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Advanced Studies in International Economic Policy Research
Spring 2005

Problem Set 4 Answers
Exchange Rate Economics

1. Portfolio Balance model. Suppose the risk premium on US$ denominated assets is given by:

$$rp = -\beta^{-1}\alpha + \beta^{-1}x$$

where *x* is the share of US$ denominated assets in the world (assume there are only two currencies, the US$ and the euro).

1.1 In the context of this model, what do you think will happen if one's assessment of *future* US Government budget deficits goes up?

Answer: Rearranging, and letting the lowercase letters denote the logs of the uppercase:

$$s_t = \left(\frac{1}{1+\beta}\right)[(b_t - f_t) - \alpha - \beta(i_t - i_t^*) + \beta s^e_{t+1}] \quad (22)$$

Notice that the expression for the current value of the exchange rate depends upon the expected future value of the exchange rate.

$$s^e_{t+1} = \left(\frac{1}{1+\beta}\right)[(b^e_t - f^e_t) - \alpha - \beta(i^e_t - i^{e*}_t) + \beta s^e_{t+2}] \quad (23)$$

Substituting (23) into (22) yields:

$$\begin{aligned} s_t = {} & \gamma[(b_t - f_t) - \alpha - \beta(i_t - i_t^*) \\ & + \beta\gamma[(b^e_t - f^e_t) - \alpha - \beta(i^e_{t+1} - i^e_{t+1}) + \beta s^e_{t+2}] \end{aligned} \quad (24)$$

Hence, it is clear that not only next period's expected bond supplies (and interest rates) determine the current exchange rate, but indeed the entire path of expected bond supplies and interest rates into the infinite future. Since bond supplies are determined by budget deficits (and the conduct of monetary policy), future budget deficits obviously determine the current exchange rate in this model.

1.2 If the variance of relative returns on the two assets rises, *in US$ terms*, what do you think is the quantitative magnitude of the effect you indicate in your answer to question 1.1?

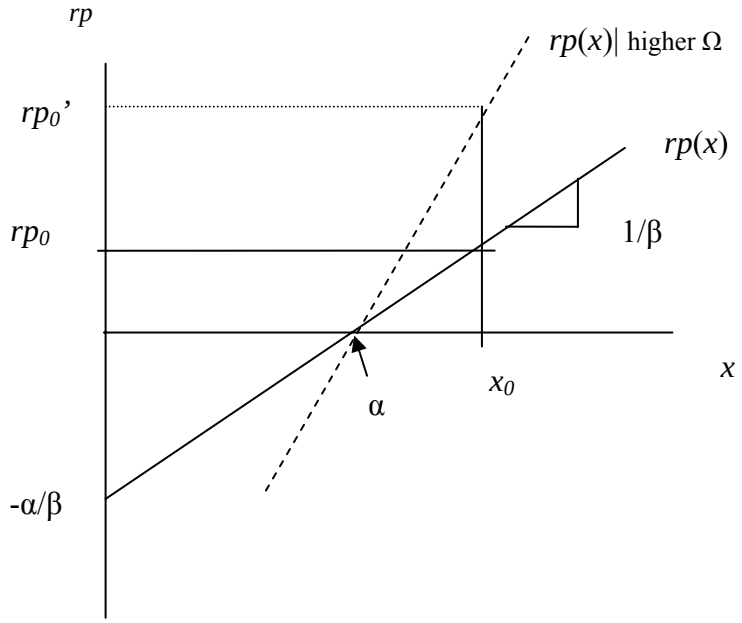
Recall the ad hoc expression for the determinations of the exchange risk premium:

$$rp = -\beta^{-1}\alpha + \beta^{-1}x$$

Is consistent with mean-variance optimization, where:

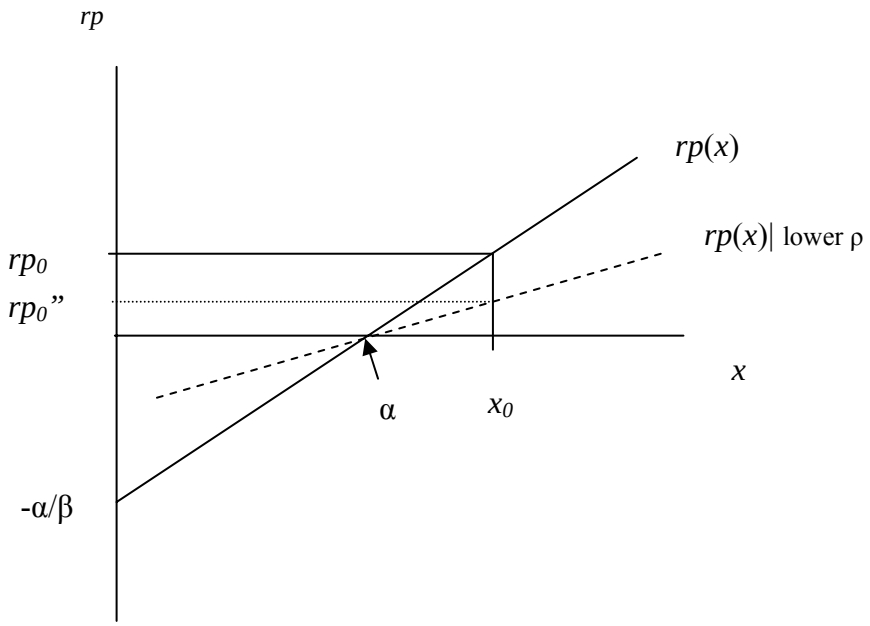
$$\alpha = -\Omega^{-1}\,\mathrm{cov}[rp, (i^* + \Delta s^e)]$$
$$\beta = (\rho\Omega)^{-1}$$

where in turn Ω is the variance of relative returns. Hence, a an increase in the variance of relative returns means that Ω rises, and β (= $[\rho\Omega]^{-1}$) decreases. Consequently, the slope of the *rp* (= 1/β) line increases, and the effect of an increase in x causes a larger increase in the risk premium than in the original situation.



1.3 If the coefficient of relative risk aversion were to decline, what would happen to the slope of the rp curve?

Using the same reasoning as before, the slope would decline.



2. Salt Water versus Fresh Water. "The correlation between the nominal and real exchange rate proves that price levels are sticky." Discuss, in relation to at least two theoretical models. Equations may be helpful.

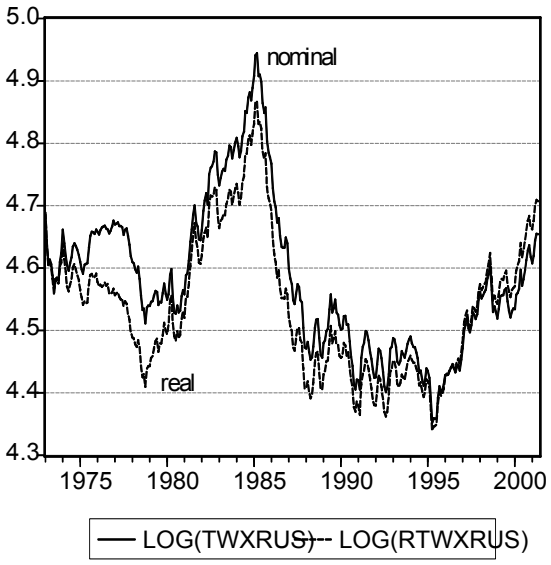


Figure 12: Log US trade weighted value of the dollar (against maior currencies).

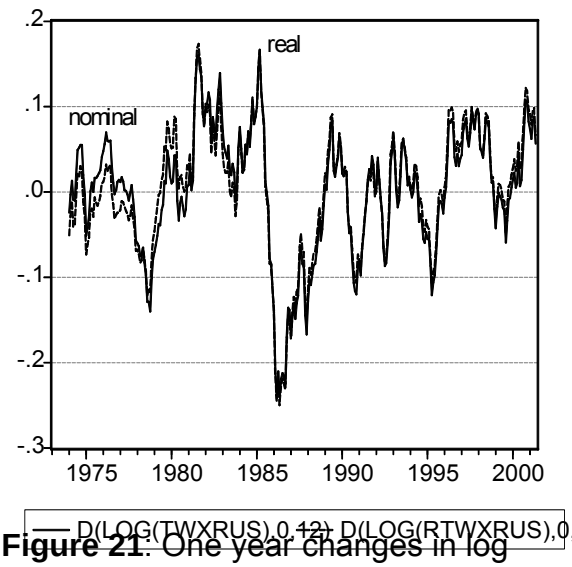


Figure 21: One year changes in log trade weighted value of the dollar.

ANSWER: The high covariation between the nominal and real exchange rate can arise for (at least) two reasons: (i) monetary shocks in the presence of sticky nominal prices or (ii) real shocks in the context of perfect price flexibility. Consider first the following identity:

$$s \equiv p - p^* + q$$
$$\text{where } q \equiv s - p + p^* \qquad (25)$$

If p and p^* are fixed in the very short run, but the common currency relative price, q, is not, then definitionally s and q will covary. This sticky price assumption is common in the Dornbusch (1976) and Frankel (1979) models.

On the other hand, consider the Stockman model:

$$e = \frac{M^s \alpha^* y^s}{M^{s*} \alpha x^s} \pi_y$$

In this case, the exchange rate e can move because of money shocks or real shocks, via π_y. If real shocks are large relative to the nominal shocks (here shocks to M and M^*), then e will tend to covary with π_y . But π_y is the real exchange rate, although it is assumed that the home country and the foreign produce different goods.

3. Consider the basic Stockman model of the exchange rate, where money demand depends upon income, but preferences are homothetic. Initial wealth is equal across the two countries. Use equations in your answers.

3.1 What happens to the nominal exchange rate in response to an increase in the foreign money stock? What about the real exchange rate?

Consider the basic equation in the Stockman paper:

$$e = \frac{M^s \alpha^* y^s}{M^{s*} \alpha x^s} \pi_y$$

An increase in the foreign money stock M^{s*} will cause e to fall, i.e., the home currency to appreciate. However, the real exchange rate π_y will remain constant. That is because money is a veil, and does not affect real variables in this model by virtue of perfect price flexibility.

3.2 Suppose domestic money demand exogenously increases; what happens to the real exchange rate.

This causes α to rise, and hence *e* to fall, i.e., to appreciate. Once again the real rate remains unchanged.

3.3 Consider an increase in endowment of good *y* in the UK. What must be true for a nominal appreciation of the foreign currency to occur?

Recall the home country is the US and the foreign country is the UK. An increase in the endowment of *y* will tend to *depreciate* the foreign currency in nominal and real terms. If money demand rises sufficiently, then the nominal rate will appreciate, and will appreciate sufficiently to cause a net appreciation if this effect is strong.

3.4 What would be required for a real appreciation to occur in the situation provided in 3.4? Home bias in consumption would result in a real appreciation.