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Department of Economics

# Exam

Course name:      Intermediate Macroeconomics
Course code:       EC2201
Examiner:          Paul Klein
Number of credits:   7.5
Date of exam:       October 25, 2016
Time of exam:      9:00-14:00

# Instructions

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

Use only one cover sheet per question. 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 four out of five assignments, please solve one of the mathematical problems in part III. Otherwise, solve two.

Your results will be available on November 7 at the latest. The exam review will be held on November 16, 13:00-15:00 in B4.

**Good luck!**

# Part I. Multiple choice questions.

## Instructions

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

1. A balanced growth path is, by definition, a situation where...

   (a) consumption, output and the capital stock all grow at the same rate.
   (b) output is constant over time.
   (c) the marginal product of labour is constant over time.
   (d) the capital stock is constant over time.

2. According to standard economic theory, higher taxes lead to lower labour supply if the increase in revenue is used to...

   (a) refurbish the royal palace.
   (b) send diplomats around the world to secure a spot on the UN Security Council.
   (c) increase the child benefit (*barnbidrag*).
   (d) increase subsidies on childcare (*barnomsorg*).

3. Which aphorism comes closest to capturing the truth about how a country best achieves prosperity?

   (a) "With law shall the land be built." (Västgötalagen and many other sources)
   (b) "An imbalance between rich and poor is the oldest and most fatal ailment of all republics." (Plato)
   (c) "Republics have a longer life and enjoy better fortune than principalities". (Macchiavelli)
   (d) "Learning, whether speculative or practical, is... the natural source of wealth and honour." (Franklin)

4. According to the Kydland-Prescott model of real business cycles, a greater than expected improvement in technology leads to a rise in labour supply because...

   (a) the substitution and income effects cancel out.
   (b) it is not expected to last forever.
   (c) leisure is an inferior good.
   (d) the endowment income effect dominates all the other effects because everyone is a net supplier of leisure.

5. If government consumption 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 $+1/2$.

6. When you see a country running a large current account deficit you conclude that this country...

   (a) needs to introduce currency controls to stem the outflow of capital.
   (b) might recently have discovered that it is abundant in natural resources.
   (c) needs to increase its tariffs to reduce the trade deficit.
   (d) may have a lot of middle-aged people.

7. The credibility problem in monetary policy arises because of...

   (a) the desire to raise employment above its natural rate.
   (b) irresponsible, populist politicians.
   (c) irrational expectations.
   (d) policy makers who are mistaken about how the economy works.

8. Unemployment is likely to increase if unemployment benefits are raised because...

   (a) wages fall and hence the unemployed have weaker incentives to search for a job.
   (b) wages rise and hence fewer vacancies are posted.
   (c) the Beveridge curve shifts to the right.
   (d) the Beveridge curve shifts to the left.

# Part II. Short answer questions.

## Instructions

This part contains five questions. Please choose <u>three</u> 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 not a model of growth." Discuss.

2. "Minimum wages kill jobs." Discuss.

3. "Labour supply curves slope up if leisure is a normal good." Discuss.

4. "Higher taxes on labour income and consumption leads to fewer hours worked." Discuss.

5. "Higher unemployment benefits lead to higher unemployment because the unemployed search less eagerly for a new job." Discuss.

# Part III. Mathematical problems.

## Instructions

This part contains three questions. Please choose <u>two</u> of them (if you have not submitted acceptable assignment answers) or just <u>one</u> (if you have). This part carries a maximum score of 25 points. If you handed in acceptable answers to the assignments, you have automatically gained 13 points already.

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 population so that

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

We assume that population $N(t)$ grows at the rate $0.03$ and that the depreciation rate is $\delta = 0.06$. Capital's share of income $\alpha$ is $1/3$. The investment rate $s$ is 0.3.

   (a) Suppose you are given the capital/labour ratio $k$. What is then the capital/output ratio (in terms of $k$ and parameters)?

   (b) What is the long-run capital/output ratio in this model (in terms of parameters only)?

   (c) Consider an instant $t = s$ such that the capital/output ratio is 2.5.

      (i) Is the economy below or above its balanced growth path at $t = s$?

      (ii) Find the (instantaneous) growth rate of output at $t = s$.

      (iii) What is the growth rate of output as $t \to \infty$?

2. Consider a country that exists for two periods, $t = 1$ and $t = 2$. It production possibilities are described by $y_1 \geq 0$, $y_2 \geq 0$, and

$$y_1^2 + \alpha y_2^2 \leq 4$$

where $y_t$ is output in period $t$; $t = 1, 2$. The country can borrow and lend in international capital markets, where the rate of return is $r$. Its preferences are represented by

$$u(c_1, c_2) = \ln c_1 + \beta \ln c_2.$$

where $c_t$ is consumption in period $t$; $t = 1, 2$.

(a) Draw (sketch) the production possibility frontier (PPF) for this economy. Indicate how the frontier would shift as you change $\alpha$.

(b) Write down a single–equation intertemporal budget constraint for this economy.

(c) Explain why, in equilibrium, the slope of the PPF and the slope of the budget line should be equal.

(d) Draw (sketch) a typical consumer indifference curve. Derive an expression for its slope. Explain why, in equilibrium, the slope of an indifference curve should equal the slope of the budget line.

(e) Write down all four equations that must hold in equilibrium.

(f) Suppose $\alpha = 5/4$, $\beta = 4/5$, $r = 0$. Show that the period 1 trade balance is zero.

(g) Suppose $\alpha = 1/3$. $\beta = 4/5$, $r = 0$. Show that the period 1 trade balance is negative. Explain why.

3. Suppose inflation $\pi$ (measured in percent) and (log) output's deviation from trend $y$ are governed by the following Lucas surprise supply function:

$$y = \pi - \pi^e$$

and that you evaluate inflation and log output outcomes according to the following loss function.

$$L(y, \pi) = \frac{1}{2}(y - \bar{y})^2 + \frac{1}{2}(\pi - \bar{\pi})^2 \tag{1}$$

where $\bar{\pi} > 0$ and $\bar{y} > 0$. Inflation expectations are formed before inflation is chosen by the monetary policy maker.

(a) Suppose you trying to hire a new governor of the Riksbank. You will be giving the governor full control over monetary policy and his or her salary will not depend on performance. Each candidate $i$ has preferences described by

$$L^i(y, \pi) = \frac{1}{2}(y - \bar{y}^i)^2 + \frac{1}{2}(\pi - \bar{\pi})^2.$$

What value of $\bar{y}^i$ would you most prefer to see in a good governor?

(b) Suppose again that you are trying to hire a new governor of the Riksbank. This time, however, all candidates have the same preferences as you do, except that they also care about their own salary $S$. Specifically, the person you hire maximizes $-L(y, \pi)$ plus $S$ (measured in MSEK). You decide to write a performance contract specifying a basic salary $\bar{S}$ minus a penalty $p$ for each percentage point that inflation exceeds $\bar{\pi}$. How big should $p$ be?

# Part IV. Essay questions.

## Instructions

This part contains three questions. Please answer just <u>one</u> of them. Your answer should not exceed one page. This part carries a maximum score of 25 points.

1. "In my view, real business cycle theory does not provide an empirically plausible explanation of economic fluctuations." (N. Gregory Mankiw)
   Do you agree?

2. "Tax rates alone account for most... differences in labor supply [among the major industrial countries]." (Edward C. Prescott)
   Do you agree?

3. What policies might be used to reduce the rate of unemployment?

# 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 $m = \mathbf{p} \cdot \boldsymbol{\omega}$:

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

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

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

- 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

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