

Problems involving Foreign Exchange Solutions

1. A bank quotes the following rates: CHF/USD 1.0898-1.0910 and JPY/USD 119–121. What is the minimum JPY/CHF bid and the maximum ask rate that the bank would quote?

- Calculate the JPY/CHF bid rate, the rate at which the bank buys CHF for JPY. Doing the calculations in two parts, we have:
 1. The bank sells JPY, and buys USD at 119.
 2. The bank sells USD, and buys CHF at 1.0910

The rate would then be $119/1.0910 = 109.0742$

- Calculate the rate at which the bank sells CHF for JPY
 1. The bank sells CHF and buys USD at 1.0898
 2. The bank sells USD and buys JPY at 121

The rate would then be $121/1.0898 = 111.0295$

Note the bid-ask quote is in the right order

2. Foreign Interest Rate (R_f) = 2.5%; Domestic Interest Rate (R_d) = 5%

Forward Rate = 118.16 JPY/USD Spot Rate = 119.14 JPY/USD

- Is dollar at a forward premium or discount?
- Does interest rate parity hold?

Forward less than spot so dollar at a discount

- ✓ Borrow JPY at 2.5%; $10,000,000 * 1.025 = 10,250,000$ JPY Owed at end
 - ✓ Sell 10,000,000 JPY and buy USD spot at 119.41 JPY/USD = 83,745.08 USD
 - ✓ Loan USD at 5% = \$87,932.33
 - ✓ Cover JPY loan $10,250,000 / 118.16 = \$86,746.78$ (buy JPY forward)
 - ✓ Net Gain = \$1,176.55
 - ✓ Interest rate parity close but not perfect
-

3. An investor wishes to buy euros spot (at \$1.1139) and sell euros forward for 180 days (at \$1.1203).

a. What is the swap rate on euros?

ANSWER. A premium of 64 points.

b. What is the premium on 180-day euros?

ANSWER. The 180-day premium is $(1.1203 - 1.1139)/1.1139 \times 2 = 1.15\%$.

4. On checking the screen, you see the following exchange rate and interest rate quotes:

Currency	90-day interest rates annualized	Spot rates	90-day forward rates
Dollar	4.99% - 5.03%		
Swiss franc	3.14% - 3.19%	USD/ CHF 0.711 -22	USD/CHF 0 .726 - 32

a. Can you find an arbitrage opportunity?

ANSWER. Yes. The profitable route is to borrow Swiss and lend Dollars. The forward rates do not reflect the difference in interest rates.

b. What steps must you take to capitalize on it?

ANSWER. Borrow 722,000 CHF at .007975% for 90 days (3.19%/4), convert these francs into dollars at the ask rate of \$.722 to get the \$1,000,000; lend the dollars at .1.2475% for 90 days (4.99%/4), and immediately sell them forward for CHF at the buy rate of \$0.726

c. What is the profit per \$1,000,000 arbitrated?

ANSWER. The profit is approximately \$10,109 or 7,299 CHF

5. A foreign exchange trader assesses the euro exchange rate three months hence as follows:

\$1.11 with probability 0.25

\$1.13 with probability 0.50

\$1.15 with probability 0.25

The 90-day forward rate is \$1.12.

a. Will the trader buy or sell euros forward against the dollar if she is concerned solely with expected values? In what volume?

ANSWER. The expected future spot exchange rate is \$1.13 ($\$1.11 \times 0.25 + \$1.13 \times 0.50 + \1.15×0.25). Because this exceeds the forward rate of \$1.12, the trader will buy euros forward against the dollar. She should buy an infinite amount of euros. This absurd result is due to the assumption of a linear utility function.

b. In reality, what is likely to limit the trader's speculative activities?

ANSWER. Regardless of her utility function, she will be restrained by bank policies designed to guard against excessive currency speculation.

c. Suppose the trader revises her probability assessment as follow

\$1.09 with probability 0.33

\$1.13 with probability 0.33

\$1.17 with probability 0.33

Assuming the forward rate remains at \$1.12, do you think this new assessment will affect the trader's decision?

ANSWER. The expected future spot rate remains at \$1.13. However, the variance of the expected spot rate is now greater than it was before. If the trader is concerned solely with expected values, this will not affect her speculative activities. But if she is concerned with risk in addition to expected return, the greater variance and consequent greater risk should lead her to reduce her speculative activities.

6. You currently have EUR 500,000 in currency available to your firm, sitting in a bank account in Europe, invested at short-term rates. You have a funding requirement of USD 450,000 for three months in the United States and wish to utilize your EUR funds to meet this funding requirement. You do not wish to take any foreign exchange risk on this transaction. The interest rates in EUR are 5% and 3% in USD and the currency spot rate is \$0.90 per EUR.

- a. Illustrate how you would set up a currency swap to satisfy your need for USD for three months.
- b. What is your potential gain assuming the bank is willing to assist with the swap at no profit?

Currency Swap

A Currency Swap transaction allows you to utilize the funds you have in one currency to fund obligations denominated in a different currency, without incurring foreign exchange risk. It is an effective and efficient cash management tool for companies that have assets and liabilities denominated in different currencies. On the near date, you swap one currency for another at an agreed foreign exchange rate and agree to swap the currencies back again on a future (far) date at a price agreed upon at the inception of the swap. In most cases, currencies are initially swapped at the spot rate and the future (far) rate is calculated by adjusting the spot price by the forward points for the length of time the swap transaction runs for.

The Solution

In the situation outlined above, you would agree to sell the EUR to the bank at the spot rate of 0.90. A full exchange of funds takes place on the near date and you would deliver EUR 500,000 to the bank. In return the bank will deliver USD 450,000 to you on the near date (typically but not always the spot date). At the same time you would agree to buy back the EUR and send back the USD in three months time at a spot price of 0.90, adjusted for forward points of -.0045, for a forward price of 0.8955. In this case, on the future (far) date the bank would return the EUR 500,000 and you would send the bank USD 447,750

The forward points adjustment is easily explained and calculated. In this case, assume the prevailing interest rate in Europe are 5% and in the United States are 3%. By entering into the foreign exchange swap with the bank you are giving them the use of a currency which they could invest at 5% and in return

they are giving you the use of USD which you could only invest at 3%. The purpose of the forward points adjustment is to equalize this interest rate differential and compensate you for 'giving up' or 'receiving' the higher interest bearing currency.

The forward points are easy to calculate and a simple method is outlined below:

Near Date

On the near date the Bank receives EUR 500k and pays you \$450k.

\$450k divided by EUR 500k = Spot Exchange Rate of 0.9000

In the three month period the bank could earn 5% interest on the EUR 500k for three months = EUR 6,250

In the three month period you could earn 3% interest on the \$450k for three months = \$3,375

At the end of the period the bank would have EUR 506,250

At the end of the period you would have USD 453,375

Far Date

\$453,375 divided by EUR 506,250 = Exchange Rate of 0.8955

*Bank returns the EUR 500k to you at the agreed upon rate of 0.8955 and you send the bank USD 447,750***

*** The \$2,250 "gain" you made on the transaction described above is simply the monetized difference between the interest rates in the two countries/currencies. 2% earnings on EUR500k for three months translated back to USD is \$2,250.*

