

Scoring is 2 points for each question. Question 10 will be scored at 4 points.

- 1) If EURJPY is 145.35, how many EUR can JPY 250,000,000 buy?

Answer: EURJPY is 145.35 means JPY 145.35 can be exchanged for EUR 1. So, JPY 250,000,000 can be exchanged for $250,000,000 / 145.35 = 1,719,986$ EUR.

- 2) Assuming the following rates (which include both bid and offer)

EURUSD 1.0625 / 27
USDJPY 136.35 / 40

- a) If a customer (i.e., market taker) buys USD 25 million versus EUR, what will the EUR amount be?
b) If a customer buys USD 10 million versus JPY, what will the JPY amount be?

Answer: a) Buying USD versus EUR means selling EUR so the customer must rely on the market maker's EURUSD bid, which is 1.0625. USD 25,000,000 can be exchanged for $25,000,000 / 1.0625 =$ EUR 23,529,412.

b) The customer buying USD will rely on the market marker's offer, which is 136.40. USD 10,000,000 can be exchanged for $10,000,000 * 136.40 =$ JPY 1,364,000,000.

- 3) Derive the following cross rates from their components using the spot rates listed below. Assume all rates are mid-market and ignore bid-offer spread for this exercise

Assume these rates:

USDJPY 136.85
GBPUSD 1.2175
USDCHF 0.9305
EURUSD 1.0625

Calculate these rates:

a) EURJPY
b) CHFJPY
c) EURGBP
d) GBPCHF

Answer:

a) EURJPY means "EUR 1 in terms of JPY", which is the product of: "EUR 1 in terms of USD" (which is EURUSD) and "USD 1 in terms of JPY" (which is USDJPY)

So, EURJPY = $1.0625 * 136.85 = 145.40$

b) CHFJPY means "CHF 1 in terms of JPY", which is the product of: "CHF 1 in terms of USD" (which is the inverse of USDCHF) and "USD 1 in terms of JPY" (which is USDJPY)

So, CHFJPY = $(1/0.9305) * 136.85 = 147.07$

c) EURGBP means "EUR 1 in terms of GBP", which is the product of: "EUR 1 in terms of USD" (which is EURUSD) and "USD 1 in terms of GBP" (which is the inverse of GBPUSD),

So, EURGBP = $1.0625 * (1/1.2175) = 0.8727$

d) GBPCHF means "GBP 1 in terms of CHF", which is the product of: "GBP 1 in terms of USD" (which is GBPUSD) and "USD 1 in terms of CHF" (which is USDCHF)

So, GBPCHF = $1.2175 * 0.9305 = 1.1329$

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- 4) A trader has the following position, selling CAD 35.70 million versus USD at 1.4120. If the current USDCAD rate is 1.3628, what is the mark-to-market value of the position?

Answer: Initial trade is -CAD 35.70 million and +USD $(35.70/1.4120)$ million = +USD 25.283 million

At 1.3628 the USD value = USD $(35.70/1.3628)$ = USD 26.196 million

Note that this must be a loss since the USD-value of CAD sold is now higher

Loss = USD 25.283 million - USD 26.196 million = -USD 0.913 million

- 5) A USD-based trader has the following position: selling EUR 105 million versus EUR at a spot EURCHF rate of 1.1025. The current spot EURCHF rate is 0.9865.

a) What do you need to know to calculate the mark-to-market value of the position (in USD)?

b) Choose a level for the rate you need to know and show what USD-value the trade would have.

Answer:

a) With the given information, you can calculate the mark-to-market in either CHF or EUR.

To calculate in USD, you need either the current USDCHF or EURUSD rate

b) To illustrate, assume USDCHF is 0.9300.

(For this problem you may pick any USDCHF or EURUSD rate.)

The initial trade is - EUR 105 million and + CHF $(105 * 1.1025)$ million = + CHF 115.763 million

At 0.9865 the CHF-value of sold EUR is = - CHF $(105 * 0.9865)$ million = - CHF 103.583 million

Note that this must be a gain since the CHF-value of EUR sold is lower

Gain = CHF 115.763 million - CHF 103.583 million = CHF 12.18 million

At 1.1100, the USD-value of the gain is USD $(12.18*0.9300)$ million = USD 11.327 million

- 6) A EUR-based car manufacturing company sources parts from Mexico.

a) What is the company's immediate FX exposure (i.e., which currency pair is the company exposed to and is it long or short that pair?)

b) What type of hedge would reduce the company's FX risk?

Answer: a) The company is exposed to EURMXN, and the company is long EURMXN. Long because the company would benefit if the value of EUR increased relative to MXN. A relative decrease in MXN would make their Mexico purchases less expensive.

b) A contract, such as a spot or forward contract, to sell EUR and buy MXN

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- 7) With the following information and assuming covered interest rate parity holds, determine if you would pay or earn the points and what the forward rate would be. (Note that the points are given without positive or negative signs.)
- a) USDJPY spot rate 137.10, JPY deposit rate -0.10%, USD deposit rate 4.50%. You want to sell USD forward against the yen, and the forward points are quoted as “170”.
 - b) EURGBP spot rate 0.8750, EUR deposit rate 2.50%, GBP deposit rate 3.50%. You want to sell EUR forward against the British pound, and the forward points are quoted as “37”.

Answer: a) The USD deposit rate is higher, so the USDJPY forward is at a discount which means the points are subtracted. Forward rate = $137.10 - 1.70 = 135.40$. You are selling USD so you “pay” the forward points (i.e., the negative forward points make your sale price lower, less advantageous.)

b) The EUR deposit rate is lower, so the EURGBP forward is at a premium which means the points are added. Forward rate = $0.8750 + 0.0037 = 0.8737$. You are selling EUR so you “earn” the forward points (i.e., the positive forward points make your sale price higher, more advantageous.)

- 8) Find the all-in 6-month forward rate for GBPUSD, assuming covered interest rate parity holds, ignoring bid/ask, and assuming the following:

GBPUSD spot 1.2134
GBP deposit rate 3.52%
USD deposit rate 4.53%
162 days between spot and the forward date

Assume that GBP money market rates follow ACT/365, USD rates follow ACT/360.

Answer: Forward rate = $1.2134 * (1 + 4.53\% * 162/360) / (1 + 3.52\% * 162/365) = 1.2191$

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9) Par forwards

A client wants to sell EUR versus USD in a strip of three forwards, but they want you (a market maker) to quote a single rate for all three forwards as a single package.

The client wishes to pay EUR 10 million on each of the 1-year, 2-year and 3-year dates.

Calculate the rate you should quote. Assume all USD interest rates for all maturities equal 4.75% (use an annual bond basis for simplicity), and assume the following spot and forward rates:

EURUSD	1.0635
EURUSD 1 year	1.0858
EURUSD 2 year	1.1070
EURUSD 3 year	1.1271

Notice that three standard forward contracts would produce the following cash flows:

- 1 year Client sells EUR 10,000,000 Client buys USD 10,858,000
- 2 years Client sells EUR 10,000,000 Client buys USD 11,070,000
- 3 years Client sells EUR 10,000,000 Client buys USD 11,271,000

Quoting a single rate for all three cash flows is the same as setting a fixed USD amount for all three cash flows. So, we need to find a single USD amount which would have the same USD present value as the three uneven USD cash flows above.

To find this, let df_1 , df_2 , and df_3 be the three USD discount factors.

Then we want an amount, N , where:

$$10,858,000 * df_1 + 11,070,000 * df_2 + 11,271,000 * df_3 = N * (df_1 + df_2 + df_3), \text{ which means}$$

$$N = (10,858,000 * df_1 + 11,070,000 * df_2 + 11,271,000 * df_3) / (df_1 + df_2 + df_3)$$

Solving this we find,

$$N = 30,260,625 / 2.7361 = 11,059,946$$

So, the fixed cash flow is USD 11,059,946, and the fixed rate we can offer is 1.1060 (after rounding)

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- 10) (This problem counts for 4 points.) Assume there are 153 days between spot and the 5-month forward date, assume covered interest rate parity holds, and assume the following rates (all mid-market rates) and that both deposit rates are quoted ACT/360:

USDCAD	1.3710
5mo USD deposit	4.70%
5mo CAD deposit	4.45%

How many pips would spot have to move, and in which direction, before the forward points moved 1 pip (higher)?

Answer: The question asks for both the spot rate and forward points movements in pips, so we will deal with the spot and forward rates in pips (this would mean taking the quoted exchange rates and multiplying by 10^4 .)

With this consideration, note that

$$\text{Forward points} = \text{Forward rate (pips)} - \text{Spot rate (pips)}$$

$$\text{Forward points} = \text{Spot rate (pips)} * \left\{ \frac{(1 + 4.45\% * 153/360)}{(1 + 4.70\% * 153/360)} \right\} - \text{Spot rate (pips)}$$

$$\text{Forward points} = \text{Spot rate (pips)} * \left\{ \frac{(1 + 4.45\% * 153/360)}{(1 + 4.70\% * 153/360)} - 1 \right\}$$

$$\text{So, Change (Forward points)} = \text{Change (Spot rate pips)} * (1.0200/1.0189 - 1)$$

$$\text{Change (Forward points)} = \text{Change (Spot rate pips)} * (-0.0010)$$

We want a +1 pip change, meaning we want Change (Forward points) = +1,

$$\text{So, } +1 = \text{Change (Spot rate pips)} * (-0.0010)$$

$$\text{Change (Spot rate pips)} = 1 / (-0.0010) = -960$$

Meaning spot must move 960 pips lower, which is from 1.3710 to 1.2750