Quiz 3, 10/23/03

A. Topics that we've covered so far:

I've placed these topics in three categories (A) – very important; (B) medium importance; (C) lower priority. Note that the topics placed in category B must be understood in order to make sense of any of the A and C category topics. I've also added class A+ for concepts that I think are totally fundamental. If you can't do the A+ concepts, you can't do anything in the other sections. I'm sure you'd have figured that out on your own but it merits repetition.

Chapter 7

- 1. Options terminology (strike price, premium, break-even price, out-of-the-money, at-the-money, in-the-money options) (A+)
- 2. Types of options: American vs. European and Long & Short Call, Long & Short Put (A+)
- 3. Option market speculation (A+)
- 4. Market, time, & intrinsic value of options (B)
- 5. Currency Volatility & Options (B)
- 6. Replicating Portfolio Evaluation of Options (C)

Chapter 8

- 1. Distinction between transaction, operating, and translation exposure (A)
- 2. Pros & Cons for hedging (B)
- 3. Causes of transaction exposure (C)
- 4. Contractual hedges: money market hedge, forward market hedge, & option market hedge (A)
- 5. Account Receivable Hedge (A+)
- 6. Account Payable Hedge (A+)

B. Quiz Format/Structure

4 questions. 20 minutes. There will be four questions, where each question (as usual \textcircled) will have two sub-questions, of which you have to answer only one (by your choice). You will <u>not</u> be allowed a crib sheet w/notes. You will need a calculator. (I'll bring one or two spares – depending on what I can round up – but you shouldn't count on them.)

I reserve the right to include among the four questions one relevant question from the replies on chapters seven (the end of) & eight O.

C. Sample Quiz Questions

Question 1.

Suppose you expect that Singapore dollar will appreciate versus the US\$ in the coming 90 days. The current spot rate is \$0.60/S\$. You expect an appreciation to \$0.70/S\$. The following options are available to you:

Option	Strike Price	Premium
Put on S\$	\$0.65/S\$	\$0.0002/S\$
Call on S\$	\$0.65/S\$	\$0.045/S\$

a. What option would you buy?

Since we expect an appreciation of the S\$, we shall buy a call on the S\$ (i.e. right to buy at a given rate).

b. What is the gross and net profit (i.e. accounting for the premium) if the spot rate at the end of 90 days is \$0.80/S\$?

The gross profit is (\$0.80-\$0.65)/S\$ = \$0.15/S\$. *The net profit is* (\$0.15-\$0.0002)/S\$ = \$0.1498/S\$

Question 2.

Assume an American call option on euros is written w/ a strike price of $\frac{0.94}{EUR}$ at a premium of $\frac{0.90 \text{ cents per EUR}}{100,000}$ and with an expiration date three months from now. The option is for EUR 100,000. Calculate your profit or loss should you exercise the option before maturity at a time when the euro is traded spot at

a. <u>\$0.94/EUR</u>

At the spot rate of 0.94/EUR the option is not exercised (it is at the money), and the loss is the premium paid, 0.009/EUR * EUR 100,000 = 900.

b. <u>\$1.00/EUR</u>

*At the spot rate of \$1/EUR the option is exercised for a profit of (\$1 - \$0.94 - \$0.009)/EUR * EUR 100,000 = \$5,100.*

Question 3.

Does foreign currency exchange hedging both reduce risk and increase expected value? Explain, and list several arguments in favor of currency risk management and several against.

Foreign exchange currency hedging can reduce the variability of foreign currency receivables & payables by locking in specific rate in future via a forward contract, converting currency at current spot rate using a money market hedge, or minimizing unfavorable rate movement w/ currency option. None of these hedging techniques, however, increases expected value of foreign currency exchange. Actually, expected value should fall by the cost of hedge.

Those in favor of currency risk management find value in reduction of variability of uncertain cash flows. Those opposed to currency risk management argue the NPV of such activities are \$0 or less and that shareholders can reduce risk themselves more efficiently. Moreover, entrenched management can use forex risk hedging to their benefit.

Question 4.

Briefly explain quotation-, backlog-, & billing-exposures.

Quotation, backlog, & billing exposure are examples of the transaction exposure. Quotation exposure is created when the seller quotes a price in foreign currency terms to a potential buyer. The placing of an order converts the quotation exposure into a backlog exposure (goods are not yet shipped or billed). Backlog exposure lasts until goods are shipped and billed, when it becomes billing exposure. Billing exposure remains until seller receives payment.

The following two questions refer to the next case.

Oregon Scientific (OS) has signed a contract to purchase LCD panels from Germany for €1,300,000. The purchase was made June, payment due 6 months later, in December. OS considers hedging its forex exposure. The following info is available.

- Spot exchange rate: \$0.89/€
- OS cost of capital is <u>12%</u>
- Euro 6-month <u>borrowing</u> rate is 9% (or 4.5% for 6 months)
- Euro 6-month <u>investment</u> rate is 7% (or 3.5% for 6 months)
- U.S. 6-month <u>borrowing</u> rate is 8% (or 4% for 6 months)
- U.S. 6-month <u>investment</u> rate is 6% (or 3% for 6 months)
- Dec. call option w/ strike price $\frac{9.90}{1.00}$, premium is $\frac{2\%}{1.00}$
- Dec. put option w/ strike price $\underline{\$.90}$, premium is $\underline{1\%}$

Question 5.

Set up a money market hedge.

Invest
$$\frac{EUR1,300,000}{1+0.07 \times \frac{180}{360}} = EUR1,256,039$$
 into a money market account in Euro to receive

back in six month EUR 1,300,000. At the current spot rate, we need $EUR1,256,039 \times \$0.89 / EUR = \$1,117,874$. The cost of these funds being invested into a EUR deposit, rather than being used by the company as working capital for six months, is:

$$1,117,874 \times \left(1 + 0.12 \times \frac{180}{360}\right) = 1,184,947$$
. That is the cost of the money market hedge.

<u>*Question 6.*</u> Set up an option market hedge. Since we have <u>an account payable</u>, we need to obtain a <u>call</u> option on the EUR. The available call option is with a strike price of 0.90/EUR and with premium of 2%. So, what is the cost of this hedge? EUR1,300,000×0.02×0.89/EUR = 23,140, i.e. the premium of 2% times the current notional value of the contract.

This is a present value cost of the option. In terms of a future value, we can use the cost of capital, 12% per annum, or 6% for six months, to carry this option premium six months forward, $$23,140 \times 1.06 = $24,529$. So, if we were to exercise the call option the total maximum expense that we have locked in to pay:

 $EUR 1,300,000 \times \$.90/EUR + cost of option = \$1,170,000 + \$24,529 = \$1,194,529.$

The call option would be exercised if the appreciation of the EUR is high enough, i.e. above the strike of \$0.90/EUR.

The following two questions refer to the next case.

KB-Toys sold toys to a Japanese customer. The sale was for Yen 200,000,000, with payment due in three months. The following info is available:

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

Money rates (% per annum): 3m-US <u>investment</u> rate: 4.8% 3m-Japan <u>investment</u> rate: 0.1%

KB toys can borrow in Yen at 1% above the Japanese investment rate. KB toys can borrow in \$ at 2% above the US investment rate.

The cost of capital of KB Toys is 16%.

Question 7.

Set up a money market hedge and a forward market hedge.

Let's start with the easier one O - the forward market hedge. Know that we have an account receivable for Yen 200,000,000. We can sell forward Yen 200,000,000 at the rate of Yen116/\$ to lock in \$ receivables in three months of

 $\frac{Yen200,000,000}{Yen110} = \$1,724,138.$

*Yen*116/\$

To set up <u>a money market hedge</u>, we borrow for three months the present value of Yen 200,000,000. Notice that the borrowing rate in Yen is 1%+0.1%=1.1% per annum. So the amount to borrow is

 $\frac{Yen200,000,000}{1+0.011\times\frac{90}{360}} = Yen199,451,508.$

Exchanging this amount at the current spot rate Yen 118/\$ gives us

 $\frac{Yen199,451,508}{Yen118/\$} = \$1,690,267.$

This is the PV of the money market hedge of the A/R. To compare it with the forward market hedge we carry the PV receipts at the cost of capital, 16%, or 4% for three months.

 $1,690,267 \times (1+0.04) = 1,757,877.7.$

So, comparing the receipts of the forward and the money market hedge, we can tell that the money market hedge will be more valuable.

Question 8.

What is the break-even reinvestment rate when comparing forward and money market alternatives?

To check what is the break-even reinvestment rate, \underline{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,
$$\$1,724,138 = \left(1 + R \times \frac{90}{360}\right) \times \$1,690,267$$
. Solving for R, we get, R=8.02%. So, if the

re-investment rate is above 8.02%, we shall go for the money market hedge (because it will earn us higher \$ receivables). Otherwise, we shall prefer the forward market hedge.