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Econ421: International Finance
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Problem Set #6: Purchasing Power Parity

1. **Problems from the textbook**

   Solve problems 4, and 6 in chapter 15 p. 401 (7th edition), pp. 426-427 (6th edition).

2. **Exchange rate overshooting. Again...**

   In this exercise you are asked to show that the overshooting result is extended to a case where money is constantly growing. Under these conditions the exchange rate is constantly depreciating (assuming $R > R^*$) and therefore it does not converge to a constant level, instead it converges to a trend.

   It should be stressed that the analysis below assumes sticky prices and therefore combines both short run and long run effects. This is in contrast to Handout 6 which only discussed the long run.

The environment

The monetary authorities in both countries control their nominal money supply. Their policy is to let M and M^* grow at constant rates, μ and μ^* respectively. For simplicity we will assume that $\mu^* = 0$ (and $\mu > 0$), therefore:

$$M_t = (1 + \mu)\cdot M_{t-1}$$
$$M^*_t = M^*_{t-1}$$

Assume that initially the home and foreign economies are in their long run equilibrium. Specifically we assume that in the long run:

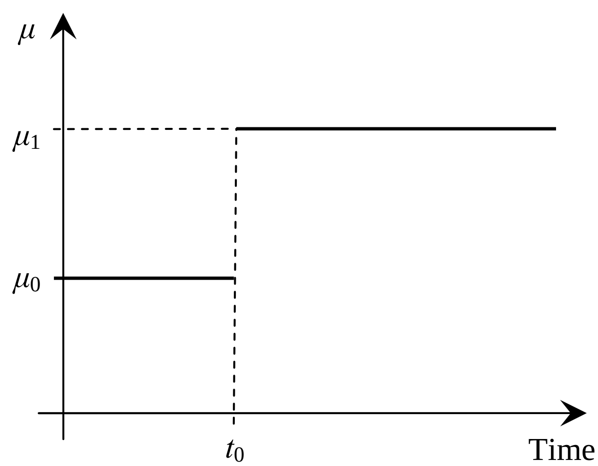
- Inflation in each country is equal to money growth rate: $\pi = \mu > 0$, $\pi^* = \mu^* = 0$
- Absolute PPP holds (up to a constant): $P = \lambda\cdot EP^*$

Notice that this version of absolute PPP is a weaker requirement than the one we saw in Handout 6; there we imposed $\lambda = 1$. In fact, this version is equivalent to relative PPP:

$$\varepsilon = \pi - \pi^* = \pi$$

Suppose that at time t_0 the monetary authority in the home country unexpectedly increases μ, from μ_0 to μ_1 ($\mu_1 > \mu_0$). The time path of μ is depicted below.

Figure 1: The Time Path of Money Growth Rate (μ)



In what follows, you are asked to analyze the time path of all relevant variables.

(a) Does M jump on impact? Draw the time path of log(M).

(b) The long run equilibrium:

i. What is the long run inflation rate (π_1)? What assumption allows you to pin it down?

ii. What is the new long run depreciation rate (actual and expected, i.e. ε_1 and $\varepsilon^e{}_1$)? What equation allows you to pin it down?

iii. What is the new long run home interest rate (R_1)? Express R_1 in terms of R_0, μ_0, and μ_1. What equation allows you to pin it down?

iv. What happens to real money balances (M/P) in the long run? Why?

v. Start drawing six diagrams for the time paths of π, ε, R, M/P, log(P), and log(E). In these diagrams depict the time paths according to the initial equilibrium (before t_0), and the time paths according to the new long run equilibrium. Leave a space for the transition path between the lines of the initial equilibrium and the new long run equilibrium.

Notice that for the price level and the exchange rate (in logs), you have only pinned down the slopes, not the levels. Hence depict three lines for the new long run equilibrium: one trend line that goes through the levels of P and E before the shock, one line that goes above it, and one that goes below it. Later we will decide which one is consistent with the new equilibrium.

(c) On impact and the transition:

In what follows some variables may jump on impact, however, assume that after t_0 they converge monotonically to their long run values (or trends).

i. P cannot jump since we assume that prices are sticky. Does M/P jump on impact? What is the transition path of M/P? Complete the diagram for real money balances.

ii. Given your answer to i; on impact, what happens to the growth rate of P (i.e. π) is it greater or smaller than μ_1? Complete the diagram for π.

iii. Given your answer to ii, complete the diagram for log(P).

iv. Given your answer to i, analyze the behavior of R. What equation (or diagram) do you use? Complete the diagram for R.

v. Given your answer to iv, analyze the behavior of ε. What equation do you use? Complete the diagram for ε.

(d) The exchange rate:

Recall our assumption about absolute PPP: $P = \lambda \cdot EP^*$

This relationship holds in the long run; that is, before t_0 and after the transition is complete. Assume that at time T the economies are in their new long run equilibrium (T is very large).

i. What is the relationship between P_T / P_{0^-} and E_T / E_{0^-} ? Where P_{0^-} and E_{0^-} are the values an instant before the shock. Also, recall that λ and P^* do not change over time.

ii. Given your conclusions about π and ε in part (c), which variable grew faster between t_0 and T, the exchange rate (E) or the price level (P)?

iii. How can you reconcile the contradiction between your answers to parts i. and ii.? What happens to the exchange rate on impact?

iv. Given your answer to iii. and the behavior of ε, complete the diagram for $\log(E)$.