

Answer Key to Homework I

1. Suppose the Canadian dollar is currently traded at C\$ 1.40/\$. The Deutsche mark is traded at DM 1.39/\$.
 - a. Determine the C\$/DM exchange rate consistent with these direct quotations.
 - b. Suppose the C\$/DM cross rate in the market was at C\$ 1.05/DM. Is there any arbitrage opportunity?
 - c. How would you take advantage of any arbitrage situation?
 - d. What is your profit?

SOLUTIONS:

- a. Spot is C\$ 1.0072/DM = $(1.40 \text{ [C\$/\$]} / 1.39 \text{ [DM/\$]})$
 - b. Arbitrage opportunity: DM cheaper with combination of direct rates than using the cross rate.
 - c. Buy US \$ with C\$ at 1.40, buy DM with US \$, sell DM at the market's cross rate of C\$ 1.05/DM.
 - d. Gain is C\$ 0.0425 for each C\$ 1.0 that can be arbitrated or 4.25% $[(1/\text{C\$}1.4/\text{\$}) * \text{DM}1.39/\text{\$} * \text{C\$}1.05/\text{DM} = \text{C\$}1.0425; 1.0425 - 1 = 0.0425]$
2. Calculate the dollar rates of return on the following assets:
 - a. A painting whose price rises from \$200,000 to \$250,000 in a year.
 - b. A bottle of a rare Burgundy, Domaine de la Romanee-Conti 1978, whose price rises from \$180 to \$216 between 1999 and 2000.
 - c. A £10,000 deposit in a London bank in a year when the interest rate on pounds is 10 percent and the \$/£ exchange rate moves from \$1.50 per pound to \$1.38 per pound.

SOLUTIONS:

- a. $(\$250,000 - \$200,000) / \$200,000 * 100 = 25\%$
- b. $(\$216 - \$180) / \$180 * 100 = 20\%$

- c. In this case, we can use the approximated formula for rate of return on pound deposit in terms of US dollar.

$$R_{\text{£}} + (E_{\$/\text{£},\text{new}} - E_{\$/\text{£},\text{old}}) / E_{\$/\text{£},\text{old}} = 0.10 + (1.38 - 1.50) / 1.50 \\ = 0.02 \text{ or } 2\%$$

In terms of the full steps,

1. You have to have £10,000 * 1.50 \$/£ = \$15,000 originally.
 2. In a year, you would receive £10,000 * (1 + 0.1) = £11,000.
 3. Exchange back to the US dollar, you would receive £11,000 * 1.38 \$/£ = \$15,180.
 4. Therefore, the rate of return on the pound deposit is (\$15,180 - \$15,000) / \$15,000 * 100 = 1.2%.
3. Suppose the spot rate is \$ 0.20/FF. The US one-year rate is 6%. You expect the future exchange rate to be \$0.1923/FF.
- a. What is the current one-year French interest rate that will satisfy the Interest Rate Parity?
 - b. Suppose the one-year French interest rate is 12% instead. What kind of arbitrage would you perform to take advantage of this opportunity?

SOLUTIONS:

- a. Using the exact formula, $0.06 = (1 + R_F) * 0.1923 / 0.2 - 1 = 10.24\%$
Using the approximation, $0.06 = R_F + (0.1923 - 0.20) / 0.20 \rightarrow R_F = 9.85\%$
 - b. An interest rate of 12% is greater than the rate that results in interest rate parity. Arbitrage with a capital outflow to FF: borrow \$ at 6%, buy FF spot, invest FF at 12%, sell FF in the future for US\$.
4. Petroleum is sold in a world market and tends to be priced in U.S. dollars. The Nippon Steel Chemical Group of Japan must import petroleum to use in manufacturing plastics and other products. How are its profits affected when the yen depreciates against the dollar? Which hedging instrument is likely to be the most appropriate scheme for this particular company, and why?

SOLUTIONS:

The yen depreciation will make the imports of Japanese-based companies more expensive and hence raise the cost and lower profit. The company can arrange for a forward contract with its commercial bank. The contract should suit the company's

profile as it seems to be large in size and hence should be able to receive bargaining power for cheaper deal over the counter. The large contract size makes futures a less convenient option.

5. Suppose the dollar interest rate and the pound sterling interest rate are the same, 5 percent per year. What is the relation between the current equilibrium \$/£ exchange rate and its expected future level? Suppose the expected future \$/£ exchange rate, \$1.52 per pound, remain constant as Britain interest rate rises to 10 percent per year. If the U.S. interest rate also remains constant, what is the new equilibrium \$/£ exchange rate?

SOLUTIONS:

The interest parity is already in equilibrium in this case which means we are at the equilibrium interest rate also. Therefore, we expect no changes in exchange rate in the future and hence expected exchange rate equals current spot exchange rate.

As interest rate in Britain rises to 10 percent, exchange rate has to adjust given constant exchange rate expectation.

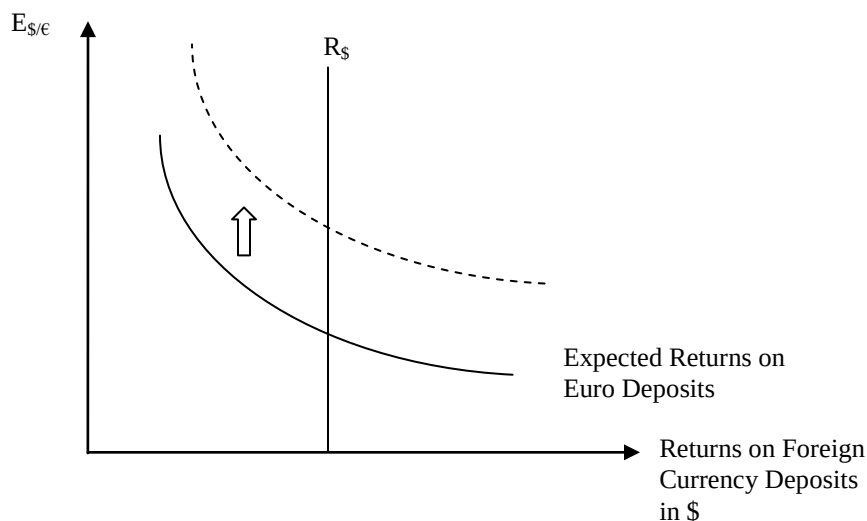
$$R_{\$} = R_{£} + \{(E^e - E)/E\}_{\$/£}$$

$$0.05 = 0.10 + (1.52 - X)/X$$

$$X = 1.60_{\$/£}$$

6. Traders in asset markets suddenly learn that the interest rate on dollars will decline in the near future. Use the diagrammatic analysis based on the Uncovered Interest Parity to determine the effect on the current dollar/euro exchange rate, assuming current interest rates on dollar and euro deposits do not change.

SOLUTIONS:



7. Assume that the Citibank trading room is dealing on the following quotations Spot Sterling = \$1.5000, Euro-Sterling interest rate = 11.00% p.a. Euro-\$ interest rate = 6.00% p.a. and that Barclays Bank is quoting Forward Sterling at \$1.4550.
- a. Describe the transactions you would make to earn risk-free covered interest arbitrage profits?
 - b. How much profit would you expect to make?

SOLUTIONS:

The implied, or synthetic, forward rate that Citibank is quoting using the exact formula is

$$\begin{aligned} F_{\text{Citi}} &= E_{\$/\pounds} (1 + i_{\$}) / (1 + i_{\pounds}) \\ &= \$1.50 * 1.06 / 1.11 = \$1.4324 / \pounds \end{aligned}$$

Since $F_{\text{Barclays}} = \$1.4550 / \pounds$, it follows that forward contracts at Barclays are dear and synthetic forward at Citibank are cheap.

- a. The arbitrageur should BUY synthetic forwards (i.e. borrow £, sell £ spot, and lend \$) at Citibank and SELL forwards at Barclays to earn a profit.
- b. The profit would be \$0.0226/£ (1.4550 – 1.4324) or about 1.58% on capital.