation (7). Solve for the equilibrium value of H . Verify that and explain why it is higher than it would be under the policy described in (b).
- (d) (Optional bonus question.) Verify that and explain why the utility level is higher in (c) than in (b), assuming in both cases that $w = 1$, $\alpha = 0.2$ and $G = 0.0125$.

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. “The Solow model has nothing to say about long-term economic growth because it predicts that output will converge to a constant.” Do you agree?
3. “Differences in skill levels of the workforce is the most important factor explaining cross-country income differences.” 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

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