

Practice Midterm Questions

These are questions I've asked on exams in the past, and indicative of the difficulty of midterm questions. However, to provide extra practice and better topic coverage, there are more questions here than I would expect you to answer on the actual exam. There also may be more questions asking for intuition or facts discussed on class than is represented here.

1. Imagine that the Financial Times reported the following information:

Spot exchange rate: 116.65 yen per dollar

6-month forward exchange rate 113.74 yen per dollar

Dollar denominated 6-month CDs are quoted at 5.2% (simple interest, actual/360 day basis)

Yen denominated 6-month CDs are quoted at 0.17% (simple interest, actual/360 day basis)

Assume 6 months = 183 days for all contracts. Are Japanese CD rates in line with U.S. CD rates? Explain your answer with a calculation.

2. You have information on the following set of Treasury coupon bonds (semi-annual coupons):

Maturity	Coupon	Price (per \$100 face value)
6 months	6.9%	100.6323
1 year	0.0%	93.7129
1.5 years	0.0%	89.9333
2 years	5.8%	96.7860

a. By bootstrapping, construct the 2-year spot yield curve at a six-month frequency. More precisely, calculate the effective 6-month yield going out to 6 months, 1 year, 1.5 years, and 2 years. Also report each yield on a bond equivalent basis to annualize it.

b. Consider a two-year 5% coupon bond with annual coupon payments. What is its yield to maturity if it is priced consistently with the yield curve in (a)? State the YTM on a bond equivalent basis.

c. At time 0 you enter into a forward contract to sell a one-year 6.7% coupon Treasury bond (semi-annual payments) at the end of the year, with a face value of \$1 million. In the absence of arbitrage opportunities, what price is specified in the forward contract? (Hint: calculate the appropriate implied forward rates to do this calculation.)

3. a. In last few weeks the Treasury yield curve has gradually steepened, and some commentators expect the trend to continue. Indicate ALL of the following that are possible explanations for this phenomenon (do not explain):

- (i) The market anticipates that the Fed will continue to raise the Fed Funds rates in coming months
- (ii) The growing federal deficit and continuing record trade deficits have increased fears of future inflation
- (iii) The liquidity premium has increased
- (iv) Future business conditions are expected to improve
- (v) The demand by foreigners for long-term U.S. government bond has declined recently, as several large sovereigns are moving to diversify their reserves away from the dollar.

b. In this steepening yield curve environment, would you expect a barbell investment strategy to outperform a bullet investment strategy (holding duration equal in both strategies) by more or less than if the curve were making parallel shifts? Explain briefly.

4. You are a securities dealer, and find yourself with an inventory at the end of the day valued at \$5 million: \$2 million in 5-year 9.5% coupon bonds (annual payments), and \$3 million in 8 year strips. The yield curve is flat at 8% over the relevant range (effective annual yield). To avoid the risk of a loss if rates rise overnight, you decide to place a delta hedge.

The following liquid bonds are available, and can be bought or sold in any amount:

Maturity (years)	Coupon (annual)
4	7.5%
12	6.375%

a. Calculate the modified duration and convexity of your portfolio. (You can calculate the portfolio duration and convexity as the value weighted duration and convexity of the component securities.) Also calculate the modified duration and convexity of each bond that can be used to hedge. (Be sure to show all inputs into the convexity calculator.)

b. To delta hedge the price risk from your securities, do you take a long or short position? How much (in dollars) would you need to buy or sell to delta hedge your portfolio? Answer the question for both of the available bonds, and explain your answer with a calculation.

c. The over-night RP/reverse rate with the 4-year bond as collateral, is 7.2% (simple, 360-day basis). Explain the transactions you would make using the RP to set up the long or short position you described in part b. Explain briefly (no calculation needed) why closing out the transaction the next day serves as a hedge against your portfolio position.

d. In a volatile interest rate environment, do you expect the hedge to be more effective using the 4 year or 12 year bond? Explain the intuition behind your answer.

5. On May 3, 2005, suppose that the following were available:

i. A 29 day RP/reverse agreement with a CD as collateral, with a simple interest rate of 2.75% (actual/360 basis).

ii. A negotiable certificate of deposit (CD), with a simple interest rate of 3.15% (actual/360 basis), maturing on Aug 31, 2005, 119 days later.

a. Using the CD and a RP or reverse RP, you can lock in a short forward position in a 90 day CD to be delivered in 29 days. What is the implied forward rate for this synthetic forward contract? (State the answer on a 360-day simple interest basis.)

Also available were the following 90-day Eurodollar futures contracts. Assume each is closed out on the first day of the delivery month (i.e., the expiration date is the first of the month):

Contract	Quoted "Price" (simple interest rate = $100 - \text{"price"}$)
Jan '05	97.12
Mar '05	96.90
Jun '05	96.73
Sep '05	95.96

b. Which of these contracts locks in an equivalent short forward position over the same period as the transaction in part (a)? Explain briefly.

c. Is there an arbitrage opportunity between the cash and futures markets? Explain why or why not with a short calculation (just based on a comparison of the rates you can lock in, no need for detailed cash flows).

6. Imagine that you think that the yield curve will steepen over the next few months in the 3 to 7 year range. However, you do not have a view on whether rates overall will rise or fall. You'd like to take a speculative position that will be profitable if you're right, but that protects against general movements in interest rates. Available for trading are:

i. A 3-year 2.9 percent Treasury bond with semiannual payments priced to yield 2.4% on a b.e. basis

ii. A 7-year zero-coupon Treasury bond priced to yield 3.2% on a b.e. basis

a. Calculate the modified duration and convexity of each of the two bonds.

b. Describe the dollar position in each bond (long or short) that you would take to speculate on the curve steepening, but that is delta hedged against general changes in the level of interest rates. Base the calculation on a position (present value) of \$1 million in the 3-year bond.

c. Does the convexity of your overall position work to your benefit or detriment if interest rates become more volatile? Explain briefly.

