1. The US real exchange rate is the price of US goods relative to foreign goods, such as Chinese goods. We will write it using the Greek letter “Epsilon,” \( \varepsilon = \frac{E}{P^*} \); where \( E \) = the nominal exchange rate is (Chinese Yuan per $), \( P \) is the US price level and \( P^* \) is the Chinese price level.

If the real exchange rate is, say, 1.4, it means US goods are 40% more expensive than Chinese goods. The Chinese must give up 1.4 Chinese goods to buy one US good. The Americans must give up \( \frac{1}{1.4} = 0.71 \) US goods to buy one Chinese good. As the US real exchange rate increases, imports gets more expensive for China and cheaper for the US.

a. If \( E = \$6/\text{Yuan} \) and \( P = \$10 \), what is the price of US goods in Yuan, \( EP = \)?

b. If you also know that \( P^* = \$30 \), what is the real exchange rate, \( \varepsilon = \frac{EP}{P^*} = \)?

c. If the US price level rises to \( P' = \$15 \), what is the new real exchange rate, \( \varepsilon' = \frac{EP'}{P'^*} = \) ?

d. How will the rising real exchange rate affect US exports? What about imports?

e. If originally the US exported 50 goods and imported 100 Chinese goods and paid \( \frac{1}{\varepsilon} = 1/2 = 0.5 \) US goods per imported good, then US net exports (the trade balance) was \( NX = X - (1/\varepsilon)M = 50 - (0.5)100 = 0 \). Suppose that due to the new real exchange rate in part c., exports fall to 30 and imports rise to 120. What are net export now, \( NX' = X' - (1/\varepsilon')M' = \)? How did the rise in the real exchange rate affect net exports?

2. Assume that the uncovered interest parity (UIP) condition holds, \( i = i^* - \frac{E_{t+1} - E_t}{E_t} \), where \( i \) and \( i^* \) are the US and foreign bond interest rates, \( E_{t+1} \) is the future expected nominal exchange rate (expected future foreign currency per $), and \( E_t \) is the current nominal exchange rate.

a. Explain what the UIP equation is saying and why we think it is realistic. Make sure to explain the economic theory behind it (see Chapter 18).

b. Assume for now that \( i = 0.04, i^* = 0.06 \), and investors expect the dollar to rise 3% against the foreign currency, \( \frac{E_{t+1} - E_t}{E_t} = 0.03 \). (Maybe now it’s 6 foreign per dollar and they expect it to rise to 6.18, so the dollar will gain \( 6.18 - 6)/6 = 3\% \). How does the dollar return to US bonds, \( i = 0.04 \), compare to the dollar return to foreign bonds, \( i^* - \frac{E_{t+1} - E_t}{E_t} \)? Therefore, do you expect global investment funds to stay put, flow into the US bond market or flow to the foreign bond market?
c. Assuming the funds will flow to the US, what will happen to the demand for dollars (which investors need to buy US bonds) and to the US nominal exchange rate $E_t$?

d. Given the expected future exchange rate $E_{t+1}^e$, what will happen to the expected value gain between now and the future, $\frac{E_{t+1}^e - E_t}{E_t}$? (hint: note that if $E_t$ increases today, it will close part of the gap to the future expected value already today, so the remaining gain $\frac{E_{t+1}^e - E_t}{E_t}$ will fall).

e. For a one-year US discount bond with face value $100$ bought in 2014, the interest rate is $i = \frac{100 - P_{1,2014}}{P_{1,2014}}$. If global capital flows into the US bond market, what happens to the demand for bonds and the bond price $P_{1,2014}$? What happens to the US interest rate $i = \frac{100 - P_{1,2014}}{P_{1,2014}}$?

f. Above you should have found that initially $i > i^* - \frac{E_{t+1}^e - E_t}{E_t}$ and therefore capital will flow into the US. This will decrease the expected future value gain of the dollar as well as decrease the US interest rate. As these variables, $\frac{E_{t+1}^e - E_t}{E_t}$ and $i$ fall, will the equation $i = i^* - \frac{E_{t+1}^e - E_t}{E_t}$ eventually come to hold? (note that subtracting less on the right hand side of the inequality will increase the right hand side) Once the equation holds, is there any remaining incentive to shift global investment funds into US bonds? Is the international bond market “self-equilibrating”?

3. We will now finally use the UIP to link the US interest rate to the nominal/real exchange rates.

(1) UIP can be written $i = i^* - \frac{E_{t+1}^e - E_t}{E_t} \Rightarrow E_t = \frac{E_{t+1}^e}{1 - i + i^*}$.

(2) The real exchange rate is $\varepsilon = E \frac{P}{P^*}$.

a. If $i = 0.04, i^* = 0.06, E_{t+1}^e = 6.12, P = 1, P^* = 3$, what are the nominal and real exchange rates?

b. If $i = 0.10$ and everything else is the same, what are now the nominal and real exchange rates?

c. How did the rising nominal interest rate affect the nominal and real exchange rates?

d. All else constant, what should happen to US net exports and the trade balance?