FINA 690K – Structured Products and Exotic Options

Homework One

1. When a known future cash outflow in a foreign currency is hedged by a company using a forward contract, there is no foreign exchange risk. When it is hedged using futures contracts, the marking-to-market process does leave the company exposed to some risk. Explain the nature of this risk. In particular, consider whether the company is better off using a futures contract or a forward contract when
   (a) The value of the foreign currency falls rapidly during the life of the contract.
   (b) The value of the foreign currency first falls and then rises back to its initial value.
   Assume that the forward price equals the futures price.

2. A company that is uncertain about the exact date when it will pay or receive a foreign currency may try to negotiate with its bank a forward contract that specifies a period during which delivery can be made. The company wants to reserve the right to choose the exact delivery date to fit in with its own cash flows. Put yourself in the position of the bank. How would you price the product that the company wants?

3. Consider a Treasury bond with a face value of $10,000, a coupon of 8% and several years to maturity. Currently this bond is selling for $9,260, and the previous coupon has just been paid. What is the forward price for delivery of this bond in 1 year? Assume that interest rates for 1 year out are flat at 9%.

4. The Z corporation issues a 10%, 20-year bond at a time when yields are 10%. The bond has a call provision that allows the corporation to force a bondholder to redeem his or her bond at face value plus 5%. After 5 years the corporation finds that exercise of this call provision is advantageous. What can you deduce about the yield at that time? (Assume one coupon payment per year).
   Hint
   Find the yield such that the present value of the future coupons (from 6th to 20th year) plus the par at maturity equal to the call price offered by the issuer upon call. The yield of the bond must be lower than the yield computed above since the market price of the bond should be above the call price to induce the call.

5. A bank has a choice of making a 2-year loan at 10 percent or a variable loan at the 1-year Treasury bill rate plus 2 percent. Currently, the Treasury bill rate is 7 percent. Under what circumstances is the 2-year loan better than the variable rate loan and vice versa?

6. A Merill Lynch note structure called a liquid yield option note (LYON) is a zero-coupon instrument that is convertible into the common stock of the issuer. The issuer has the right to call the bond at pre-determined set of times. The bond is structured such that the call price increases over time. Why such structuring is reasonable?

7. Consider a convertible bond as follows:
   par value = $1,000
   coupon rate = 9.5%
   market price of convertible bond = $1,000
   conversion ratio = 37.383
   estimated straight value of bond = $510
   yield to maturity of straight bond = 18.7%
   We define the following terms
   (a) market conversion price = market price of convertible bond / conversion ratio
   (b)   market conversion premium per share
      = market conversion price – current market price
   (c)   market conversion premium ratio
      = conversion premium per share / market price of common stock
   Calculate each of the following quantities:
   (i)   conversion value
   (ii)   market conversion price
   (iii)   conversion premium per share
   (iv)   conversion premium ratio
   (v)   premium over straight bond value.
   Suppose that the price of the common stock increases from $23 to $46. What will be the approximate return realized from investing in the convertible bond? Why the return on investing in the common stock directly be higher than investing in the convertible bond?

8. A 3-year convertible bond with a face value of $100 has been issued by company ABC. It pays a coupon of $5 at the end of each year. It can be converted into ABC's equity at the end of the first year or at the end if the second year. At the end of the first year, it can be exchanged for 3.6 shares immediately after the coupon date. At the end of the second year, it can be exchanged for 3.5 shares immediately after the coupon date. The current stock price is $25 and the stock volatility is 25%. No dividends are paid on the stock. The riskfree interest rate is 5% with continuous compounding. The yield on bonds issued by ABC is 7% with continuous compounding.
   (a) Use a 3-step tree to calculate the value of the bond.
   (b) How much is the conversion option worth?
   (c) What difference does it make to the value of the bond and the value of the conversion option if the bond is callable any time within the first two years for $115?
   (d) Explain how your analysis would change if there were a dividend payment of $1 on the equity at the 6-month, 18-month and 30-month point. Detailed calculations are not required.

9. Discuss the following risks in investing convertibles.
   (a) call risk, (b) default risk, (c) interest rate risk, and (d) equity risk.