ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

# Assignment #3

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Course: *Global Business Environment* – Professor: *Luisa Lambertini*
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## Exercise I

### a)

The equilibrium spot exchange rate (E=current exchange rate) is the one that adjust to make sure that this equilibrium is respected. Remember that $E = E_{domestic/foreign}$, $R = R_{domestic}$ and $R^* = R_{foreign}$.

$$R = R^* + \frac{E^e - E}{E}$$

We want

$$E = \frac{E^e}{1 - R^* + R} \tag{1}$$

Substituting the datas:

$$E = \frac{1.2}{1 - (0.04/4) + (0.03/4)} = 1.2030 \tag{2}$$

The rounded (to two decimal digits) result is 1.20.

### b)

The expected exchange rate in 3 months is slightly smaller than the spot one.

$$E^e - E = 1.2 - 1.2030 = -0.003$$

So, there is a super small appreciation.

However, the exercises says to round off the results to two decimal digits. In this case, the difference would be zero: there is neither an appreciation nor a depreciation.

### c)

Consider R=0.02. Using the formula 1, the new E is:

$$\begin{aligned} E &= \frac{E^e}{1 - R^* + R} = \\ &= \frac{1.2}{1 - (0.04/4) + (0.02/4)} = \\ &= 1.2060 \end{aligned} \tag{3}$$

The rounded (to two decimal digits) result is 1.21. See the Figure 1 on the following page. It shows that a decrease in the domestic rate causes a new equilibrium point. The spot exchange rate has increased (depreciation).

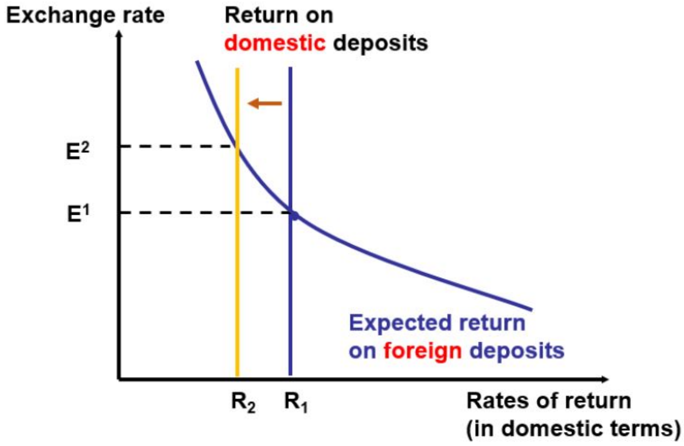


Figure 1: Question 1.c

**d)**

Consider $R^*$=0.05 and R=0.03. Using the formula 1, the new E is:

$$\begin{aligned} E &= \frac{E^e}{1 - R^* + R} = \\ &= \frac{1.2}{1 - (0.05/4) + (0.03/4)} = \\ &= 1.2060 \end{aligned} \tag{4}$$

The rounded (to two decimal digits) result is 1.21. See the Figure 2.It shows that an increase in the foreign interest rate causes a shift of the expected return on foreign deposits and a new equilibrium point at a bigger exchange rate (depreciation).

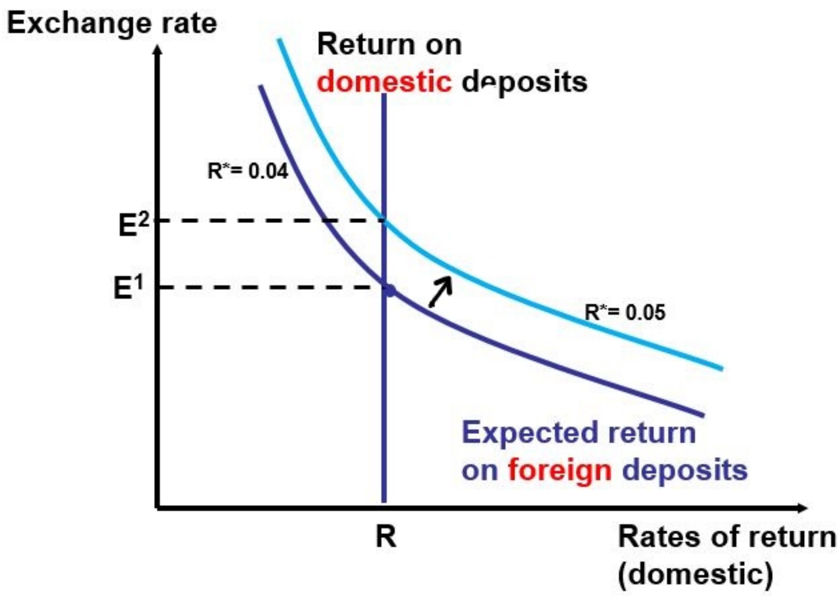


Figure 2: Question 1.d

**e)**

Consider $R^*$=0.04, R=0.03 and $E^e$=1. Using the formula 1, the new E is:

$$\begin{aligned} E &= \frac{E^e}{1 - R^* + R} = \\ &= \frac{1}{1 - (0.04/4) + (0.03/4)} = \\ &= 1.0025 \end{aligned} \quad (5)$$

The rounded (to two decimal digits) result is 1.00. See the Figure 3. It shows that a decrease in the expected exchange rate causes a shift of the expected return on foreign deposits and a new equilibrium point at a smaller spot exchange rate (appreciation).

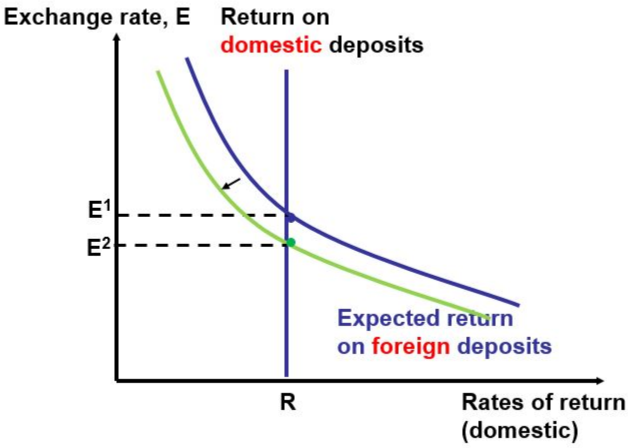


Figure 3: Question 1.e

# Exercise II

**a)**

$$E^e_{CHF/EUR} = 0.4 * 1.1 + 0.6 * 1.016667 = 1.05$$

**b)**

Using the formula 1, the spot exchange rate $E_{CHF/EUR} = E$ is:

$$\begin{aligned} E &= \frac{E^e}{1 - R^* + R} = \\ &= \frac{1.05}{1 - (0.115/4) + (0.04/4)} = \\ &= 1.070 \end{aligned} \quad (6)$$

**c)**

The invoice is of 1000EUR. We have to decide between three alternatives:

1. Buy the call option today:
   If I buy the option today I spend 0.0312CHF for 1EUR. Today I spend:

$$number of EUR * 0.0312CHF = 31.2CHF.$$

Moreover I have to buy the EUR at the specified time settled.
I consider that $E^e_{CHF/EUR} = 1.070$. I would like to have an exchange rate as small as possible (so I need less CHF to buy the EUR).
I would use my option only if $E^e = 1.1$ (probability=0.4), using the strike price 1.04. In the other case (probability=0.6) $E^e = 1.016667$ I would not. So,

$$0.4 * \frac{1000EUR * 1.04CHF/EUR}{1 + R/4} + 0.6 * \frac{1000EUR * 1.016667CHF/EUR}{1 + R/4} = 1015.84CHF.$$

In the end I have a present value of

$$31.2CHF + 1015.84CHF = 1047.04CHF.$$

2. Buy EUR today:
I need 1000EUR in 3 months. So today I buy the amount of EUR that will have a value of 1000EUR in 3 months:

$$\frac{1000EUR}{1 + R^*/4} = \frac{1000EUR}{1 + 0.115/4} = 972.05EUR$$

I am working in CHF. Considering the spot exchange rate $E^e_{CHF/EUR} = 1.070$, I have

$$972.05EUR * 1.070CHF/EUR = 1040.155CHF.$$

3. Buy EUR in three months:
I need 1000EUR in 3 months and I directly buy them. In this case we keep our CHF and we invest them. At that time 1000EUR will have a value in CHF of $1000EUR * E^e_{CHF/EUR}$. This amount today has a value of

$$\frac{1000EUR * E^e_{CHF/EUR}}{1 + R/4} = \frac{1000EUR * 1.05CHF/EUR}{1 + 0.04/4} = 1039.60CHF.$$

The cheapest alternative is the last one.

## Exercise III

**a)**

The CIRC states that

$$R^6_{USD} = R^6_{EUR} + \frac{F^6_{USD/EUR} - E_{USD/EUR}}{E_{USD/EUR}};$$

where $R^6$ is the rate of interest for six months. Then

$$\begin{aligned} F^6_{USD/EUR} &= E_{USD/EUR} * (1 + R^6_{USD} - R^6_{EUR}) = \\ &= 1.1489 * (1 + 0.02623/2 + 0.00313/2) = 1.166 \end{aligned}$$

**b)**

Following the formula for the forward premium, I obtain

$$\frac{F^6_{USD/EUR} - E_{USD/EUR}}{E_{USD/EUR}} = \frac{1.166 - 1.1489}{1.1489} = 0.015.$$

A forward premium is a situation in which the expected future price for a currency is greater than the spot price. So the market expects a depreciation of the USD relative to the EUR.