An Economy With Tradables and Non-Tradable Goods

Consider a two-period, small, open economy. In period 1, households receive an endowment of 6 units of tradable goods and 9 units of nontraded goods. In period 2, households receive 13.2 units of tradables and 9 units of nontradables ($Q^T_1 = 6, Q^T_2 = 13.2$, and $Q^N_1 = Q^N_2 = 9$). Households start period 1 with no assets or liabilities ($B_0^* = 0$). The country enjoys free access to world financial markets, where the prevailing interest rate is 10 percent ($r^* = 0.1$). Suppose that the household’s preferences are defined over consumption of tradable and nontradable goods in periods 1 and 2, and are described by the following utility function,

$$\ln C^T_1 + \ln C^N_1 + \ln C^T_2 + \ln C^N_2,$$

where $C^T_i$ and $C^N_i$ denote, respectively, consumption of tradables and nontradables in period $i = 1, 2$. Let $p_1$ and $p_2$ denote the relative prices of nontradables in terms of tradables in periods 1 and 2, respectively.

1. Write down the budget constraints of the household in periods 1 and 2.

2. Derive the household’s intertemporal budget constraint. Assign this expression the number (1).

3. The household chooses consumption of tradables and nontradables in periods 1 and 2 to maximize its lifetime utility function subject to its intertemporal budget constraint. Find the optimality conditions associated with this problem. To this end, begin by solving (1) for $C^T_1$ and use the resulting expression to eliminate $C^T_1$ from the lifetime utility function. Derive the resulting lifetime utility with respect to $C^N_1$, $C^T_2$, and $C^N_2$, and assign the resulting expressions the numbers (2), (3), and (4), respectively. Express (2), (3), and (4) in terms of (a subset) of $C^T_1$, $C^N_1$, $C^T_2$, and $C^N_2$.

4. Write down the market clearing conditions in the nontraded goods market in periods 1 and 2.

5. Use these market clearing conditions to eliminate $C^N_1$, $C^N_2$, $Q^N_1$, $Q^N_2$, $p_1$, and $p_2$ from the intertemporal budget constraint (1). Assign the number (5) to the resulting intertemporal resource constraint.

6. Now solve (3) and (5) for $C^T_1$ and $C^T_2$ as functions of only $Q^T_1$, $Q^T_2$, and $r^*$.

7. Calculate the net foreign asset position of the economy at the end of period 1, $B^*_1$. 

8. Continuing, write down the rest of the solution.
8. Compute for period 1 the equilibrium levels of the current account balance and the relative price of nontradables in terms of tradables.

9. Calculate for period 2 the equilibrium levels of the current account balance and the relative price of nontradables in terms of tradables. Explain intuitively why the relative price of nontradables changes over time.

10. Assume that the domestic consumer price index in period \( t = 1, 2 \), denoted \( P_t \), is defined by \( P_t = \sqrt{P_t^T P_t^N} \), where \( P_t^T \) and \( P_t^N \) denote the nominal prices of tradables and nontradables in period \( t = 1, 2 \), respectively. Similarly, suppose that the foreign consumer price index is given by \( P_t^* = \sqrt{P_t^{T*} P_t^{N*}} \), where the superscript * denotes foreign variables. Foreign nominal prices are expressed in terms of foreign currency. Assume that PPP holds for tradable goods. Finally, suppose that the foreign relative price of nontradables in terms of tradables equals unity in both periods. Compute the real exchange rate in periods 1 and 2.

11. **An External Crisis:** Let us sketch a scenario like the one that took place during the Argentine debt crisis of 2001 by assuming that because of fears that the country will not repay its debts in period 2, foreign lenders refuse to extend loans to the domestic economy in period 1. Answer the questions in items 7 through 10 under these new (adverse) circumstances. Compute the equilibrium interest rate. Provide an intuitive explanation of your results.

12. Compute real GDP in period 1 under the crisis and no-crisis scenarios. Consider two alternative measures of real GDP: GDP measured in terms of tradable goods and GDP measured in terms of the basket of goods whose price is the consumer price index \( P_1 \). What measure is more economically sensible? Why?

13. **Crisis Relief Policy:** Suppose the Inter American Development Bank (IADB) decided to implement a transfer (gift) to Argentina to ameliorate the effects of the external crisis. Specifically, suppose that the IADB gives Argentina a transfer of \( F \) units of tradable goods in period 1. Use the utility function given above to compute the size of \( F \) that would make Argentineans as happy as in the no-crisis scenario. Express \( F \) as a percentage of the country’s crisis/no-aid GDP in period 1.