

STOCKHOLM UNIVERSITY
Department of Economics

Course name	Macroeconomics
Course code	EC7210
Examiner	Johan Söderberg
Number of credits	7.5 credits
Date of exam	21 February 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 NOT 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

Good luck!

Question 1 (25 p)

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

$$\max_{\{C_0, C_1, A_1\}} \sum_{t=0}^1 \beta^t \ln C_t, \quad (1)$$

subject to the real budget constraint

$$C_t + A_{t+1} = Y_t + [1 + r(1 - \tau)] A_t, \quad (2)$$

where $\tau > 0$ is a capital income tax. Assume that $A_2 = 0$. Also assume that income is \bar{Y} in both periods.

- a) Derive the household's Euler equation. Explain how the household's level of consumption in period 0 relative to period 1 is affected by τ
- b) Solve for C_0 , C_1 , and A_1 . How are they affected by β and A_0 ? Explain intuitively.
- c) Suppose that the economy consists of many identical households. Assume the same income process as above and that $A_0 = 0$. Solve for the equilibrium interest rate. Explain how it is affected by τ ?

Question 2 (25 p)

Consider an economy where the representative household solves

$$\max_{\{C_t, A_{t+1}, H_t\}_{t=0}^{\infty}} E_0 \sum_{t=0}^{\infty} \beta^t \left\{ \frac{1}{1 - \sigma} C_t^{1 - \sigma} - \frac{\Phi_t^h}{1 + \varphi} H_t^{1 + \varphi} \right\}, \quad (3)$$

where Φ_t^h is a labor supply shock that affects the household's disutility of labor, subject to the real budget constraint

$$(1 - \tau_t) C_t + A_{t+1} = w_t H_t + (1 + r_{t-1}) A_t - T_t, \quad (4)$$

where τ_t is a consumption subsidy (a tax if negative), and T_t is a lump-sum tax that finances the subsidy.

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

$$\max_{Y_t, H_t} \{Y_t - w_t H_t\}, \quad (5)$$

subject to the production function

$$Y_t = H_t. \quad (6)$$

- 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) Solve for the equilibrium level of output in the economy. Explain how it is affected by Φ_t^h and τ_t .
- c) Solve for the level of the subsidy required to keep output constant at all times.
- d) Suppose that the subsidy solved for in (c) is imposed. If there is a change in Φ_t^h , do you expect the representative household's utility to be higher or lower than in the case when the subsidy is set to zero? No formal calculations are required, but discuss intuitively.

Question 3 (25p)

Consider an economy with sticky prices where government expenditures are financed by lump sum taxes, and the central bank conducts monetary policy in such a way so that the real interest rate always is at its steady state value ρ . The DIS curve in this economy can be written as

$$\hat{y}_t = E_t \hat{y}_{t+1} - \frac{1 - S_G}{\sigma} (i_t - E_t \pi_{t+1} - \rho) - S_G E_t (\hat{g}_{t+1} - \hat{g}_t), \quad (7)$$

where $\hat{y}_t = y_t - \bar{y}$ and $\hat{g}_t = g_t - \bar{g}$, in which \bar{y} and \bar{g} are the steady state values of y and g .

- a) Calculate the fiscal multiplier, dY_t/dG_t , for an increase in government expenditures that lasts for one periods (period t). In period $t+1$, government expenditures go back to their steady state value indefinitely.

Hint: Recall that $\frac{dY_t}{dG_t} \approx \frac{1}{S_g} \frac{dy_t}{dg_t} = \frac{1}{S_g} \frac{d\hat{y}_t}{d\hat{g}_t}$

- b) Calculate the fiscal multiplier, dY_t/dG_t , when government expenditures instead follow the stochastic process

$$\hat{g}_t = \rho_g \hat{g}_{t-1} + \varepsilon_t, \quad (8)$$

where ε_t is serially uncorrelated with mean zero.

- c) Discuss how your results would change if taxes were collected through distortionary income taxes instead of lump sum taxes.

Question 4 (25 p)

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. Suppose that income in the large country is constant.

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

$$\sum_{t=0}^{\infty} \beta^t \ln C_t, \quad (9)$$

subject to the real budget constraint

$$C_t + A_{t+1} = Y_t + (1 + r) A_t, \quad (10)$$

where r is the world interest rate.

- a) Solve for the equilibrium world interest rate.
- b) Assume that income in the small country is \bar{Y} in every period except in period 0 when it is $\bar{Y} + \Delta\bar{Y}$. Solve for the small country's consumption level, current account, and net foreign asset position for periods 0 and 1. Explain intuitively how they are affected by the temporary increase in income.
Hint: Remember that $CA_t = NFA_{t+1} - NFA_t$.
- c) Assume instead that income in the small country is $\bar{Y} + \Delta\bar{Y}$ in every period from period 0 and onwards. Solve for the small country's consumption level, current account, and net foreign asset position for periods 0 and 1. Explain intuitively how they are affected by the permanent increase in income.