Universität Siegen

Fakultät III
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Exam “International Macroeconomics“
Winter Semester 2016-17
(2nd Exam Period)

Solution

Available time: 60 minutes

For your attention:

1. The exam is made up of 8 pages (including this cover page). Please check and see if the exam you are holding is **complete**.

2. For your answers, use the designated spaces. Should these not suffice, use the backside of the pages. Please do not use a **pencil**.

3. Additional materials you may use for the exam: a non-programmable calculator. (Smart phones and mobile **phones** are **not** allowed!)

4. ATTENTION: The names for variables have the same meaning as in the lecture. Insofar as you also use the same symbols for the variables as we did in the lecture you will not have to define these any further.

Question	**1**	**2**	**3**	**4**	**Sum**	**Mark**
Points achievable	11	13	18	18	60	
Points achieved						

Problem 1: Aggregate Accounting of an Open Economy

Suppose you have the following information about an open economy with a flexible exchange rate. Gross domestic product is 150 while gross domestic demand is 120. The net export of services is 30, the imports of goods are 40. There are neither transfers nor payments of factor income between domestic residents and foreigners.

Please calculate the following variables using the appropriate equations from the relevant accounting systems of an open economy:

a) Balance of trade in goods and services (NX_t) [2 points]

Solution:

$$NX_t = GDP_t - GDD_t = \underset{(1)}{150} - \underset{(1)}{120} = \underset{(0.5)}{30}$$

b) Exports of goods (Ex_t^G) [3 points]

Solution:

$$EX_t^G = NX_t - NX_t^S + IM_t^G = \underset{(0.5)}{30} - \underset{(1)}{30} + \underset{(1)}{40} = \underset{(0.5)}{40}$$

c) Balance on current account (CA_t) [2 points]

Solution: $CA_t = NX_t + BPI_t + BSI_t = \underset{(0.5)}{30} + \underset{(0.5)}{0} + \underset{(0.5)}{0} = \underset{(0.5)}{30}$

d) Balance on financial account (FA_t) [2 points]

Solution: $\mathrm{FA}_t = CA_t + KA_t = \underset{(0.5)}{30} + \underset{(1)}{0} = \underset{(0.5)}{30}$

e) Balance of the non-reserve financial account (FA_t^{NR}) [2 points]

Solution: $\mathrm{FA}^{\mathrm{NR}} = FA_t - \Delta R_t = \underset{(0.5)}{30} \underset{(1)}{- 0} = \underset{(0.5)}{30}$

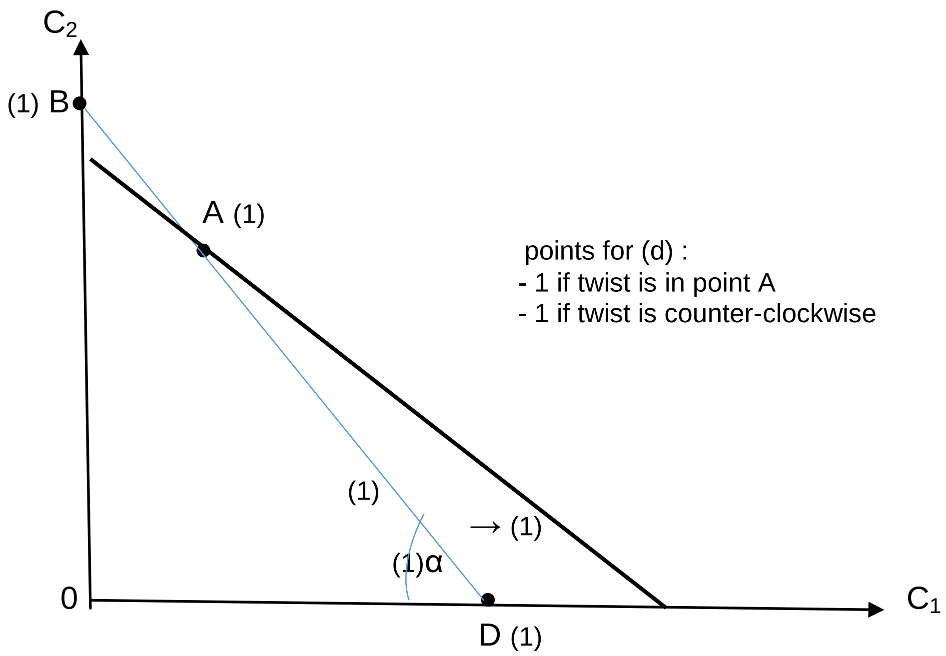
Problem 2: Representative Consumer in a Small Endowment Economy

We consider an economy with exogenous incomes ($Y_1<Y_2$) where the representative consumer has a two-period horizon. There is no initial international investment position ($B_1 = 0$). The individual has the following budget constraint.

$C_2=Y_2+(1+r)(Y_1-C_1)$

a) Please illustrate the budget constraint in C_2-C_1 space. [1 point]

Solution:



b) Please denote the following in the graph above:
- the endowment point as A
- the maximal future consumption point as B
- the maximal present consumption point as D
- the angle as α, where tan α = 1+r [4 points]

c) Calculate the slope of budget line. Interpret the slope! [4 points]

Solution: $\frac{dC_2}{dc_1} = -(1 + r)$

(0.5) (0.5)

Opportunity cost of C_1 in terms of C_2

(0.5) (0.5) (1) (1)

d) Assume the representative consumer consumes at the endowment point. Now the interest rate r falls. Illustrate the change (in the graph above) and calculate the effect on the second-period consumption (dC_2); show your calculation. [4 points]

Solution:

$$dC_2 = (Y_1 - C_1) \cdot dr = 0$$

(0.5) (0.5) (0.5) (0.5)

Problem 3:

Consider the following functions:

(I) $U_1 = \ln C_1 + ß \ln C_2 \quad , \quad ß = 1/(1+b)$

(II) $C_1 + \dfrac{C_2}{1 + r} = Y_1 + \dfrac{Y_2}{1 + r}$

a) Please briefly interpret function (I). [2 points]

Solution: intertemporal (or: life-time) utility
(1) (1)

b) What does the factor b in function (I) mean? How will the consumption preference of the representative individual change when b falls? [4 points]

Solution:

- Subjective interest rate
(1) (1)

- individual is more patient (or: C_2 generates more utility)
(1) (1)

c) Please give an economic interpretation of the left-hand side of equation (II). [2 points]

Solution: present value of life-time consumption
(1) (0.5) (0.5)

d) Derive the so-called Euler equation by using the Lagrange approach. [7 points]

Solution:

$$L \;=\; \ln C_1 \;+\; ß \ln C_2 \;+\; \lambda \left(Y_1 + \frac{Y_2}{1+r} - C_1 - \frac{C_2}{1+r} \right)$$

(0.5) (0.5) (0.5) (0.5) (0.5) (0.5)

$$\left.\begin{array}{l} \dfrac{\partial L}{\partial C_1} = \dfrac{1}{C_1} - \lambda = 0 \quad (1) \\[3ex] \dfrac{\partial L}{\partial C_2} = ß \, \dfrac{1}{C_2} - \lambda \dfrac{1}{1+r} = 0 \quad (1) \end{array}\right\} \begin{array}{l} C_2 = (1+r)\, ß \, C_1 \qquad (2) \\[2ex] \text{or: } \dfrac{1}{C_1} = (1+r)\, ß \, \dfrac{1}{C_2} \end{array}$$

e) In general terms, the Euler equation reads like this: $u'(C_1) = (1+r) ß\, u'(C_2)$.
Please interpret this equation. [3 points]

Solution:

marginal utility of consumption in period 1
(0.5) (0.5)

must be equal (0.5)

to marginal utility of consumption in period 2 multiplied by the interest rate factor
(0.5) (0.5) (0.5)

or: the marginal utility loss of savings in period 1

must be equal

to marginal utility gain of consumption in period 2

<u>or:</u> marginal rate of substitution must be equal to interest rate factor

Problem 4: Current Account Balance and the Interest Rate in a Two-Country Model with Exogenous Incomes

We consider a two-period model of two large open economies H and F that are linked by a perfect international capital market. The intertemporal Euler equation of the representative consumer in country z (z = H, F) is given by:

(I) $u'(C_1^z) = ß\,(1 + r)\, u'(C_1^z)$, where $u\,(C_i^z) = \ln C_i^z$, $i = 1, 2\ ;\ z = H, F$

Both countries face an exogenous time path of income Y_i^z , $i = 1, 2\ ;\ z = H, F$

(II) $B_{t+1}^z = (1 + r)\, B_t^z + Y_t^z - C_t^z$, $i = 1, 2\ ;\ z = H, F$

a) What does equation (II) describe? [3 points]

Solution: evolution of net international investment position
(1) (0.5) (0.5) (0.5) (0.5)

b) Is r in this situation endogenous or exogenous? Explain why! [5 points]

Solution:

- endogenous (1)

- both countries are large (2)

- their investment and savings decisions thus affect r (2)

(or: r emerges as an equilibrium price in the international capital market)

c) Derive B_2^z as a function of r. Assume that $B_1^z = B_3^z = 0$. [10 points]

Solution:

$$B_2^z = Y_1^z - C_1^z \quad \rightarrow \text{(III)} \quad C_1^z = Y_1^z - B_2^z \qquad (2)$$

$$B_3^z = 0 = (1+r)\,B_2^z + Y_2^z - C_2^z \quad \rightarrow \text{(IV)} \quad C_2^z = (1+r)\,B_2^z + Y_2^z \qquad (2)$$

Intertemporal Euler equation:

$$\text{(V)} \quad \frac{1}{C_1^z} = ß\,(1+r)\,\frac{1}{C_2^z} \qquad (2)$$

Insert (III) and (IV) into (V):

$$\frac{1}{Y_1^z - B_2^z} = ß\,(1+r)\,\frac{1}{(1+r)B_2^z + Y_2^z} \qquad (2)$$

$$Y_1^z - B_2^z = \frac{1}{ß\,(1+r)}\,[\,(1+r)\,B_2^z + Y_2^z\,]$$

$$Y_1^z - \frac{1}{ß\,(1+r)}\,Y_2^z = \left(1 + \frac{1}{ß}\right) B_2^z \qquad or: = \frac{ß+1}{ß}\,B_2^z$$

$$B_2^z = Y_1^z \frac{ß}{ß+1} - \frac{1}{(1+ß)(1+r)}\,Y_2^z \qquad \text{or:} \quad = \frac{1}{1+ß}\,[\,ß\,Y_1^z - \frac{Y_2^z}{1+r}\,] \qquad (2)$$