International macroeconomics (postgraduate course) 2014–2015 — Final exam

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Surnames: _____

First name: _____

ID or passport number: _____

Question	Points	Obtained
1	8	
2	8	
3	12	
4	8	
5	8	
Total	44	

Instructions

Please do not read the questions until the professor allows you to do so.

All five questions have to be answered. Each question has between 8 and 12 points, giving a **total of 44 points**.

Duration of the exam: **1.5 hours** (= 2 minutes per point).

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1. Consider the following maximization problem of a representative agent:

$$\max_{C_1} u(C_1) + \beta u(C_2), \tag{1}$$

subject to the intertemporal budget constraints:

$$Y_1 + (1+r)B_1 = C_1 + B_2, \tag{2}$$
$$Y_2 + (1+r)B_2 = C_2 + B_3. \tag{3}$$

(a) Derive the Euler equation. [3]

(b) Assume that $u(C) = \ln(C)$. Use the Euler equation you have just derived to show how C_1 and C_2 are related in this case? [2]

(c) Suppose that β rises and that Y_1 and Y_2 are given exogenously. How does this change consumption and the current account balance in period 1. Explain your answer briefly. [3]

Total of question 1: [8]

2. Consider the currency flow model and suppose that the real exchange rate depends solely on currency market pressure, $\tilde{m}_0$:

$$q_0 = \xi \tilde{m}_0. \tag{4}$$

(a) By stating the three components of currency market pressure, show how the central bank can prevent an appreciation of the real exchange rate when it faces strong capital inflows.   [2]

(b) Using the variables of the currency flow model, write down the sum of three components which make up the total money holdings of the domestic resident, denoted here as m_0^{HT} (= effective domestic money supply).   [2]

(c) It is often said that strong capital inflows are "sterilized" by the domestic central bank so as to avoid an increase of the effective money supply, m_0^{HT}. Based on your previous answer, what kind of intervention could "capital flow sterilization" refer to?   [2]

(d) Consider now the opposite situation where the home country faces strong capital *outflows*. Which two measures can the domestic central bank adopt to prevent a depreciation of the real exchange rate? Which kinds of limits does the central bank face with respect to each of the two measures?   [2]

Total of question 2: [8]

3. Consider the model of capital accumulation under uncertainty. The production function is:

$$\tilde{y} = Z_0 k_0^\alpha, \qquad 0 < \alpha < 1, \tag{5}$$

where the business conditions index, Z_0, follows a geometric Brownian motion process:

$$dZ_0 = \mu Z_0 dt + \zeta Z_0 d\omega. \tag{6}$$

For simplicity, let the price of capital, P_0, be constant and equal to one.

The business conditions index, Z_0, is supposed to depend positively on the demand for the country's output and on productivity and negatively on the cost of factors other than capital.

Capital is accumulated according to the following continuous-time stochastic differential equation:

$$dk_0 = (-\delta k_0 + k_1)dt, \tag{7}$$

where δ is the depreciation rate and $k_1 dt$ gross investment.

The value function is:

$$V(k_0, Z_0) = \max_{k_1} E\left(\int_0^\infty e^{-rt}(Z_0 k_0^\alpha - P_0 k_1)dt \right). \tag{8}$$

The corresponding Bellman equation is:

$$rV = \max_{k_1} \left\{ Z_0 k_0^\alpha - P_0 k_1 + E\left(\frac{dV}{dt} \right) \right\}. \tag{9}$$

(a) Using Ito's lemma, derive the stochastic differential dV (assuming that the time derivative of V is zero (that is, $V_t = 0$). [2]

(b) Take the expectation of dV, $E(dV)$, and divide it through dt. [1]

(c) When you plug your result from part b into equation (9), what is the resulting Bellman   [1]
equation?

(d) Derive the first-order condition with respect to k_1 and interpret it in economic terms (that   [2]
is, state its economic intuition).

(e) In class, we found that the optimal capital stock when investment is reversible, k_0^r, and   [2]
the optimal capital stock when investment is irreversible, k_0^i, are related as follows:

$$k_0^i = \left(\frac{\alpha Z_0}{r + \delta + B\zeta^2} \right)^{\frac{1}{1-\alpha}} < \left(\frac{\alpha Z_0}{r + \delta} \right)^{\frac{1}{1-\alpha}} = k_0^r. \tag{10}$$

What is the intuition behind this result?

(f) Now consider what happens if investment is irreversible and business conditions improve strongly for several years and then deteriorate similarly strongly in the subsequent years?

    i) How does this affect real investment? [1]

    ii) How does this affect the current account? [1]

    iii) How does this affect currency market pressure (ignoring the possible effects of cross-border capital flows)? [1]

    iv) Draw the evolution of currency market pressure with time on the horizontal axis and currency market pressure on the vertical axis (ignoring again the possible effects of cross-border capital flows)? [1]

Total of question 3: [12]

4. (a) Why is foreign investment in the domestic country always financial investment and never real, or physical, investment? [2]

(b) Why does the currency flow model not include the variable b_0^{HH}. [2]

(c) The performance of different stock market tends to be positively correlated. Why should we expect higher cross-country equity holdings if the returns of e_0^{HF} and e_0^{FH} are positively correlated than when they are negatively correlated. [2]

(d) If PPP holds, what is the nominal exchange rate, s_0, equal to? [2]

Total of question 4: [8]

5. (a) The currency flow model uses a theoretically structured balance of payments (BoP) iden- [2]
       tity that contains 10 variables in total. Write down this identity, making sure that you use
       the right subindices that we have used in the course to distinguish stock variables from
       flow variables.

   (b) There are three monetary variables in the BoP of the currency flow model. To which other [2]
       variables of the BoP of the currency flow model are each of them equal to?

   (c) On the following page, construct a table with two columns. In the left column, write [4]
       a detailed structure of a BoP as one can find it in the statistical publications of central
       banks and international institutions. In the right column, indicate the variables from the
       currency flow model that correspond to the balance and sub-balances of the left column.
       Should you find that a balance or sub-balance in the left column has no equivalent in the
       right column, please indicate this with an horizontal bar (—).

Total of question 5: [8]