Problemset 8

International Macroeconomics (Master)

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Traded and non-traded goods

Consider the static model with traded and non-traded goods. Preferences of the representative agent are characterised by the following utility function

$$U(C_N, C_T) = \left[\gamma^{\frac{1}{\theta}} C_N^{\frac{\theta-1}{\theta}} + (1-\gamma)^{\frac{1}{\theta}} C_T^{\frac{\theta-1}{\theta}}\right]^{\frac{\theta}{\theta-1}}$$

where C_N denotes consumption of the non-tradable good and C_T denotes consumption of the tradable good, $\theta > 0$, and $\gamma \in (0,1)$. The budget constraint is given by

$$C_T + \frac{P_N}{P_T} C_N = rB_0 + Y_T + \frac{P_N}{P_T} Y_N - CA$$

with P_N and P_T denoting the price of the non-tradable good Y_N and the tradable good Y_T respectively. CA denotes the current account and B_0 is a given stock of foreign assets, r is the interest rate.

Exercise 1:

Derive and interpret

$$\theta = -\frac{\mathrm{d}\log\left(\frac{C_T}{C_N}\right)}{\mathrm{d}\log\left(\frac{P_T}{P_N}\right)}$$

Exercise 2:

(a) Suppose that the home price index P is constructed as follows

$$P = \phi\left(P_N, P_T\right)$$

where the function $\phi(\cdot)$ is increasing in P_T and P_N and homogeneous of degree one.[1] Analogously, the foreign price index $P^\star$ is defined as

$$P^\star = \phi\left(P_N^\star, P_T^\star\right).$$

Assume that the law of one price holds for the tradable goods sector and show that $\frac{P_N}{P_T}$ determines the real exchange rate. Ceteris paribus, why does a drop in $\frac{P_N}{P_T}$ correspond to a real exchange rate depreciation?

(b) What is the price index P and the real exchange rate λ in the setup at hand?

[1] A function is homogeneous of degree one if $\lambda f(x,y) = f(\lambda x, \lambda y)$.

Exercise 3:

Assume the following parametrisation of the model:

Variable	Description	Value
α	labour elasticity	0.6
γ	relative weight of non-tradables	0.75
θ	intratemporal elasticity of substitution	1
$\frac{B_0}{Y}$	relative stock of foreign bonds	-20.4 %
$\frac{CA}{Y}$	relative current account	-6.4 %
r	interest rate	6 %

Case I: Endowment Economy

Consider an endowment economy with fixed Y_T, Y_N, and $\frac{Y_N}{Y} = 2/3$. The country's present current account deficit relative to its GDP is -6.4 %.

(a) Show that optimal consumer behavior implies

$$\frac{C_T}{C_N} = \frac{1-\gamma}{\gamma}\left(\frac{P_N}{P_T}\right)^{\theta}$$

Use a (C_T, C_N)- diagram to illustrate this economy.

(b) What is the price ratio of non-tradables to tradables associated with the relative current account deficit of -6.4 %?

(c) Calculate the optimal relative demand, $\frac{C_T}{C_N}$, associated with the relative current account deficit of -6.4 %.

(d) How must the price ratio of non-tradables to tradables change in order to close the current account deficit, i.e. $\frac{CA}{Y} = 0$? What happens to the real exchange rate? Illustrate the adjustment in a (C_T, C_N)- diagram.

(e) Calculate the optimal relative demand, $\frac{C_T}{C_N}$, associated with a zero current account.

(f) Relying on your findings from (b) and (d), by how many percent must the real exchange rate *ceteris paribus* appreciate or depreciate in order to close the current account deficit?

Case II: Production Economy

Now consider a production economy with $Y_T = A_T L_T^{\alpha}$ and $Y_N = A_N L_N^{\alpha}$. Labour is mobile between the two sectors. As a point of departure, consider again a relative current account deficit of -6.4 %.

(a) Derive the PPF and provide a graphical illustration of the economy described above.

(b) Show that optimal firm behaviour implies

$$\frac{P_N}{P_T} = \frac{\frac{Y_T}{L_T}}{\frac{Y_N}{L_N}}$$

(c) Calculate the relative total factor productivity $\frac{A_T}{A_N}$ associated with the relative current account deficit of -6.4 % at the production point $\frac{Y_N}{Y} = 2/3$.

(d) Compute the price ratio of non-tradables to tradables and the optimal relative demand, $\frac{C_T}{C_N}$, associated with a zero primary current account position. Calculate the relative change of the price ratio of non-tradables to tradables which is required to close the primary current account deficit. Illustrate the adjustment in a (C_T, C_N)-diagram.