

## Practice Questions - Session 6

### Multiple Choice Questions

For the following three questions, assume that Antarctica is the home country, and its currency is the Antarctica dollar (AAD), and Greenland is the foreign country and its currency is the crown (GRK). Choose the correct answer.

**1.** All else being equal, an increase in income in Greenland leads to:

- (a) An increase in consumption in Antarctica, and therefore an increase in imports, resulting in an appreciation of the AAD.
- (b) A decrease in consumption in Antarctica, and therefore an increase in exports, resulting in a depreciation of the AAD.
- (c) An increase in consumption in Greenland, and therefore an increase in imports, resulting in an appreciation of the AAD.
- (d) An increase in consumption in Greenland, and therefore an increase in imports, resulting in a depreciation of the AAD.

**2.** All else being equal, a decrease in the interest rate  $r^*$  in Greenland leads to:

- (a) Decreased demand for assets in Greenland, and therefore a depreciation of the GRK.
- (b) Decreased demand for assets in Greenland, and therefore a depreciation of the AAD.
- (c) An increase in consumption in Greenland, and therefore an increase in imports, resulting in an appreciation of the GRK.
- (d) An increase in consumption in Antarctica, and therefore an increase in exports, resulting in a depreciation of the AAD.

**3.** All else being equal, a decrease in prices in Greenland leads to:

- (a) An increase in exports to Antarctica, and therefore an appreciation of the AAD.
- (b) An increase in exports to Antarctica, and therefore a depreciation of the AAD.
- (c) An increase in consumption in Greenland, and therefore an increase in imports, resulting in an appreciation of the AAD.
- (d) A decrease in consumption in Greenland, and therefore a decrease in imports, resulting in a depreciation of the AAD.

## Quiz Questions

**Question 1:** You read in your newspaper that yesterday's spot quote was GBP/CAD 2.3134-2.3180.

- a. This is a quote for which currency?
- b. What is the ask price for CAD?
- c. What is the bid price for GBP?

**Question 2:** A bank quotes the following rates: USD/CHF 2.5110-2.5140 and JPY/USD 245–246.

- a. What is the JPY/CHF bid cross price that the bank would quote?
- b. What is the JPY/CHF ask cross price that the bank would quote?

**Question 3:** Given the bid-ask quotes for GBP/JPY 220-240, at what rate will you:

- a. purchase GBP?
- b. sell GBP?
- c. purchase JPY?
- d. sell JPY?

## Question 4:

The following spot rates against the GBP. Use the quotes to answer the following questions.

Country	Code	Midpoint	Change	Spread
Czech Rep	CZJ	42.7945	+0.1868	616–273
Denmark	DKK	11.30929	+0.0289	065–119
Euro	EUR	1.5172	+0.0039	168–175
Norway	NOK	12.3321	+0.0394	263–379
Russia	RUB	52.1528	– 0.0368	376–679
Switzerland	CHF	2.4531	+0.0040	522–540
Turkey	TRY	2.7656	–0.0050	614–698

**Note:** Bid-ask spreads show only the last three decimal places.

- i. What are the bid-ask quotes for:
  - a. GBP/CZJ?
  - b. GBP/DKK?
  - c. GBP/EUR?
  - d. GBP/NOK?

- ii. What are the bid-ask quotes for:
  - a. CZJ/GBP?
  - b. DKK/GBP?
  - c. EUR/GBP?
  - d. NOK/GBP?
  - e.

### **Question 5**

- a. Based on a spot USD/CAD exchange rate of 1.0526 and 91-day rates of 0.5% for U.S. dollars and 1.0% for Canadian dollars, determine what should be the 3-month forward rate?
- b. If the 3-month USD/CAD forward rate is 1.0526, describe all the steps to follow to make a risk-free profit (arbitrage opportunity)
- c. When traders realize a risk-free profit can be made, they too will engage in the transactions described in b. How will this affect the U.S dollar interest rate, the Canadian dollar interest rate, the USD/CAD spot rate, and the USD/CAD forward rate.

### **True False Questions**

#### **Question 1**

The equilibrium exchange rate suggested by the Absolute Purchasing Power Parity hypothesis depends on the relative relationship between the prices of a representative consumption bundle in the currencies of two countries.

#### **Question 2**

The following graph plots the volatility smile for USD-CAD 3 month options with different strikes. It is obtained with the <OVDV> function in Bloomberg.

Based on this graph, one can assume the market is pricing in an appreciation of the Canadian Dollar and thus is charging a higher price for call options relative to put options.



### Question 3

Strong GDP growth will tend to strengthen the value of the currency.

### Question 4

High inflation levels tend to erode the domestic value of the currency.

### Question 5

High employment levels will tend to strengthen the value of the currency.

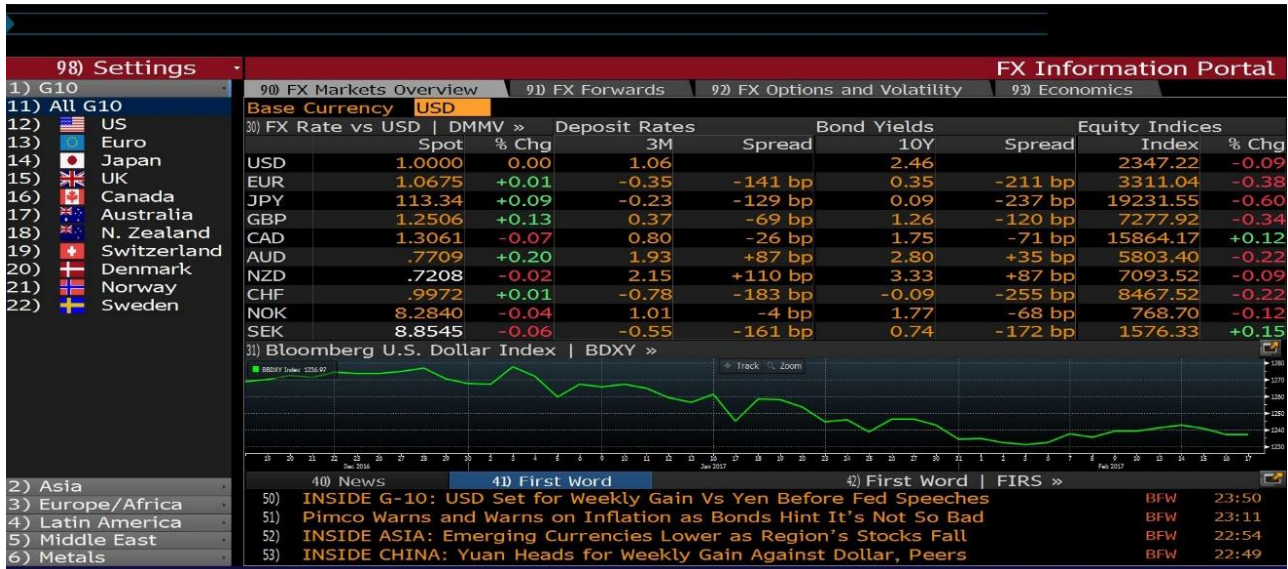
### Exercise 1:

The following screen is obtained from Bloomberg using <FXIP> function. Suppose you want to implement a carry trade strategy on a notional amount of 1,000,000 USD by going long the currency with the highest interest rate and financing this purchase by going short the currency with the lowest interest rate.

Describe the different steps to follow to implement this strategy for a 3-month period and the payoff generated from it. Use the 3-month deposit rates. Suppose spot exchange rates 3-month after you have implemented your strategy are the ones given in the second screenshot.

## Exercise 2:

You want to implement a momentum strategy by going long the currencies of the two countries with the highest 3M interest rates. You invest the equivalent of 1,000,000 USD in each currency. Suppose the quotations you have are the ones in the first screenshot above. Suppose spot exchange rates 3-month after you have implemented your strategy are the ones given in the second screenshot. Compute your P&L.



	USD	EUR	JPY	GBP	CHF	CAD	AUD	NZD	HKD	NOK	SEK
SEK	9.2213	9.8309	.08082	11.611	9.1242	6.9235	6.8372	6.5362	1.1889	1.0951	
NOK	8.4202	8.9768	.07380	10.602	8.3315	6.3220	6.2432	5.9683	1.0856		.91312
HKD	7.7562	8.2689	.06798	9.7661	7.6745	5.8234	5.7509	5.4977		.92114	.84111
NZD	1.4108	1.5041	.01236	1.7764	1.3960	1.0593	1.0461		.18190	.16755	.15299
AUD	1.3487	1.4379	.01182	1.6982	1.3345	1.0126		.95597	.17389	.16017	.14626
CAD	1.3319	1.4199	.01167	1.6770	1.3179		.98754	.94406	.17172	.15818	.14444
CHF	1.0106	1.0775	.00886	1.2725		.75880	.74935	.71636	.13030	.12003	.10960
GBP	.79420	.84670	.00696		.78583	.59629	.58886	.56293	.10240	.09432	.08613
JPY	114.10	121.64		143.67	112.90	85.667	84.600	80.875	14.711	13.551	12.373
EUR	.93799		.00822	1.1811	.92811	.70425	.69548	.66486	.12093	.11140	.10172
USD		1.0661	.00876	1.2591	.98947	.75081	.74146	.70881	.12893	.11876	.10844

% Change on Day Range  
 Below -2.5%   -0.5% to -2.0%   -0.05% to -0.05%   -0.05% to 0.05%   0.05% to 0.5%   0.5% to 2.5%   Above 2.5%

Rates are from Composite where Bloomberg BGN is not available.

### Solutions – Multiple Choice Questions

1. c
2. a
3. b

### Solutions – Quizz Questions

#### Question 1

- a. This is a quote for GBP in terms of CAD.
- b. The ask rate for CAD is  $1/2.3134 = 0.432$ .
- c. The bid rate for GBP is 2.3134.

#### Question 2

- a. The **CHF/JPY** bid price is the price at which the bank buys CHF for JPY. Doing the calculations in two parts, we have: (a) The bank sells JPY, and it buys USD at USD/JPY 245. (b) The bank sells USD, and it buys CHF at USD/CHF 2.5140. Thus the rate is:  $(\text{USD/JPY } 245) / (\text{USD/CHF } 2.5140) = [\text{CHF/JPY}]_{bid} 97.4543$ .
- b. The CHF/JPY ask rate is the rate at which the bank sells CHF for JPY. (a) The bank sells CHF, buys USD at CHF/USD 2.5110. (b) The bank sells USD, buys JPY at USD/JPY 246. Thus the rate is  $(\text{USD/JPY } 246) / (\text{USD/CHF } 2.5110) = [\text{CHF/JPY}]_{ask} 97.9689$ .

Note: the bid rate is less than the ask rate, as it should be.

#### Question 3

- a. GBP/JPY 240
- b. GBP/JPY 220
- c. GBP/JPY 220 or JPY/GBP 0.00454
- d. GBP/JPY 240 or JPY/GBP 0.004167

#### Question 4

- i.
  - (a) GBP/CZJ 42.7616 -42.8273.
  - (b) GBP/DKK 11.30065 -11.30119.
  - (c) GBP/EUR 1.5168 -1.5175.
  - (d) GBP/NOK 12.3263 -12.3379.

ii.

- (a) CZJ/GBP 0.023350 - 0.023385
- (b) DKK/GBP 0.088486 - 0.088490
- (c) EUR/GBP 0.658979 - 0.659283
- (d) NOK/GBP 0.081051 - 0.081127

### Question 5

- a. The three-month forward rate should be equal to:

$$F_{x/y} = S_{x/y} \frac{1+(r_x * \frac{n}{360})}{1+(r_y * \frac{n}{360})} = 1.0526 * \frac{1+(0.01 * \frac{91}{360})}{1+(0.005 * \frac{91}{360})} = \underline{\underline{1.0539}}$$

- b. The forward price of the US Dollar is undervalued. Hence, we can assume the US dollar forward price will rise. As a consequence, we have to buy U.S dollars forward.

There are four steps to follow to make a risk-free profit:

- i. Borrow U.S. dollars. If US\$1 million is borrowed in the US market at 0.5%, the amount that must be repaid at the end of the three month is:  
US\$ 1 million + (US\$1 million \* 0.005 \* 91/360) = US\$ 1,001,264
- ii. Sell U.S. dollars and buy Canadian dollars spot. Convert the US\$1 million to Canadian dollars at the spot rate of 1.0526 for proceeds of C\$ 1,052,600.
- iii. Invest the Canadian dollars. Invest the Canadian dollars at the Canadian interest rate for 3 month. After 3 month, the Canadian dollar investment will be worth:  
C\$ 1,052,600 + (C\$ 1,052,600 \* 0.01 \* 91/360) = C\$1,055,261
- iv. Sell Canadian dollars and buy U.S dollars forward. Sell C\$1,055,261 forward at three-month CAD/USD forward rate of 1.0526 for proceeds in three month of US\$ 1,002,528 (C\$ 1,055,261 / 1.0526).

In three months, the proceeds from the Canadian dollar investment can be used to satisfy the obligations of the forward contract and in return will produce US\$ 1,002,528 of which US\$ 1,001,264 must be used to repay the U.S.-dollar loan. After all the transactions have settled, US\$ 1,264 is left as a risk-free profit.

- c. When traders realize a risk-free profit can be made, they too will engage in the transactions described in b. This will affect the following four prices and rates:
- U.S. dollar interest rates will rise as traders borrow U.S dollars.
  - The USD/CAD spot rate will fall, as traders sell U.S dollars spot.
  - Canadian dollar interest rates will fall, as traders invest Canadian dollars.
  - The USD/CAD forward rate will rise, as traders buy U.S dollars forward.

## **Solutions – True / False Questions**

**Question 1:** True

**Question 2:** False. The market is pricing in a depreciation of the Canadian Dollar and an appreciation of the US Dollar. That's why for instance the implied volatility of a 20-Delta Call is higher than the implied volatility of a 20-Delta Put. Hence, the price of a 20-Delta Call is higher than the price of a 20-Delta put.

**Question 3:** True

**Question 4:** True

**Question 5:** True

## **Solution to exercises**

### **Exercise 1:**

The currency with the highest 3-month rate is the NZD (New-Zealand Dollar; 2.15%) while the currency with the lowest 3-month rate is the CHF (Swiss Franc; -0.78%).

The carry-trade strategy is implemented as follow:

1. Borrow the equivalent of 1,000,000 USD in CHF at the spot rate of 0.9972 USD/CHF (USD1=CHF 0.9972). You borrow 997,200 CHF at an annual rate of - 0.78% (you will receive the interest payment at the end of the 3-month period!)
2. Buy the equivalent of 997,200 CHF (1,000,000 USD) in NZD at the spot rate of 0.7208 (1 NZD = 0.7208USD, so 1 USD = 1.3873 USD). Purchase of 1,000,000 USD@1.3843 = NZD 1,387,347
3. Lend this NZD-denominated amount at the annual rate of 2.15%

At the end of your 3-month trading period, the payoff from your carry trade strategy is generated from the spot exchange rates variations and from the lending/borrowing interest rate differential.

### **1. Lending/borrowing Interest payment**

- a. Interest income from the CHF borrowing (as CHF interest rate is negative):  
 $997,200 \times 0.78\%/4 = \text{CHF } 1,945$  which is equivalent to USD 1,965 ( $=1,945/0.98947$ ) as the USD/CHF spot is 0.9849
- b. Interest income from the NZD lending:  
 $1,387,347 \times 2.15\%/4 = \text{NZD } 7,457$  which is equivalent to USD 5,285 ( $=7457/1.4108$ ) as the NZD/USD spot is 1.4108.
- c. Total interest income in USD = 7230 or 0.7230% over 3 months, which is very close to the initial interest differential over 3 months ( $2.15\%/4 + 0.78\%/4 = 0.7325\%$ )

## 2. Capital Gain/loss

- a. Refund of the CHF loan in USD : 1,007,812 (=997,200 / 0.98947) as 1 CHF = USD 0.98947. The swiss franc has appreciated over the 3 months period.
- b. Final value of the NZD lending in USD: USD 983,351 (=1,387,347\*0.7088), the NZD has depreciated against the USD.
- c. Total Capital Gain or loss = 983,351 - 1,007,812 = -USD 24,460 or -2.46%  
Depreciation of the NZD:  $(0.70881-0.7208)/0.7208 = -1.67\%$   
Appreciation of the CHF =  $(1/0.98947 - 1/0.9972)/(1/0.9972) = +0.78\%$

Total loss is USD 17,230 or -1.72%

### Exercise 2:

The two currencies with the highest 3-month rates are the NZD (New-Zealand Dollar; 2.15%) and the AUD (Australian Dollar; 1.93%).

You borrow 2,000,000 USD at an annual rate of 1.06% and you buy:

- 1,387,347 NZD (1,000,000 USD at a rate of 0.7208 NZD/USD)
- 1,297,185 AUD (1,000,000 USD at a rate of 0.7709 AUD/USD).

At the end of your 3-month trading period, your NZD-denominated amount, invested at an annual rate of 2.15% is worth  $(1,387,347 * (1 + \frac{0.0215}{4})) = 1,394,804$  NZD while your AUD-denominated amount, invested at an annual rate of 1.93% is now worth  $1,297,185 * (1 + \frac{0.0193}{4}) = 1,303,444$  AUD.

You convert those amounts into USD with the spot FX rates:

1,394,804 NZD = 988,651 USD (0.70881 NZD/USD)

1,303,444 AUD = 966,452 USD (0.7406 AUD/USD)

The total amount earned in USD is thus equal to  $988,651 + 966,452 = 1,955,103$  USD

You still have to pay the interest and the notional on the US amount borrowed:  $2,000,000 * (1 + \frac{0.0106}{4}) = 2,005,300$  USD.

You made a loss of  $1,955,103 - 2,005,300 = 50,197$  USD.