

UNIVERSITY OF OSLO
DEPARTMENT OF ECONOMICS

Exam: **ECON4330 – International Macroeconomics**

Date of exam: Friday, May 26, 2017

Grades are given: June 14, 2017

Time for exam: 9.00 a.m. – 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.

1 Foreign exchange market

Consider a world with two currencies, kroner and dollars. The table below shows the balance sheets. B_i is holding of NOK assets, F_i is holdings of dollar assets. The subscripts are g for the Norwegian government, p for the Norwegian private investor and p^* for the foreign private investor. The domestic government is the consolidated government and central bank sector and is a net borrower. The last two lines are equal, this equality defines the net assets (or wealth) of the three sectors measured in their respective currencies. (If this helps, you may think of the initial price levels as being equal to one).

Assets	Domestic		Foreign
	Govern.	Private	Private
Kroner	B_g	B_p	B_{p^*}
Dollars	F_g	F_p	F_{p^*}
Sum	$B_g + EF_g$	$B_p + EF_p$	$B_{p^*} + EF_{p^*}$
Sum	W_g	W_p	EW_{p^*}

Consider a period which is too short for new savings to add significantly

to the stock of wealth. The only thing the agents can do then is to change one currency for another within the constraint that

$$B_i + EF_i = B_i^0 + EF_i^0 \quad (1)$$

for all sectors i .

1. Write down the equilibrium condition in the foreign exchange market.
2. Explain how the domestic central bank choose B_g and F_g when following respectively:
 - (a) A fixed exchange rate regime ($E = \bar{E}$)
 - (b) A floating exchange rate regime

Private investors act to maximize real return adjusted for risk. Specifically they have preferences given by:

$$E(\pi_i) - \frac{1}{2}R_iVar(\pi_i)$$

where the relevant factors are:

i, i^* = domestic and foreign interests rate

e = rate of depreciation of NOK

p_i = inflation rate

Inflation and the rate of depreciation is stochastic with expectations μ_e and μ_{p_i} , variances σ_{ee} and $\sigma_{p_i p_i}$ and covariance σ_{ep_i} Domestic investors have profits given by:

$$\pi = (1 - f)i + f(i^* + e) - p$$

and optimize with respect to the share of assets held in the foreign currency,
 $f = EF_p/W_p$.

In case you need it: If x and y are two stochastic variables, then

$$Var(ax + by) = a^2Var(x) + b^2Var(y) + 2abCov(x, y)$$

3. Solve the domestic investors problem and find F_p .

Foreign investors solve the symmetric problem of finding the share they hold in NOK, b . Their profits is given by:

$$\pi^* = (1 - b)i^* + b(i - e) - p^*$$

4. Solve the foreign investors problem and find F_p^* .

You can assume that both f and b is between zero and one.

5. Assume the central bank is running a floating exchange rate regime and is keeping F_g fixed. Solve for the equilibrium exchange rate E . How does it depend on F_g ?

The Norwegian government now chooses to implement Quantitative easing. One effect of this is that wealth is shifted from the government to private investors. Specifically initial private holdings of NOK bonds change to $B_p^0 + \Delta$ and government holdings change to $B_g - \Delta$.

6. Analyze the effects this policy has on E , F_p and F_p^* . (You can assume the policy does not affect the future distribution of prices and depreciation rates)

2 Real exchange rates

Consider the text-book 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 are for traded and non-traded):

$$Y_T = A_T K_T^\gamma L_T^{1-\gamma} \quad (2)$$

$$Y_N = A_N K_N^\alpha L_N^{1-\alpha} \quad (3)$$

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 (it is still measured 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 a 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?