UNIVERSITY OF OSLO
DEPARTMENT OF ECONOMICS

Exam: **ECON4330 – International Macroeconomics**

Date of exam: Friday, May 18, 2018   **Grades are given:**   June 8, 2018

Time for exam: 09.00 – 12.00 noon

The problem set covers 6 pages (incl. cover sheet)

Resources allowed:
- No written or printed resources – or calculator - is allowed (except if you have been granted use of a dictionary from the Faculty of Social Sciences)

The grades given: A-F, with A as the best and E as the weakest passing grade. F is fail.

EXAM

ECON 4330

1 Uncertainty & International Financial Markets

Consider a world consisting of two endowment economies, home and foreign, that exist for two periods and whose output is Y_1 and Y_1^* in period one. A $*$ indicates the foreign country. In period two, the countries face uncertain output equal to $Y_2(s)$ and $Y_2^*(s)$, respectively, in states $s = 1, .., S$ which occur with probability $\pi(s)$. The countries can trade state-contingent Arrow-Debreu securities (ADSs) for all states $s \in S$.

- $p(s)/(1+r)$ is the price of an ADS in terms of period-one consumption

- $1+r$ is the price of sure period-two consumption in units of period-one consumption

- $B_2(s), B_2^*(s)$ denote the countries' net purchases of ADSs for state s

- C_1, C_1^* denote consumption in period one

- $C_2(s), C_2^*(s)$ denote consumption in period 2 state s

The utility of the representative agent is

$$U_1 = u(C_1) + \beta \sum_s \pi(s) u(C_2(s)) \qquad (1)$$

for the home country and

$$U_1^* = u(C_1^*) + \beta \sum_s \pi(s) u(C_2^*(s)) \qquad (2)$$

in the foreign country.

- β measures the agents' patience

1. Explain why the risk-free bond market is redundant given that there exists an ADS for every state and provide intuition for the no-arbitrage condition $\sum_{s=1}^{S} p(s) = 1$.

2. Write down the budget constraint for period one and for state s in period two for the home country, derive the lifetime budget constraint, and explain.

3. Set up the maximization problem of the representative agent in the home country. Derive and interpret the first-order condition for $B(s)$ (you can assume that $C_2(s) \geq 0 \ \forall \ s$ always holds in equilibrium).

Let's assume that the per-period utility functions in (1) and (2) are CRRA. The first-order condition for optimal choices of $B(s)$ and $B^*(s)$ are then given by

$$C_2(s) = \left(\frac{\pi(s)\beta(1+r)}{p(s)}\right)^{\frac{1}{\rho}} C_1 \quad \text{and} \quad C_2^*(s) = \left(\frac{\pi(s)\beta(1+r)}{p(s)}\right)^{\frac{1}{\rho}} C_1^*, \qquad (3)$$

respectively, where $\rho > 0$ is the coefficient of relative risk aversion.

4. Derive the equilibrium price of an ADS for state s, $\frac{p(s)}{1+r}$, in terms of world output Y_1^W and $Y_2^W(s)$ from the first-order conditions in (3) and the world market clearing conditions $Y_1^W = Y_1 + Y_1^* = C_1 + C_1^*$ and $Y_2^W(s) = Y_2(s) + Y_2^*(s) = C_2(s) + C_2^*(s)$.

5. Explain what determines the price of an ADS using your solution to question 4. [In case you couldn't solve question 4, provide an intuitive explanation.]

6. Show that equilibrium consumption levels observe

$$\frac{C_2(s)}{C_1} = \frac{C_2^*(s)}{C_1^*} = \frac{Y_2^W(s)}{Y_1^W}$$

and interpret. Why does national output not determine a country's relative consumption across states?

7. What empirical observation has become known as the *consumption growth correlation puzzle*? In view of the result from question 6, why is it a puzzle?

8. What is the *equity home bias puzzle* and how is it related to the consumption growth correlation puzzle? How can we rationalize that both puzzles have become less severe over time and appear to be less pronounced for developed countries?

2 Real exchange rates

Consider the model with tradable and non-tradable goods. There are two sectors producing traded and non-traded goods.

1. Output in the two sectors are (subscripts T and N is for traded and non-traded):

$$Y_T = A_T K_T^\gamma L_T^{1-\gamma} \tag{4}$$

$$Y_N = A_N K_N^\alpha L_N^{1-\alpha} \tag{5}$$

Capital can be rented at an international market at price r and labor is mobile between sectors at home. The price of the non-traded good is p. The traded good is the numeraire.

(a) Set up the maximization problems and find the first order conditions of the firms optimization problem in the two sectors. Use capital intensities, $k_T = \frac{K_T}{L_T}$ and $k_N = \frac{K_N}{L_N}$, in the conditions.

(b) Solve for the wage rate in the traded sector. How does it depend on the world interest rate?

(c) Solve for the price of the non-traded good, p.

Let the real exchange rate be defined as $Q = \frac{EP^*}{P}$ and the price index as $P = (1)^\lambda p^{1-\lambda}$, where λ is the weight on traded good in the index. Assume $E = 1$(Euro?) and $P^* = 1$

(d) Assume A_T increases. What happens to the real exchange rate Q and to the wage w (wage is in terms of the numeraire)?

Suppose now that a politician suggests to fix the price p in the non-tradable sector to help the poor as those rely on cheap non-tradable goods. Therefore we fix p now (at the value computed above in question c) and we assume again that A_T increases.

(e) What happens to the wage w (wage is again in terms of the numeraire)? Is it the same in both sectors?

(f) Calculate the profits of firms in the non-tradable sector. HINT: Negative profits means that the firm has to go out of business.

(g) How much capital and how much labor is hired in the non-tradable sector? How much capital and how much labor is hired in the tradable sector?

(h) Comment on whether this policy suggestion helps those who rely on non-tradable goods.

3   Norway

Norway is a country with a high price level and has become rich as an oil exporter. Is there an connection between these two facts? Present the elements of a theory that accounts for these two facts. What are the implications for the real exchange rate of Norway?