STOCKHOLM UNIVERSITY
Department of Economics

Course name	**Macroeconomics**
Course code	**EC7210**
Examiner	**Johan Söderberg**
Number of credits	**7.5 credits**
Date of exam	**13 January 2016**
Examination time	**3 hours (09.00-12.00)**

Write your identification number on each paper and cover sheet (the number stated in the upper right hand corner on your exam cover).

Do not write answers to more than one question in the same cover sheet. Explain notions/concepts and symbols. If you think that a question is vaguely formulated, specify the conditions used for solving it. Only legible exams will be marked. No aids are allowed.

The exam consists of 4 questions. Each question is worth 25 points, 100 points in total. For the grade E 45 points are required, for D 50 points, C 60 points, B 75 points and A 90 points.

Only students who have <u>NOT</u> received credits from the seminar series should answer question 4.

Results will be posted on mitt.su.se three weeks after the exam, at the latest

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Good luck!

Question 1 (25 p)

Consider a *two-period* economy where an individual household, that takes the interest rate as given, solves

$$\max_{\{C_0,C_1,A_1\}} \sum_{t=0}^{1} \beta^t \Phi_t^c \ln C_t, \tag{1}$$

where $\Phi_t^c > 0$ is a consumption preference shock, subject to the real budget constraint

$$C_t + A_{t+1} = Y_t + (1+r) A_t. \tag{2}$$

Assume that the household has no initial assets.

a) For this to be a well-specified problem we should also impose an end-period restriction for the household. What restriction, corresponding to the transversality condition, should be imposed? Explain intuitively.

b) Derive the household's Euler equation.

c) Suppose that income is $\bar{Y}$ in the first period and 0 in the second period. Solve for C_0, C_1, and A_1. Explain how they are affected by $\bar{Y}$, and Φ_0^c and Φ_1^c.

d) Suppose that the economy consists of many identical households. Assume the same income process as in (c). Solve for the equilibrium values of C_0, C_1 and r. Explain how they are affected by $\bar{Y}$, and Φ_0^c and Φ_1^c.

Question 2 (25 p)

Consider an economy where the representative household solves

$$\max_{\{C_t,B_{t+1},H_t\}_{t=0}^{\infty}} E_0 \sum_{t=0}^{\infty} \beta^t \left\{ \frac{C_t^{1-\sigma}}{1-\sigma} - \frac{H_t^{1+\varphi}}{1+\varphi} \right\}, \tag{3}$$

where $\sigma > 0$ and $\varphi > 0$, subject to the nominal budget constraint

$$P_t C_t + B_{t+1} = W_t H_t + (1+i_{t-1}) B_t - T_t, \tag{4}$$

where T_t is a lump-sum tax used to finance government expenditures.

Firms in the economy are price takers, operating on a perfectly competitive market. The representative firm's profit maximization problem is

$$\max_{Y_t, H_t} \{P_t Y_t - W_t H_t\},\tag{5}$$

subject to the production function

$$Y_t = H_t.\tag{6}$$

The government's budget constraint is given by

$$P_t G_t + (1 + i_{t-1}) D_t = T_t + D_{t+1},\tag{7}$$

where D_{t+1} is the government's nominal debt at the beginning of period $t+1$.

a) Derive the household's Euler equation and the optimal condition for labor supply, and the first-order condition for the firm's profit maximization problem.

b) Derive the economy's resource constraint.

c) Calculate the government expenditure multiplier (dY_t/dG_t). Is it larger or smaller than unity?

d) Calculate the multiplier instead assuming that government expenditures are financed via a consumption tax. Assume that the government runs a balanced budget in every period. Is the multiplier larger or smaller than in (d)? Explain intuitively.

Question 3 (25 p)

Consider an economy where the Phillips curve is given by

$$\pi_t = \kappa x_t + \beta E_t \pi_{t+1} + u_t,\tag{8}$$

where u_t is a serially uncorrelated cost-push shock with mean zero. The DIS curve is given by

$$x_t = E_t x_{t+1} - \frac{1}{\sigma}(i_t - E_t \pi_{t+1} - r_t^e),\tag{9}$$

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where r_t^e is the efficient interest rate.

The central bank's problem is to minimize

$$E_0 \sum_{t=0}^{\infty} \beta^t L_t, \tag{10}$$

where

$$L_t = \pi_t^2 + \lambda x_t^2 \tag{11}$$

is the period loss function.

a) Explain the difference between the natural level of output and the efficient level of output.

b) For each "shock" described below, explain if it affects the natural and/or the efficient level of output.

(i) A natural disaster that destroys some of the economy's productive capacity

(ii) A decrease in competition, leading to higher markups

(iii) An increase in union bargaining power, leading to higher wages

(iv) A negative technology shock

c) Solve for x_t and π_t in terms of u_t. Explain intuitively how the output gap, inflation and the nominal interest rate react to a cost-push shock.

Question 4 (25p)

Suppose that the world consists of one large and one small country. The countries trade with each other in the single homogeneous good that sells for the same real price in both countries (PPP holds). The initial net asset position is zero. There are no taxes and no government expenditures.

The representative household in both countries maximize a lifetime utility function of the form

$$\sum_{t=0}^{\infty} \beta^t \ln C_t, \tag{12}$$

subject to the real budget constraint

$$C_t + A_{t+1} = Y_t + (1+r)A_t, \tag{13}$$

where r is the world interest rate.

a) Let C_t^L denote period t per capita consumption in the large country, and C_t^S period t per capita consumption in the small country. Write down the Euler equation for both countries.

b) Suppose that income in the large country follows the process

$$Y_t^L = (1+\gamma)Y_{t-1}^L. \tag{14}$$

Solve for the equilibrium world interest rate.

c) Assume that income in the small country is $\delta + \bar{Y}$ in odd periods and $\bar{Y}$ in even periods. Solve for the period 0 consumption level in the small country and explain how it is affected by δ, γ, and $\bar{Y}$.