

Covid-19 Real Exchange Rates

Consider the model with tradable and non-tradable goods as in class but with two modifications. There is no capital and the production function in the non-tradable sector has decreasing returns to scale. To remind you: The country produces Y_T tradables and Y_N nontradables. Tradables can be imported and exported without any costs, while nontradables are impossible to export/import. Labor is mobile across sectors, but not across countries. The tradable good is the numeraire. p is the relative price of nontradables. w is the wage rate. Output is assumed to be given by two production functions:

$$Y_T = A_T L_T \quad (1)$$

$$Y_N = A_N L_N^\xi, \quad (2)$$

where L_T and L_N are labor inputs into the tradable sector and non-tradable sector respectively and $0 < \xi < 1$. We assume a representative agent who chooses consumption C_T and C_N to maximize utility, for $0 < \epsilon < 1$,

$$C_T^\epsilon C_N^{1-\epsilon}$$

subject to the budget constraint $C_T + pC_N = wL + \Pi$, where L is inelastically supplied labor and Π are profits. In equilibrium $L = L_T + L_N$.

Now assume that (I know it is a crazy assumption) that a pandemic (aka as Corona virus) hits the home country (and only the home country) so that the productivity of non-tradables is reduced to $A_N\theta$ with $\theta < 1$.

1. Derive the real exchange rate before and during the pandemic.
2. Now assume that the foreign country is also hit by the virus and productivity of non-tradables is reduced from A_N^* to $A_N^*\theta^*$. Derive the real exchange rate before and during the pandemic. Denote foreign variables by $*$.

Important: You have to explain your results. Just writing down equations without clear, short and sensible explanations is **not** sufficient.

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Guidelines: Explain in your own words. Do not simply copy paste formulas or text from the lecture notes/books. You can include formulas, but you have to explain them in words with the goal to convince the reader that you have 100% understood what the formula means. You do not have to write down the definition of the variables in an equation as long as you are using the notation from the corresponding lecture notes/book chapters.

Equilibrium in the foreign exchange (forex) market

1. Explain what “uncovered interest rate parity” means and how it is related to capital mobility.
2. Consider the equilibrium in the forex market $F_g = S(E) = -F_p(E) - F_*(E)$ and assume that the supply curve is well behaved. Show graphically how we find the
 - (a) new E if the CB adjusts F_g under the floating exchange rate regime.
 - (b) new F_g if the CB devalues the domestic currency under the fixed exchange rate regime.
 - (c) new E if there is a shock to the supply curve which leads the public to suddenly demand less \$ under the floating exchange rate regime.

Explain in a few words what your graphs a)-c) are showing. Make sure to label axes and curves.

Uncertainty, global risk sharing, and non-traded goods

3. Consider a world consisting of two small open economies, indexed by $h = H, F$, producing two goods, $g = T, N$. Good T can be traded, good N is non-tradeable. There are two periods and in period two there are two states of nature ($s = 1, 2$) occurring with probability $\pi(s)$. In country h , output (consumption) of good $g = T, N$ in period one is $Y_{g,1}^h$ ($C_{g,1}^h$) and in period two state s it is $Y_{g,2}^h(s)$ ($C_{g,2}^h(s)$). The traded good is the numéraire. The price of the non-traded good is $p_{N,1}^h$ ($p_{N,2}^h(s)$) in period one (period two state s).

There are Arrow Debreu securities (ADSs) that pay out one unit of the *tradable* good in either state s . The price of such an ADS for state s is $p(s)/(1+r)$.

- (a) Write down country H 's intertemporal budget constraint and explain its components. [hint: To that end it is useful to express output and consumption values in the different periods and states in units of the traded good in period one.]
- (b) Expected lifetime utility of a representative agent from country h is

$$U = u(C_{T,1}^h, C_{N,1}^h) + \beta \sum_{s=1}^2 \pi(s) u(C_{T,2}^h(s), C_{N,2}^h(s)) \quad \text{with } u'() > 0, u''() < 0.$$

Write down the maximization problem of the representative agent from country H .

- (c) Derive and explain the first-order conditions for country H that guide
- i. optimal relative consumption of the two goods in period one
 - ii. optimal relative consumption of the traded good across states 1 and 2 in period 2.
- (d) Suppose the countries are in complete autarky. What will be the price of an ADS for state 1 in country H ?
- (e) Under what conditions will the ADS for state 1 be more expensive in country H than in country F under autarky? [Hint: multiple combinations of output levels across states and goods imply this result. Find and describe one of them.]