The Johns Hopkins Carey Business School

Derivatives

Spring 2010

Instructor: Bahattin Buyuksahin

Midterm Exam

MIDTERM– DUE ON WEDNESDAY, April 28th, 2010

Late submissions will not be graded.

Show your calculations. Do not just report the final numerical answer! Obey page limits.
If a question has multiple parts, indicate exactly where you answer each part.
This exam has five (5) sections; be sure to follow the directions for each section. Use Times New Roman 12pt in your writing.

The plagiarizing, in any form, of the work of another is a form of academic dishonesty and will result in an automatic failing grade. By the act of submitting written work to satisfy the homework assignment, you make the claim that the work is your own.

A. DEFINITIONS: (10 points) (Suggested time: 20 minutes)
ANSWER ALL OF THESE. Carefully define the following terms. Whenever possible, give *both* mathematical and verbal definition.
Page limit: 1/4 page per definition.

Contango	Minimum Variance Hedge Ratio
Backwardation	Tailing the Hedge
Bootstrapping	Macaulay Duration
Basis Risk	Convexity
Cross Hedging	Normal Backwardation

B. TRUE-FALSE: (10 points) (Suggested time: 20 minutes)

ANSWER ALL OF THESE. Please comment the following statements. (True or False). Write down your reason. Each question is equally weighted.

Page limit: 1/4 page per question.

1. A decrease in the basis will benefit a long hedger and hurt a short hedger.
2. A short hedger suffers losses when the basis decreases.
3. When the zero curve is downward-sloping, the zero rate for a particular maturity is greater than the par yield for that maturity.
4. The forward exchange rate is an unbiased predictor of the future exchange rate when the exchange rate has no systematic risk.
5. The 350-day LIBOR rate is 3% with continuous compounding and the forward rate calculated from a Eurodollar contract that matures in 350 days is 3.2% with continuous compounding. 440-day zero rate is 3.0409%

C. MULTIPLE CHOICE: (10 points) (Suggested time: 20 minutes)
ANSWER ALL OF THESE. Please show your work. Answers without explanation will not be accepted.

1) To exploit an expected increase in interest rates, an investor would most likely

a) sell Treasury bond futures.
b) take a long position in wheat futures.
c) buy S&P 500 index futures.
d) take a long position in Treasury bond futures.

2) To hedge a long position in Treasury bonds, an investor most likely would

a) buy interest rate futures.
b) sell S&P futures.
c) sell interest rate futures.
d) buy Treasury bonds in the spot market.

3) A hedge may not give complete price protection for changes in the spot price if

a) The basis changes while the hedge is on
b) The quantity hedged differs from the size of the futures contract
c) The grade of the commodity hedged is different from the grade on which the futures contract is based
d) All of the above

4) The S&R index spot price is 1100, the risk free rate 5%, and continuous dividend yield on the index is 2%. Suppose you observe a 6-month forward price of 1120. What arbitrage would you undertake?

a) Short spot, long forward
b) Short forward, long spot
c) Short spot, short forward
d) Long spot, long forward

5) Given a continuously compounded risk-free rate of 3% annually, at what lease rate will forward price equal to the current commodity price.

a) 3%
b) 0%
c) 5%
d) 4%

6) Which of the following describes a crush spread?

a) A long position in crude oil against short position s in gasoline and heating oil futures
b) An intra-market spread
c) A long position in soybean against short positions in soybean oil and soybean meal futures.

d) A short position in crude oil and long position in gasoline and heating oil futures.

7) An American importer places an order with a Swiss watch manufacturer. The order, to be delivered in August, is value at 2,000,000 Swiss Francs. The cash price for the franc is $ .5975 and September futures are trading at $ .5715. On the day the watches are delivered, the cash market price of the Swiss franc is $ .6135 and September futures are $ .5855. If the importer hedged his position, his net result on the hedge would be:

a) a profit of .016
b) a loss of .016
c) a profit of .002
d) a loss of .002

8) On September 1, 2009, XXX Company purchased equipment from USA to be paid on March 1, 2010. The exchange rate on September 1, 2009 is P45 to $1. On the same date XXX entered into a foreign currency forward contract and agreed to pay P2,250,000 at the rate of P45 to $1. This forward contract is designed as a fair value hedge of the payable that is denominated in foreign currency. The peso exchange rate to the dollar is P46 on December 31, 2009 and P49 on March 1, 2010. What is the gain on foreign currency forward contract that will be recognized in the 2009 income statement.

a) 0
b) 50,000
c) 150,000
d) 200,000

9) Which of the following statements is not correct?

a) Because there is no storage cost in stocks, arbitrage is easy between the futures and spot markets. Therefore, backwardation is not possible in financial markets.
b) Oil futures can be in backwardation because it reflects temporal scarcity.
c) If businesses have more important use of a commodity and are unwilling to arbitrage in futures market, backwardation can happen
d) Futures are more liquid than forwards because they are standardized, traded on exchanges, and cleared by the clearing houses.

10) The term structure theory which predicts long-term interest rates will, on average, be higher than short-term interest rates is called:

a) The expectation theory
b) The preferred habitat theory
c) The segmented market theory
d) The liquidity preference theory

D. SHORT QUESTIONS: (70 points) (Suggested time: 120 minutes)

ANSWER ALL OF THESE. Please show your work. Answers without derivation will not be evaluated.

1) On August 1, a portfolio manager has a bond portfolio worth $10m. The duration of the portfolio in October will be 7.1 years. The December Treasury bond futures price is currently 91-12 and the cheapest to deliver bond will have a duration of 8.8 years at maturity.

a) How should the portfolio manager immunize the portfolio against changes in interest rates over the next 2 months?(3 points)

b) How can the portfolio manager change the duration of the portfolio to 3 years? (2 points)

2) An airline knows that it will need to purchase 20,000 metric tons of jet fuel in three months. It wants some protection against an upturn in prices using futures contracts. The company can hedge using heating oil futures contracts traded on NYMEX. The notional for one contract is 42,000 gallons. There is no futures contract on jet fuel, the risk manager wants to check if heating oil could provide an efficient hedge. The current price of jet fuel is $300/metric ton. The futures price of heating oil is $0.7/gallon. The standard deviation of the rate of change in jet fuel prices over three months is 20%, that of futures is 15%, and the correlation is 0.8.

a) You decide to hedge your price exposure. What is your optimal strategy? Explain.

b) What are the payoffs of hedging?

3) Assume today is September 9, 2009. Today's close price of the MSFT share is $35. The risk-free interest rate is 5% per annum, continuously compounded. Consider a six-month forward contract to purchase the stock.

a) What is the forward price, assuming zero dividends?
[Hint. To calculate the forward price, set up two strategies and then make use of the arbitrage principle].

b) If the 6-month forward price is $35.5, what is the implied continuously compounded dividend yield? What is the forward and annualized forward premium?

c) One month later, the price of the stock is $40 and the risk-free interest rate declined to 4.0% per annum. What is the forward price? [Hint. Once again, to calculate the forward price, set up two strategies and then make use of the arbitrage principle].

d) What is the value of a long position in the original forward contract? Comment on your results.

4) Compute Macaulay and modified durations for the followings bond?

a) A 5-year bond paying annual coupons of 4.432% and selling at par?

b) An 8-year bond paying semiannual coupons with a coupon rate of 8% and a yield of 7%.
c) A 10 year bond paying annual coupons of 6% with a price of $92 and face value of $100.

5) The following table gives the price of bonds

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Bond Principal	Time to Maturity (years)	Annual Coupon ($)	Bond Price ($)
100	0.5	0.0	98
100	1.0	0.0	95
100	1.5	6.2	101
100	2.0	8.0	104

a) Calculate the zero rates for maturities 0.5, 1.0, 1.5 and 2.0 years. Comment on your results.

b) What are the forwards rates for the periods: 6 months to 12 months, 12 months to 18 months, 18 months to 24 months? Comment on your results.

c) Estimate the price and yield of a 2-years bond providing a semiannual coupon of 7% per annum.
d) Assume that the zero rates you computed in part a) are bond yields. Describe and discuss the shape of the yield curve.

6) The cheapest to deliver T-bond is a 12 percent bond that paid its coupon 87 days ago, and it is priced at 105-16. The conversion factor of the bond is 1.0900. The nearby T-bond futures expires in 50 days and the current price is 98-00. If you can borrow and lend to finance a T-bond for a total outlay of 2 percent over this period, how would you transact? What if you could borrow or lend at 3%? What if you could borrow at 3% and lend at 2%? Explain.

7) Assume economic and political conditions are extremely turbulent. How would this affect the value of the seller's options on the T-bond futures contract? If they have any effect on price, would they cause the futures price to be higher or lower than it otherwise would be?

8) Suppose that in order to hedge interest rate risk on your borrowing, you enter into an FRA that will guarantee a 6% effective annual interest rate for 1 year on $500,000,000.00. On the date you borrow the $500,000,000.00, the actual interest rate is 5%. Determine the dollar settlement of the FRA assuming
a) Settlement occurs on the date the loan initiated
b) Settlement occurs on the date the loan is paid.

9) Suppose the September Eurodollar futures contract has a price of 96.4. You plan to borrow $50m for 3 months in September at LIBOR, and you intend to use the Eurodollar contract to hedge your borrowing rate.

a) What rate you can secure?
b) Will you be long or short the futures contract?
c) How many contracts will you enter into?
d) Assuming the true 3-month LIBOR is 1% in September, what is the settlement in dollars at expiration of the futures contract?

10) The current price of oil is $83.27 per barrel. Forward prices for 3, 6, 9, and 12 months are $87.24, $88.82, $89.70 and $90.66. Assuming 2% compounded annual risk-free rate, what is annualized lease rate for each maturity? Is this an example of contango or backwardation? (Lease rate can be considered as the negative of storage cost)

E. LONG QUESTIONS: (4 points) (Suggested time: Unlimited)

1. How many hours did you spend for this exam?
2. If you are asked to grade the difficulty of this exam, what will be your grade? (1 is very easy, 2 is easy, 3 is moderate, 4 is difficult, 5 is very difficult)
3. What grade are you expecting from this exam (give me a range not greater than 10; i.e you can say I expect to get between 80 and 90)?
4. After this exam, if you are given the chance to choose between take-home and in-class final exam, which one will you choose?