

PROBLEM SET 2 - EXCHANGE RATES  
(Due February 21)

1. (25 points). This question is based on the monetary model of exchange rates. Equilibrium in the domestic and foreign money markets is given by (with all variables in logs, except the interest rate).

$$\begin{aligned}m_t - p_t &= \phi y_t - \lambda i_t \\m_t^* - p_t^* &= \phi y_t^* - \lambda i_t^*\end{aligned}$$

where  $\phi$  is the income elasticity of money demand and  $\lambda$  is the interest rate semi-elasticity of money demand. Money demand parameters are identical across countries.

International capital market equilibrium is given by uncovered interest parity:

$$i_t - i_t^* = E_t s_{t+1} - s_t$$

where  $E_t s_{t+1}$  is the expectation at time- $t$  of the exchange rate in period  $t + 1$ .

Price levels and the exchange rate are related through purchasing-power parity:

$$s_t = p_t - p_t^*$$

Define  $f_t = (m_t - m_t^*) - \phi(y_t - y_t^*)$  as the economic fundamentals.

- (a) Derive a first-order stochastic difference equation for the equilibrium exchange rate,  $s_t$ .
- (b) Find the fundamentals (no bubbles) solution. What is the condition for this solution to hold?
- (c) Consider the effect of an unanticipated announcement at date  $t = 0$  that the money supply is going to permanently rise on a future date  $T$ , i.e.,  $f_t = \bar{f}$  when  $t < T$ , and then  $f_t = \bar{f} + \Delta$  for  $t \geq T$ . Derive the path of exchange rate and show the path in a graph.
- (d) Suppose that the fundamentals are governed by a stationary  $AR(1)$  process,  $f_t = \rho f_{t-1} + \epsilon_t$ , where  $\epsilon_t$  is an i.i.d. shock. Show and discuss how the persistence of fundamentals affect the volatility of the exchange rate.
2. (25 points). Collect quarterly (3-month) data on interest rates and the nominal exchange rate for the USA and Canada, going back as far as possible (but not before 1973). Both interest rates and the exchange rate should be sampled at the end-of-the-period (not averaged). Interest rates for both countries should be on government Treasury Bills. (I can provide the data if you are having trouble finding it).
- (a) Plot the data, and comment on any interesting features or time periods.
- (b) Test Uncovered Interest Parity by regressing changes in the log exchange rate on the (lagged) interest rate differential. Test the hypothesis that UIP holds.
- (c) If you reject, briefly discuss a couple of possible explanations.