ΑΣΚΗΣΕΙΣ – Κεφάλαιο 4

(Συναλλαγματικός Κίνδυνος & Κίνδυνος Χώρας)

- **13.8, 13.10, 13.21, 13.22, 13.30**
- **14.7, 14.17, 14.18, 14.22, 14.23, 14.24, 14.25**
- **22.32, 22.33, 22.35, 22.36**
- **24.14(a-l), 24.17, 24.18**

13.8. *The following are the foreign currency positions of an FI, expressed in the foreign currency. Remember that in all exercizes "Foreign" is defined as "non USA." The US dollar is the home country currency.*

Currency	***Assets***	***Liabilities***	***FX Bought***	***FX Sold***
Swiss franc (SF)	*SF134,394*	*SF53,758*	*SF10,752*	*SF16,127*
British pound (£)	*£30,488*	*£13,415*	*£9,146*	*£12,195*
Japanese yen (¥)	*¥7,075,472*	*¥2,830,189*	*¥1,132,075*	*¥8,301,887*

The exchange rate of dollars per SFs is 0.9301, of dollars per British pounds is 1.6400, and of dollars per yen is 0.010600. The following are the foreign currency positions converted to dollars.

Currency	***Assets***	***Liabilities***	***FX Bought***	***FX Sold***
Swiss franc (SF)	*$125,000*	*$50,000*	*$10,000*	*$15,000*
British pound (£)	*$50,000*	*$22,001*	*$14,999*	*$20,000*
Japanese yen (¥)	*$75,000*	*$30,000*	*$12,000*	*$88,000*

a. What is the FI's net exposure in Swiss francs stated in SF and in $s?

ANSWER: Net exposure in stated in SFs = SF134,394 - SF53,758 + SF10,752 - SF16,127 = SF75,261
Net exposure in stated in $s = $125,000 - $50,000 + $10,000 - $15,000 = $70,000

b. What is the FI's net exposure in British pounds stated in £ and in $s?

ANSWER: Net exposure in £ = £30,488 - £13,415 + £9,146 - £12,195= £14,024
Net exposure in $ = $50,000 - $22,001 + $15,000 - $20,000 = $22,999

c. *What is the FI's net exposure in Japanese yen stated in ¥s and in $s?*

ANSWER: Net exposure in ¥ = ¥7,075,472 - ¥2,830,189 + ¥1,132,075 - ¥8,301,887= - ¥2,924,529
Net exposure in $ = $75,000 - $30,000 + $12,000 - $88,000 = -$31,000

d. What is the expected loss or gain if the SF exchange rate appreciates by 1 percent? State your answer in SFs and $s.

ANSWER: If assets are greater than liabilities, then an appreciation of the foreign exchange rates will generate a gain = SF75,261 x 0.01 = SF7,261, or $70,000 x 0.01 = $7,000.

e. What is the expected loss or gain if the £ exchange rate appreciates by 1 percent? State your answer in £s and $s.

ANSWER: Gain = £14,024 x 0.01 = $140, or $22,999 x 0.01 = $230

f. What is the expected loss or gain if the ¥ exchange rate appreciates by 2 percent? State your answer in ¥s and $s.

ANSWER: Loss = - ¥2,924,529 x 0.02 = -$58,491 or -$31,000 x 0.02 = -$620

13.10. *City Bank issued $200 million of one-year CDs in the United States at a rate of 6.50 percent. It invested part of this money, $100 million, in the purchase of a one-year bond issued by a U.S. firm at an annual rate of 7 percent. The remaining $100 million was invested in a one-year Brazilian government bond paying an annual interest rate of 8 percent. The exchange rate at the time of the transaction was Brazilian real 0.50/$1.*

a. What will be the net return on this $200 million investment in bonds if the exchange rate between the Brazilian real and the U.S. dollar remains the same?

ANSWER: Brazilian bonds issued in reals = $100m/0.50 = Real 200m

Cost of funds	=	0.065 x $200 million	=	$13,000,000
Return on U.S. loan	=	0.07 x $100 million		= $ 7,000,000
Return on Brazilian bond	=	(0.08 x Real 200m) x 0.50		= $ 8,000,000
Total interest earned				= $15,000,000

Net return on investment = ($15 million - $13 million)/$200 million = 1.00 percent.

b. What will be the net return on this $200 million investment if the exchange rate changes to real 0.4167/$1?

ANSWER:

Cost of funds	=	0.065 x $200 million	= $13,000,000
Return on U.S. loan	=	0.07 x $100 million	= $ 7,000,000
Return on Brazilian bond	=	(0.08 x Real 200m) x 0.4167	= $ 6,667,200
Total interest earned			= $13,667,200

Net return on investment = $13,666,667 - $13,000,000/$200,000,000 = 0.33 percent.

Consideration should be given to the fact that the Brazilian bond was for Real200 million. Thus, at maturity the bond will be paid back for Real200 million x 0.4167 = $83,340,000. Therefore, the strengthening dollar will have caused a loss in capital ($16,660,000) that far exceeds the interest earned on the Brazilian bond. Including this capital loss, the net return on investment is:

Net return on investment = ($13,666,667 - $13,000,000 - $16,666,667))/$200,000,000 = -8%

c. *What will be the net return on this $200 million investment if the exchange rate changes to real 0.625/$1?*

ANSWER:

Cost of funds	=	0.065 x $200 million	= $13,000,000
Return on U.S. loan	=	0.07 x $100 million	= $ 7,000,000
Return on Brazilian bond = (0.08 x Real 200m) x 0.625			= $10,000,000
Total interest earned			= $17,000,000

Net return on investment = $17,000,000 - $13,000,000/$200,000,000 = 2.00 percent.

Consideration should be given to the fact that the Brazilian bond was for Real200 million. Thus, at maturity the bond will be paid back for Real200 million x 0.625 = $125,000,000. Therefore, the strengthening real will have caused a gain in capital of $25,000,000 in addition to the interest earned on the Brazilian bond. Including this capital loss, the net return on investment is:

Net return on investment = ($17,000,000 - $13,000,000 + $25,000,000)/$200,000,000 = 14.50%

13.21. *North Bank has been borrowing in the U.S. markets and lending abroad, thus incurring foreign exchange risk. In a recent transaction, it issued a one-year, $2 million CD at 6 percent and funded a loan in euros at 8 percent. The spot rate for the euro was €1.45/$1 at the time of the transaction.*

a. *Information received immediately after the transaction closing indicated that the euro will change to €1.47/$1 by year-end. If the information is correct, what will be the realized spread on the loan inclusive of principal? What should have been the bank interest rate on the loan to maintain the 2 percent spread?*

ANSWER:

Amount of loan in € = $2 million x 1.45 = €2.9 million
Interest and principal at year-end = €2.9m x 1.08 = €3.132m/1.47 = $2,130,612.24
Interest and principal of CDs = $2m x 1.06 = $2,120,000
Net interest income = $2,130,612.24 – $2,120,000 = $10,612.24
Net interest margin = $10,612.24/2,000,000 = 0.0053 or 0.53 percent

In order to maintain a 2 percent spread, the interest and principal earned at €1.47/$ should be:
€2.9m(1 + x)/1.47 = $2.16m (Because ($2.16m - $2.12m)/$2.00m = 0.02, or 2%).
Therefore, (1 + x) = ($2.16m x 1.47)/ €2.9m = 1.0949, and x = 0.0949 or 9.49 percent,
or the bank should have charged a rate of 9.49 percent on the loan.

b. The bank had an opportunity to sell one-year forward euros at €1.46/$1. What would have been the spread on the loan if the bank had hedged forward its foreign exchange exposure?

ANSWER:
Net interest income if hedged = €2.9m x 1.08 = €3.132m/1.46 = $2.1452m - $2.12m
= $0.0252 million, or $25,205.48
Net interest margin = $0.0252m/$2m = 0.0126, or 1.26 percent

c. What would have been an appropriate change in loan rates to maintain the 2 percent spread if the bank intended to hedge its exposure using the forward contracts?

ANSWER: To maintain a 2 percent spread: €2.9m (1 + x)/1.46 = $2.16m => x = 8.74 percent
The bank should increase the loan rate to 8.74 percent and hedge with the sale of forward €s to maintain a 2 percent spread.

13.22. (**Προαιρετική**) *A bank purchases a six-month, $1 million Eurodollar deposit at an annual interest rate of 6.5 percent. It invests the funds in a six-month Swedish krone AA-rated bond paying 7.5 percent per year. The current spot rate is $0.18/SK1.*

a. The six-month forward rate on the Swedish krone is being quoted at $0.1810/SK1. What is the net spread earned on this investment if the bank covers its foreign exchange exposure using the forward market?

ANSWER: Interest plus principal expense on six-month CD = $1m x (1 + 0.065/2) = $1,032,500
Principal of Swedish bond = $1,000,000/0.18 = SK5,555,555.56
Interest and principle = SK5,555,555.56 x (1 + 0.075/2) = SK 5,763,888.89
Interest and principle in dollars if hedged: SK 5,763,888.89 x 0.1810 = $1,043,263.89
Spread = $1,043,263.89 - 1,032,500 = $10,763.89/1 million = 0.010764 for 6 months, or 2.15 percent annually

b. What forward rate will cause the spread to be only 1 percent per year?

ANSWER: In this case, net interest income should be = (0.01/2) x 1,000,000 = $5,000

Therefore, interest income should be = $1,043,263.86 - $5,000 = $1,038,263.86

Forward rate = $1,038,263.86/SK5,763,888.89 = $0.18/SK1
For the spread to be 1% the spot and the forward need to be equal.

c. Explain how forward and spot rates will both change in response to the increased spread?

ANSWER: If FIs are able to earn higher spreads in other countries and guarantee these returns by using the forward markets, these are equivalent to risk-free investments (except for default risk). As a result, in part (a), there will be an increase in demand for the Swedish krone in the spot market and an increase in sales of the forward Swedish krone as more FIs engage in this kind of lending. This results in an appreciation of the spot krone rate and a depreciation of the forward krone rate until the spread is zero for securities of equal risk.

d. Why will a bank still be able to earn a spread of 1 percent knowing that interest rate parity usually eliminates arbitrage opportunities created by differential rates?

ANSWER: In part (b), the FI is still able to earn a spread of one percent because the risks of the securities are not equal. The FI earns an extra one percent because it is lending to an AA-rated firm. The dollar-denominated deposits in the Eurocurrency markets are rated higher because these deposits usually are issued by large institutions. Thus, the one percent spread reflects credit or default risk. If the FI were to invest in securities of equal risk in Sweden, arbitrage would ensure that the spread is zero.

13.30. (Η ερώτηση απαιτεί γνώση της άλγεβρας διαφοροποίησης χαρτοφυλακίου)

An FI has $100,000 of net positions outstanding in British pounds (£) and -$30,000 in Swiss francs (SF). The standard deviation of the net positions as a result of exchange rate changes is 1 percent for the SF and 1.3 percent for the £. The correlation coefficient between the changes in exchange rates of the £ and the SF is 0.80.

a. What is the risk exposure to the FI of fluctuations in the £/$ rate?

ANSWER: Since the FI has a positive £ position, an appreciation of the £ will increase the value of its £-denominated assets more than its liabilities, providing a net gain. The opposite will occur if the £ depreciates.

b. What is the risk exposure to the FI of fluctuations in the SF/$ rate?

ANSWER: Since the FI has a negative net position in SFs, the value of its Swiss-denominated assets will increase in value, but not as much as the value of its liabilities. Hence, an appreciation of the SF will lead to a net loss. The opposite will occur if the currency depreciates.

c. What is the risk exposure if both the £ and the SF positions are combined?

ANSWER: Use the formula:

$$\sigma_p = \sqrt{(100)^2(1)^2 + (-30)^2(1.3)^2 + 2(1)(1.3)(100)(-30)(0.8)} \qquad = \$72{,}671$$

The FI's net position is actually $72,671. Without including correlation, the exposure is estimated at $100,000 - $30,000 = $70,000.

14.7. *Countries A and B have exports of $2 billion and $6 billion, respectively. The total interest and amortization on foreign loans for both countries are $1 billion and $2 billion, respectively.*

a. What is the debt service ratio (DSR) for each country?

ANSWER:

$$\text{DSR} = \frac{\textit{Interest Plus Amortization}}{\textit{Total Exports}}$$

DSR_A = $1b/$2b = 0.50 DSR_B = $2b/$6b = 0.33

b. Based only on this ratio, to which country should lenders charge a higher risk premium?

ANSWER: Based on the above information, lenders should charge a higher risk premium on loans to Country A because it has more interest and amortization payments due as a percentage of total exports.

c. What are the shortcomings of using only these ratios to determine your answer in part (b)?

ANSWER: This is a very static model and such a preliminary conclusion could be misleading. It is also necessary to consider other factors which may be more favourable for Country A. Looking forward, it is also possible that Country A may be at its developing stage where imports and loans are needed to increase future exports. Historically, most of the industrialized countries were net importers of capital during their developing stages. Without a comprehensive analysis of the fundamentals, it is not possible to judge the quality of the borrower.

14.17. *Chase Bank holds a $200 million loan to Argentina. The loans are being traded at bid-offer prices of 91-93 per 100 in the London secondary market.*

a. If Chase has an opportunity to sell this loan to an investment bank at a 7 percent discount, what are the savings after taxes compared with the revenue from selling the loan in the secondary market? Assume the tax rate is 40 percent.

ANSWER: The price that Chase could obtain from the investment bank is $200m (1 – 0.07) = $186m. The tax loss benefit is $14m x 0.40 = $5.6m, for a net price of $186m + $5.6m = $191.60m.

In the secondary market, Chase would have had to sell the loans at 91cents on the dollar or $182 million. The tax loss benefit is $18m x 0.40 = $7.2m for a net price of $189.20. Therefore, the savings from selling the loans to the investment bank as opposed to the secondary market is $191.60m - $189.20m = $2.4 million.

b. *The investment bank in turn sells the debt at a 6 percent discount to a real estate company planning to build apartment complexes in Argentina. What is the profit after taxes to the investment bank?*

ANSWER: The investment bank purchased the loan for $186 million, and it sells the loan for $188 million [$200m (1 – 0.06) = $188m]. Thus, profit before taxes is $188m - $186m = $2 million and profit after taxes is $2m (1 - 0.40) = $1.20 million.

c. *The real estate company converts this loan into pesos under a debt-for-equity swap organized by the Argentinian government. The official rate for dollar to peso conversion is P1.05/$1. The free market rate is P1.10/$1. How much did the real estate company save by investing in Argentina through the debt-for-equity swap program as opposed to directly investing $200 million using the free market rates?*

ANSWER: If the real estate company had invested directly, it would have received $200m x 1.10 = 220 million pesos. By purchasing through the debt-for-equity swap, the company pays $188 million and receives $200m x 1.05 = 210 million pesos, for an equivalent rate of 210m/188m = P1.117/$. Thus, it still saves by purchasing through the debt-for-equity swap (P1.117/$ > P1.10/$).

d. *How much would Chase benefit from doing a local currency debt-for-equity swap itself? Why does the bank not do this swap?*

ANSWER: Assuming the bank could convert the loan at $200 million in to pesos at P1.05/$, receiving $200m x 1.05 = 210 million pesos. The actual benefit was $191.6 million. Thus, the bank would gain $8.4 million.
Chase is not allowed to participate in real equity purchases in other countries by Federal Reserve Regulation K, nor is it allowed to engage in commerce in other countries. Further, a long-term pesos-denominated position on the balance sheet may create more credit, liquidity, and foreign exchange risk than the benefits are worth.

14.18 . *Hellenic Company plans to invest $20 million in Chile to expand its subsidiary's manufacturing output. Hellenic has two options. It can convert the $20 million at the current exchange rate of 410 pesos to a dollar (i.e., P410/$1), or it can engage in a debt-for-equity swap with its bank, City Bank, by purchasing Chilean debt and then swapping that debt into Chilean equity investments.*

a. *If City Bank quotes bid-offer prices of 94-96 for Chilean loans, what is the bank expecting to receive from Zlick Corporation (ignore taxes)? Why would City Bank want to dispose of this loan?*

ANSWER: City Bank expects to receive 96 cents to the dollar since it is selling this loan, i.e. 0.96 x 20m = $19.20 million. It may wish to sell this loan to reduce its portfolio of troubled or bad quality assets. As U.S. banks experienced problems with several of their foreign loans, their choices were limited to either writing off the loans or disposing of them. The development of an active secondary market has made it easier for FIs to sell them at a discount and rearrange their composition of loans.

b. If Hellenic decides to purchase the debt from City Bank and convert it to equity, it will have to exchange it at the official rate of P400/$1. Is this option better than investing directly in Chile at the free market rate of P410/$1?

ANSWER: If exchanged at market rates: $20m x P410 = P8,200 million, for an effective rate of P410/$. If exchanged through a debt-for-equity swap: $20m x P400 = P8,000 million, for an effective price of P8,000m/$19.20m = P416.67/$. Therefore, Hellenic should choose the debt-for-equity swap option.

c. What official exchange rate will cause Hellenic to be indifferent between the two options?

ANSWER: For the options to be equal, the effective price must be:

($20m x X)/$19.20m = P410 => X = (P410 x $19.20m)/$20m = P393.60/$

The Chilean government could reduce the official rate to as low as P393.60/$ and the two options will still be equal. This is because the discount obtained from the secondary market is substantial.

14.22. *A bank is in the process of renegotiating a sovereign loan. The principal outstanding is $50 million and is to be paid back in two instalments of $25 million each, plus interest of 8 percent. The new terms will stretch the loan out to five years with only interest payments of 6 percent, no principal payments, for the first three years. The principal will be paid in the last two years in payments of $25 million along with the interest. The cost of funds for the bank is 6 percent for both the old loan and the renegotiated loan. An up-front fee of 1 percent is to be included for the renegotiated loan.*

a. What is the present value of the existing loan for the bank?

ANSWER: The present value of the loan prior to rescheduling is:

Payment in Year 1: Principal + Interest = $25m + 0.08 x $50m = $29m
Payment in Year 2: Principal + Interest = $25m + 0.08 x $25m = $27m
PV = $PV_{n=1, k=6}$ ($29m) + $PV_{n=2, k=6}$ ($27m) = $51.3884 million

b. What is the present value of the rescheduled loan for the bank?

ANSWER: Interest payments in years 1, 2 and 3: 0.06 x $50 = $3m
Payment in Year 4: Principal + Interest = $25m + 0.06 x $50m = $28m
Payment in Year 5: Principal + Interest = $25m + 0.06 x $25m = $26.5m
PV = $PVA_{n=3, k=6}$ ($3m) + $PV_{n=4, k=6}$ ($28m) + $PV_{n=5, k=6}$ ($26.5m) = $50 million
Up-front fee = 0.01 x $50m = $0.50 million
PV (total) = $50.50 million

c. *Is the concessionality positive or negative for the bank?*

ANSWER: Concessionality = PV_o - PV_R = PV of old loan - PV of rescheduled loan
= $51.3884m - $50.50m = $0.884 million

14.23. *A bank is in the process of renegotiating a three-year nonamortizing loan. The principal outstanding is $20 million, and the interest rate is 8 percent. The new terms will extend the loan to 10 years at a new interest rate of 6 percent. The cost of funds for the bank is 7 percent for both the old loan and the renegotiated loan. An up-front fee of 50 basis points is to be included for the renegotiated loan.*

a. What is the present value of the existing loan for the bank?

ANSWER: PV of old loan = $PVA_{n=3,k=7\%}(\$1.6m) + PV_{n=3,k=7\%}(\$20m) = \$20.5249$ million

b. What is the present value of the rescheduled loan for the bank?

ANSWER: PV of new loan = $PVA_{n=10,k=7\%}(\$1.2m) + PV_{n=10,k=7\%}(\$20m)$ + up-front fee of $0.10m
= $18.5953 million + $0.10 million = $18.6953 million

c. What is the concessionality for the bank?

ANSWER: Concessionality = $20.5249m - $18.6953m = $1.8296 million

d. What should be the up-front fee to make the concessionality zero?

ANSWER: Concessionality = $20.5249m - $18.5953m - x = 0 $\Rightarrow$ x = $1.9296 million or 9.65 percent.

14. 24. *A $20 million loan outstanding to the Nigerian government is currently in arrears with City Bank. After extensive negotiations, City Bank agrees to reduce the interest rates from 10 percent to 6 percent and to lengthen the maturity of the loan to 10 years from the present 5 years remaining to maturity. The principal of the loan is to be paid at maturity. There will no grace period and the first interest payment is expected at the end of the year.*

a. If the cost of funds is 5 percent for the bank, what is the present value of the loan prior to the rescheduling?

ANSWER: Interest payments in years 1 - 5: 0.10 x $20m = $2m
PV = $PVA_{n=5,k=5}(\$2m) + PV_{n=5,k=5}(\$20m) = \$24.3295$ million

b. What is the present value of the rescheduled loan to the bank?

ANSWER: Interest payments in years 1 - 10: 0.06 x $20m = $1.2m
PV = $PVA_{n=10,k=5}(\$1.2m) + PV_{n=10,k=5}(\$20m) = \$21.5443$ million

c. What is the concessionality of the rescheduled loan if the cost of funds remains at 5 percent and an up-front fee of 5 percent is charged?

ANSWER: Up-front fee = 0.05 x $20m = $1 million
PV (total) = $21.5443 million + $1 million = $22.5443 million
Concessionality = $PV_o - PV_R$ = PV of old loan - PV of rescheduled loan
= $24.3259m - $22.5443m = $1.7852 million

d. What up-front fee should the bank charge to make the concessionality equal zero?

ANSWER: The bank has to increase its up-front fees by $1.7852 for a total of $2.7852, or 13.93%.

14.25. *A bank was expecting to receive $100,000 from a loan issued to the Spanish government. Since Spain has problems repaying the loan immediately, the bank extends the loan for another year at the same interest rate of 10 percent. However, in the rescheduling agreement, the bank reserves the right to exercise an option for receiving the payment in British pounds, equal to €87,813, converted at the current exchange rate of €0.7983/$.*

a. If the cost of funds to the bank is also assumed to be 10 percent, what is the value of this option built into the agreement if only two possible exchange rates are expected at the end of the year, €0.8467/$ or €0.7499/$, with equal probability?

ANSWER: Without the option, the amount expected at the end of the year = $110,000. If the euro depreciates to €0.8467/$, the amount received by the bank is the maximum of $110,000, or €87,813/0.8467 = $103,712.06. If the euro appreciates to €0.7499/$, the amount received by the bank is the maximum of $110,000, or €87,813/0.7499 = $117,099.61. With the option, the expected amount received is 0.50($110,000) + 0.50($117,099.61) = $113,549.81. The present value of the option is $113,549.81 - $110,000 = $3,549.81/1.1 = $3,227.10

b. How would your answer differ, if the probability of the exchange rate being €0.8467/$ is 70 percent and that of €0.7499/$ is 30 percent?

ANSWER: With the option, the expected amount received is 0.70($110,000) + 0.30($117,099.61) = $112,129.98. The present value of the option = $112,129.88 - $110,000 = $2,129.88/1.1 = $1,936.25.

c. Does the currency option have more or less value as the volatility of the exchange rate increases?

ANSWER: The option will have more value as the volatility of the exchange rate increases.

22.32. *An FI has assets denominated in British pounds of $125 million and pound liabilities of $100 million. The exchange rate of dollars for pounds is currently $1.60/£.*

a. What is the FI's net exposure?

ANSWER: The net exposure is $125 million - $100 million = $25 million.

b. *Is the FI exposed to a dollar appreciation or depreciation?*

ANSWER: The FI is exposed to dollar appreciation, or declines in the pound relative to the dollar.

c. *How can the FI use futures or forward contracts to hedge its FX rate risk?*

ANSWER: The FI can hedge its FX rate risk by selling forward or futures contracts in pounds, assuming the contracts are quoted as $/£, that is, in direct quote terms in the U.S.

d. *If a futures contract is currently trading at $1.55/£, what is the number of futures contracts that must be utilized to fully hedge the FI's currency risk exposure? Assume the contract size on the British pound futures contract is £62,500.*

ANSWER: Assuming that the contract size for British pounds is £62,500, the FI must sell N_f = ($25 million/1.55)/£62,500 = 258 pound sterling futures contracts.

e. *If the British pound exchange rate falls from $1.60/£ to $1.50/£, what will be the impact on the FI's cash position?*

ANSWER: The cash position will experience a loss if the pound depreciates in terms of the U.S. dollar. The loss would be equal to (($25 million/$1.60) x 1.50) - $25 million = $23,437,500 - $25 million = -$1,562,500.

f. *If the British pound futures exchange rate falls from $1.55/£ to $1.45/£, what will be the impact on the FI's futures position?*

ANSWER: The gain on the short futures hedge is:

$$N_F \times £62{,}500 \times \Delta F_t = -258(£62{,}500)(\$1.45 - \$1.55) = +\$1{,}612{,}500$$

g. *Using the information in parts (e) and (f), what can you conclude about basis risk?*

ANSWER: In cases where basis risk occurs, a perfect hedge is not possible.

22.33. *An FI is planning to hedge its one-year, 100 million Swiss franc (SF)-denominated loan against exchange rate risk. The current spot rate is $0.60/SF. A 1-year SF futures contract is currently trading at $0.58/SF. SF futures are sold in standardized units of SF125,000.*

a. *Should the FI be worried about the SF appreciating or depreciating?*

ANSWER: The FI should be worried about the SF depreciation because it will provide fewer dollars per SF.

b. *Should the FI buy or sell futures to hedge against exchange rate risk exposure?*

ANSWER: The FI should sell SF futures contracts to hedge this exposure.

c. How many futures contracts should the FI buy or sell if a regression of past changes in the spot exchange rates on changes in future exchange rates generates an estimated slope of 1.4?

ANSWER: N_f = (Long asset position x h□/(Futures contract size) = SF100m x 1.4/SF125,000 = 1,120 contracts

d. Show exactly how the FI is hedged if it repatriates its principal of SF100 million at year-end, the spot exchange rate of SF at year-end is $0.55/SF, and the forward exchange rate is $0.5443/SF.

ANSWER: The original loan in dollars = SF100 x $0.60 = $60 million, and the loan value in dollars at year-end = SF100 x $0.55 = $55 million. The balance sheet has decreased in value by $5,000,000. The gain from hedge = ($0.58 - $0.5443) x SF125,000 x 1,120 = $4,998,000. The net loss is reduced to just $2,000 by hedging the FX rate risk.

22.35. *An FI has made a loan commitment of SF10 million that is likely to be taken down in six months. The current spot rate is $0.60/SF.*

a. Is the FI exposed to the dollar's depreciating or appreciating relative to the SF? Why?

ANSWER: The FI is exposed to the dollar depreciating, because it would require more dollars to purchase the SF10 million if the loan is drawn down as expected.

b. If the spot rate six months from today is $0.64/SF, what amount of dollars is needed if the loan is taken down and the FI is unhedged?

ANSWER: The FI needs $0.64 x SF10 million = $6.4 million to make the SF-denominated loan.

c. If the FI decides to hedge using SF futures, should it buy or sell SF futures?

ANSWER: The FI should buy SF futures if it decides to hedge against the depreciation of the dollar.

d. A six-month SF futures contract is available for $0.61/SF. What net amount would be needed to fund the loan at the end of six months if the FI had hedged using the SF10 million futures contract? Assume that futures prices are equal to spot prices at the time of payment (i.e., at maturity).

ANSWER: If it has hedged using futures, the FI will gain ($0.64 - $0.61) x SF10 million = $300,000 on its futures position. Thus, the net payment will be $6.1 million.

22.36. *A U.S. FI has assets denominated in Swiss francs (SF) of 75 million and liabilities of 125 million. The spot rate is $0.6667/SF, and one-year futures are available for $0.6579/SF.*

a. What is the FI's net exposure?

ANSWER: The net exposure is –SF50 million.

b. Is the FI exposed to dollar appreciation or depreciation relative to the SF?

ANSWER: The FI is exposed to depreciation of the dollar. If the dollar weakens, the FI will need to pay more dollars to cover its SF liabilities than it will receive for its assets.

c. If the SF spot rate changes from $0.6667/SF to $0.6897/SF, how will this impact the FI's currency exposure? Assume no hedging.

ANSWER: The loss would be SF50,000,000($0.6667 - $0.6897) = -$1,150,000.

d. What is the number of futures contracts necessary to fully hedge the currency risk exposure of the FI? The contract size is SF125,000 per contract.

ANSWER: The number of contracts = SF50,000,000/SF125,000 = 400 contracts.

e. If the SF futures exchange rate falls from $0.6579/SF to $0.6349/SF, what will be the impact on the FI's futures position?

ANSWER: The loss on the futures position would be 400 contracts x SF125,000 x ($0.6349 - $0.6579) = -$1,150,000.

24.14. *A Swiss bank issues a $100 million, three-year Eurodollar CD at a fixed annual rate of 7 percent. The proceeds of the CD are lent to a Swiss company for three years at a fixed rate of 9 percent. The spot exchange rate is SF1.50/$.*

a. Is this expected to be a profitable transaction?

ANSWER: This transaction is expected to be profitable since the spread is 2 percent.

b. What are the cash flows if exchange rates are unchanged over the next three years?

ANSWER: The 2 percent spread on $100 million (SF150 million) is $2 million. Converting into Swiss francs at the spot exchange rate yields an annual expected cash flow of SF3 million. The cash flows are as follows:

t	Eurodollar CD Cash Outflow (US$)	Swiss loan (SF)	cash inflow (SF)	Spread (SF)
1	7m	10.5m13.5m	3m	
2	7m	10.5m13.5m	3m	
3	107m	160.5m163.5m	3m	

c. *What is the risk exposure of the bank's underlying cash position?*

ANSWER: This spread will be reduced or eliminated if the SF depreciates relative to the U.S. dollar. That is, if it takes more SFs to purchase U.S. dollars, it will be more costly for the bank to repay the Eurodollar CD using SF loan proceeds.

d. How can the Swiss bank reduce that risk exposure?

ANSWER: The Swiss bank can undertake a short currency hedge if it wants to protect itself against exchange rate risk exposure.

e. If the US dollar is expected to appreciate against the SF to SF1.65/$, SF1.815/$, and SF2.00/$ over the next three years, respectively, what will be the cash flows on this transaction?

ANSWER:

t	Eurodollar CD Cash Outflow (US$)	Swiss loan (SF)	cash inflow (SF)	Spread (SF)
1	7m	11.550m	13.5m	1.950m
2	7m	12.705m	13.5m	0.795m
3	107m	214.000m	163.5m	(50.500m)

f. If the Swiss bank swaps US$ payments for SF payments at the current spot exchange rate, what are the cash flows on the swap? What are the cash flows on the entire hedged position? Assume that the U.S. dollar appreciates at the rates in part (e).

ANSWER:

t	Cash flow (SF)	Swap payments(SF)	Net swap cash flow (SF)	Total cash flow
1	11.55m	10.5m1.05m	3m	
2	12.705m	10.5m2.205m	3m	
3	214.00m	160.5m53.5m	3m	

The cash flows of the underlying cash position from part (e) are added to the net cash flows from the swap hedge (column four) to give the total cash flows in column five. That is, at the end of the first year, the spread on the loan CD is SF1.95m. The swap generates a net cash flow of SF1.05m for a total end of year 1 spread of SF3 million. At the end of year 2, the SF0.795m loan CD spread plus the SF2.205m net swap cash flow equals SF3m. At the end of year 3, the SF50.5m loss on the loan CD position is offset by the SF53.5m gain on the swap for a total cash flow of SF3m. Therefore, the hedged position locks in the annual 2 percent spread.

g. What are the cash flows on the swap and the hedged position if actual spot exchange rates are as follows:

End of year 1: SF1.55/US$
End of year 2: SF1.47/US$
End of year 3: SF1.48/US$

ANSWER:

t	CD cash flow (SF)	Swap payments(SF)	Net swap cash flow (SF)	Total cash flow
1	10.85m	10.5m0.35m	3m	
2	10.29m	10.5m(0.21m)	3m	
3	158.36m	160.5m(2.14m)	3m	

Total end of year 1 cash flows are net swap cash flows of SF0.35m plus the loan - CD spread of SF2.65m (SF13.5m - SF10.85m). Total end of year 2 cash flows are -SF0.21m on the swap plus SF3.21m (SF13.5m - SF10.29m). End of year 3 cash flows are -SF2.14m on the swap plus SF5.14m on the loan - CD spread (SF163.5m - SF158.36m). The loan cash flows in SF are given in column four of part (e).

h. What would be the bank's risk exposure if the fixed-rate Swiss loan was financed with a floating rate U.S. $100 million, three-year Eurodollar CD?

ANSWER: The Swiss bank is now exposed to both exchange rate risk and interest rate risk. If the Sf depreciates against the U.S. dollar and/or the Eurodollar CD floating rate increases, the spread on the unhedged position will be reduced.

i. What type(s) of hedge is appropriate if the Swiss bank in part (h) wants to reduce its risk exposure?

ANSWER: If the bank wants to hedge its risk exposure, it should enter a short currency hedge and a short interest rate hedge.

j. If the annual Eurodollar CD rate is set at LIBOR and LIBOR at the end of years 1, 2, and 3 is expected to be 7 percent, 8 percent, and 9 percent, respectively, what will be the cash flows on the bank's unhedged cash position? Assume no change in exchange rates.

ANSWER:

t	Eurodollar CD cash outflow (US$)	Swiss loan (SF)	cash inflow (SF)	Spread (SF)
1	7m	10.5m13.5m	3m	
2	8m	12.0m13.5m	1.5m	
3	109m	163.5m163.5m	0m	

The spread on the underlying cash position is reduced when rates increase even if exchange rates are held constant.

k. What are the cash flows on the bank's unhedged cash position if exchange rates are as follows:

End of year 1: SF1.55/US$
End of year 2: SF1.47/US$
End of year 3: SF1.48/US$

ANSWER:

t	Eurodollar CD cash outflow (US$)	Swiss loan (SF)	cash inflow (SF)	Spread (SF)
1	7m	10.85m13.5m	2.65m	
2	8m	11.76m13.5m	1.74m	
3	109m	161.32m	163.5m	2.18m

Without the swap, the cost to the bank of meeting the Eurodollar CD payments at the end of year 1 would be SF10.85m (US$7m x 1.55). At the end of year 2 the cost would be SF11.76m (US$8m x 1.47). At the end of year 3, the cost would be SF161.32m (US$109m x 1.48).

l. What are both the swap and total hedged position cash flows if the bank swaps out its floating rate US$ CD payments in exchange for 7.75 percent fixed-rate SF payments at the current spot exchange rate of SF1.50/$?

ANSWER:

t	Cash flow (SF)	Swap payments(SF)	Net swap cash flow (SF)	Total cash flow
1	10.85m	$7.75mx1.5=11.625m(0.775m)	1.875m	
2	11.76m	$7.75mx1.5=11.625m0.135m	1.875m	
3	161.32m	$107.75mx1.5=161.625m(0.305m)	1.875m	

The total cash flows are:

End of year 1 = swap loss of SF0.775m plus spread of SF2.65m.
End of year 2 = swap gain of SF0.135m plus spread of SF1.74m.
End of year 3 = swap loss of SF0.305m plus spread of SF2.18m.

The swap hedge locks in both an interest spread of 1.25 percent (9% - 7.75%) and an exchange rate of SF1.5. Based on a face value of $100m (SF150m), this yields a profit of $1.25m or SF1.875 million each year.

24.17 *Consider the following currency swap of coupon interest on the following assets:*
5 percent (annual coupon) fixed-rate U.S. $1 million bond
5 percent (annual coupon) fixed-rate bond denominated in Swiss francs (SF)
Spot exchange rate: SF1.5/$

a. What is the face value of the SF bond if the investments are equivalent at spot rates?

ANSWER: U.S. $1 million is equivalent to SF1.5 million face value.

b. What are the realized cash flows, assuming no change in spot exchange rates? What are the net cash flows on the swap?

ANSWER: Interest payments on the U.S. bond are 0.05(U.S.$1 million) = $50,000. In Swiss francs, interest payments are 0.05(SF1.5 million) = SF75,000. At spot exchange rates, these two cash flows are identical. There are no net swap cash flows.

c. *What are the cash flows if the spot exchange rate falls to SF0.50/$? What are the net cash flows on the swap?*

ANSWER: Coupon payments on the U.S. bond are $50,000, which is equivalent to SF25,000. Coupon payments on the Swiss franc bond are SF75,000, which is equivalent to $150,000. The net cash flows on the swap are $100,000, or SF50,000. The counterparty that swaps in Swiss franc bond payments receives the cash flows. The counterparty that swaps in the U.S. dollar payments makes the payments.

d. *What are the cash flows if the spot exchange rate rises to SF2.25/$? What are the net cash flows on the swap?*

ANSWER: Coupon payments on the U.S. bond are $50,000, which is equivalent to SF112,500. Coupon payments on the Swiss franc bond are SF75,000, which is equivalent to $33,333. The net cash flows on the swap are $16,667, or SF37,500. The counterparty that swaps in U.S. dollar bond payments receives the cash flows. The counterparty that swaps in the Swiss franc payments makes the payments.

e. *Describe the underlying cash position that would prompt the FI to hedge by swapping dollars in exchange for Swiss francs.*

ANSWER: The FI is swapping dollar cash flows in exchange for Swiss francs so as to balance a U.S. dollar-denominated liability.

24.18. *Consider the following fixed-floating-rate currency swap of assets: 5 percent (annual coupon) fixed-rate U.S. $1 million bond and floating-rate SF1.5 million bond set at LIBOR annually. Currently LIBOR is 4 percent. The face value of the swap is SF1.5 million. The spot exchange rate is SF1.5/$.*

a. *What are the realized cash flows on the swap at the spot exchange rate?*

ANSWER: Coupon payments on the U.S. bond are $50,000, which is equivalent to SF75,000. Coupon payments on the Swiss franc bond are SF60,000 at the spot rate of LIBOR of 4%, which is equivalent to $40,000. The net cash flows on the swap are $10,000, or SF15,000. The counterparty that swaps in U.S. dollar bond payments receives the cash flows. The counterparty that swaps in the Swiss franc payments makes the payments.

b. *If the 1-year forward rate is SF1.538 per US$, what are the realized net cash flows on the swap? Assume LIBOR is unchanged.*

ANSWER: Coupon payments on the U.S. bond are $50,000, which at forward rates, is equivalent to SF76,900. Coupon payments on the Swiss franc bond are SF60,000, which is equivalent to $39,012. The net cash flows on the swap are $10,988, or SF16,900. The counterparty that swaps in U.S. dollar bond payments receives the cash flows. The counterparty that swaps in the Swiss franc payments makes the payments.

c. If LIBOR increases to 6 percent, what are the realized cash flows on the swap? Evaluate at the forward rate.

ANSWER: Coupon payments on the U.S. bond are $50,000, which at forward rates, is equivalent to SF76,900. Coupon payments on the Swiss franc bond are SF90,000 at the spot rate of LIBOR of 6 percent, which is equivalent to $58,518. The net cash flows on the swap are U.S. $8,518, or SF13,100. The counterparty that swaps in Swiss franc bond payments receives the cash flows. The counterparty that swaps in the U.S. dollar payments makes the payments.