

Quiz 3 Solutions
International Finance Management
C45.0030.001

10/27/03

Total points: 20, Time: 20 min

Q I. (5 points) (please answer only one of the two questions):

Suppose you expect that Yen will appreciate versus the US\$ in the coming 90 days. The current spot rate is Yen120/\$. You expect an appreciation to Yen110/\$. The following options are available to you:

<i>Option</i>	<i>Strike Price</i>	<i>Premium</i>
Put on Yen	Yen115/\$	\$0.0002/Yen
Call on Yen	Yen115/\$	\$0.0001/Yen

a. What option would you buy to speculate on the expected appreciation of Yen? Why?

(2.5 points) We need to purchase a call option on the Yen. (I am emphasizing the underlying currency because a call option on the Yen is effectively a put option on the US\$ - why?). Buying a call option locks in the buy price on the yen of Yen115/\$ or \$0.008695/Yen. Since we expect an appreciation of the yen, locking a buy price on the yen is the best strategy.

b. What is the intrinsic value of each of the options, if the current spot rate is Yen 130/\$?

(2.5 points) Know that the intrinsic value of the option is the value if exercised immediately. To compute, for the call option, the value is $(\text{Yen } 130 - \text{Yen } 115)/\$ = \text{Yen } 15/\$$. For the put option, the value is 0 since it would not be worth exercising (why?).

2. Suppose you expect that Canadian dollar will depreciate versus the US\$ in the coming 90 days. The current spot rate is \$0.69/C\$. You expect depreciation to \$0.60/C\$. The following options are available to you:

<i>Option</i>	<i>Strike Price</i>	<i>Premium</i>
Put on C\$	\$0.65/C\$	\$0.004/C\$
Call on C\$	\$0.65/C\$	\$0.001/C\$

a. What option would you buy to take advantage of expected depreciation of C\$? Why?

(2.5 points) Since we expect a depreciation of the C\$, we need to buy a put option on the C\$, so we can lock the sale price on the C\$.

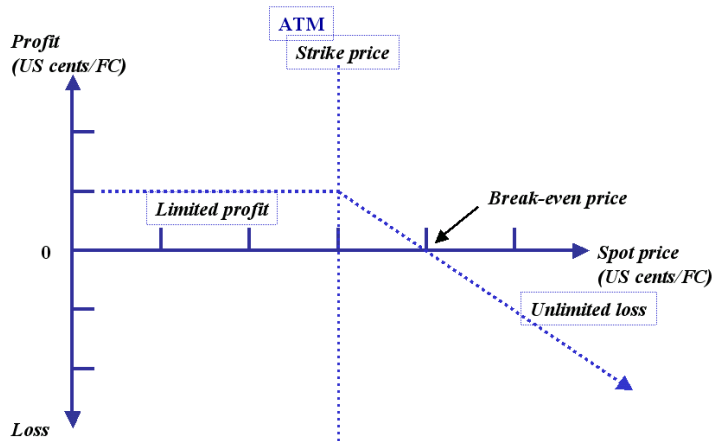
b. What is the net profit from the option you chose in a. (i.e. accounting for option premium) if spot rate at end of 90 days is \$0.62/C\$?

(2.5 points) The net profit for the long put in a. is the strike price net of the spot price and the premium. So, in this case it will be $\$(0.65 - 0.62 - 0.004)/\text{C}\$ = \$0.026/\text{C}\$$.

Q II. (5 points) (please answer only one of the two questions):

1. For each of the following positions give a diagram of the payoff and say what is the net profit/loss at maturity. On the diagram, show where is the strike price & break-even price.

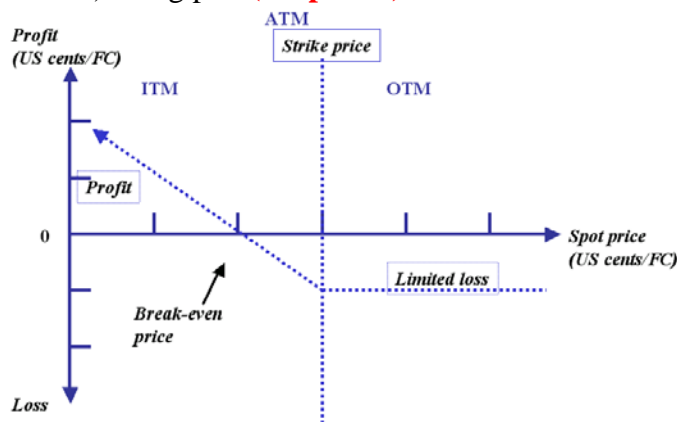
a) short call. **(2.5 points)**



The above is the payoff diagram for the short call (1.5 points).

The net profit/ loss at maturity is equal to: Premium – (Spot price – Strike price) (1 point).

a) long put. **(2.5 points)**



The above is the payoff diagram for the long put (1.5 points).

The net profit/ loss at maturity is equal to: Spot price – (Strike price + Premium) (1 point).

2. Consider a call option and a put option on EUR with strike price on both options \$0.95/EUR. The call is sold at a premium of \$0.0090/EUR, while the put is sold at a premium of \$0.0150/EUR. Both options are with expiration date three months from now and the option contracts are written on EUR 100,000. Calculate net profit for each of the options at maturity when the euro is traded spot at \$1.00/EUR

(2.5 points) *The net profit for the call (long) option is: $\text{Spot} - \text{Strike Price} - \text{Premium} = \$ (1.00 - 0.95 - 0.0090) / \text{EUR} = \$0.041 / \text{EUR}$. Accounting for the size of the contract, we get, net profit of $\$0.041 / \text{EUR} \times \text{EUR } 100,000 = \$4,100$.*

(2.5 points) *The net profit for the put (long) option is: $\text{Strike} - \text{Spot} - \text{Premium}$. However, this profit applies only if the option is exercised. Notice however, that since the strike price is less than the spot price, we will not exercise the put option. The result is that the net loss will be basically the cost of the option premium, i.e. $\$0.0150 / \text{EUR} \times \text{EUR } 100,000 = \$1,500$.*

Note: in the question I did not mention whether this is a long or short position. So, if you have assumed (& stated so) that this is a short position you would get full credit for correctly solving the problem. In the case of a short call and a short put the payoffs are exactly the same in terms of value as the above, but w/ opposite sign (why?)

Choose one of the two cases on the next two pages. Answer the two questions for **only one of the cases**.

Case I.

Motorola sold cell phone handsets to a Japanese customer. The sale was for Yen 100,000,000 with payment due in three months. The following info is available:

Spot rate: Yen 118/ \$; 3-month forward: Yen 116/\$

Money rates (% per annum):

US investment rate: 5 %

Japan investment rate: 0.5%

Motorola can borrow in Yen at 1% above the Japanese investment rate. Motorola can borrow in \$ at 2% above the US investment rate. Motorola's cost of capital (WACC) is 12%.

1. **(6 points)** Set up a forward market hedge and a money market hedge. (please show the revenues in terms of future values; when you carry forward the revenues for money market hedge, please use WACC rate)

Forward Market Hedge (2 points) Since we are hedging A/R we need to sell forward the receivables of Yen 100,000,000 @ Yen 116/\$ to get a total of \$862,069.

Money Market Hedge (4 points) Since we are hedging A/R we need to set up a liability in Yen to match in value & maturity the A/R. So, we need to borrow Yen @ Japan borrowing rate of $1\% + 0.5\% = 1.5\%$ so that at maturity we have to repay exactly the A/R value. So, we need to borrow $\frac{\text{Yen}100,000,000}{1 + 0.015 \times \frac{90}{360}} = \text{Yen}99,626,401$, which at the spot rate is Yen 99,626,401/ Yen118/\$ =

\$844,291.5. Now, since this is the \$ present value of the proceeds, we carry them forward @ WACC rate of 12% per annum or 3% for three months, to obtain $\$844,291.5 \times (1 + 0.03) = \$869,620.3$.

2. **(4 points)** What is the break-even reinvestment rate when comparing forward and money market hedge alternatives?

To check what is the break-even reinvestment rate, R , we need to equate the FV \$ proceeds from the forward market hedge to the FV \$ of the money market hedge, obtained at the break-even reinvestment rate.

So, $\$862,069 = \left(1 + R \times \frac{90}{360}\right) \times \$844,291.5$. Solving for R , we get, $R = 8.42\%$. So, if the re-

investment rate (e.g. WACC) is above 8.42%, we shall go for the money market hedge (because it will earn us higher \$ receivables). Otherwise, we shall prefer the forward market hedge.

Case II.

Eastman Kodak has purchased film-processing equipment from Siemens Germany for €2,000,000. The purchase was made June, payment due 6 months later, in December. Since Kodak is to pay EUR, it considers hedging its forex exposure. The following info is available.

- Spot exchange rate: \$0.90/EUR
- Kodak's cost of capital (WACC) is 15%
- Euro borrowing rate is 8% per annum (or 4% for 6 months)
- Euro investment rate is 6% per annum (or 3% for 6 months)
- U.S. borrowing rate is 7% per annum (or 3.5% for 6 months)
- U.S. investment rate is 5% per annum (or 2.5% for 6 months)
- December call option w/ strike price \$.92/EUR, premium is 2%
- December put option w/ strike price \$.92/EUR, premium is 1%

1. **(5 points)** Set up a money market hedge for Kodak. (please show the costs in terms of future values; please use WACC rate for carrying forward the payable)

Since we hedge an A/P, invest
$$\frac{\text{EUR}2,000,000}{1 + 0.06 \times \frac{180}{360}} = \text{EUR}1,941,747.6 \text{ (note we use the EUR}$$

investment rate) into a money market account in Euro to receive back in six month EUR 2,000,000. At the current spot rate, we need $\text{EUR}1,941,747.6 \times \$0.90 / \text{EUR} = \$1,747,572.8$. *The cost of these funds being invested into an EUR deposit, rather than being used by the company as working capital for six months, is:*

$$\$1,747,572.8 \times \left(1 + 0.15 \times \frac{180}{360}\right) = \$1,878,640.8. \text{ That is the cost of the money market hedge.}$$

2. **(5 points)** Set up an option market hedge for Kodak. Briefly say which one (money market vs. option market hedge) you would recommend.

(4.5 points) *Since we have an account payable, we need to obtain a call option on the EUR, i.e. we lock in the price at which we can buy the currency of the account payable. The available call option is with a strike price of \$0.92/EUR, current spot rate of \$0.90/EUR, & w/ a premium of 2%. So, what is the\$ cost of this hedge?* $\text{EUR}2,000,000 \times 0.02 \times \$0.90 / \text{EUR} = \$36,000$, *i.e. the option premium of 2% times the current\$ value of the contract.*

This is a\$ present value of the cost of the option. In terms of a future value, we can use the cost of capital, 15% per annum, or 7.5% for six months, to carry this option premium six months forward, $\$36,000 \times 1.075 = \$38,700$. So, if we were to exercise the call option the total maximum expense that we have locked in to pay, is:

$\text{EUR } 2,000,000 \times \$0.92 / \text{EUR} + \text{future value cost of option} = \$1,840,000 + \$38,700 = \$1,878,700$. The call option would be exercised if the appreciation of the EUR is high enough, i.e. above the strike of \$0.92/EUR (the appreciation of the currency of the A/P, EUR, is the risk against which we hedged in the first place).

(0.5 point) *So, the cost of a money market hedge is \$1,878,640.80. The cost of an option market hedge is \$1,878,700, just 59.8\$ more. However, if there is a significant depreciation of the EUR, we would not be able to take advantage were we locked in a money market hedge. So, maybe choosing an option market hedge is better.*