

Homework Assignment # 9 (max. points = 20)
Due at the beginning of class on Tuesday April 22, 2008

Please show your work - enough to show that you understand how to do the problem. Circle your final answer. Full credit can only be given only if the answer and work leading to the answer are correct.

1. A 1000 face value bond with 6% semiannual coupons can be called at par in 10 years, called at par in 20 years, or it will mature at par in 30 years. What price will guarantee an investor a yield of (i) 4% compounded semiannually and (ii) 7% compounded semiannually?
2. Suppose you are absolutely confident that the bond issuer in problem 1 will call the bond in 20 years. You purchase the bond for a price that assumes it will be called in 20 years and yield 4% convertible semiannually. If your intuition is wrong, and the issuer calls the bond in 10 years, what yield do you end up earning?
3. A 100 par 11% bond with annual coupons is callable at 115 any time after 5 years, 102 any time after 10 years, and it matures at 100 in 15 years. What price will guarantee an investor a yield of 10% compounded annually?
4. Suppose you purchase the bond from problem 3 at the price you found problem 3. If the issuer calls the bond after five years, what yield did you earn? Compare this with the minimum yield that you expected to earn.
5. Suppose a fund balance is 1000 on January 1, 1998. Use the table on Broverman page 284 to find the accumulated value of the fund on January 1, 2002:
 - (a) under the investment year method
 - (b) under the portfolio method
 - (c) if the balance is withdrawn at the end of each year and reinvested at the new money rate
6. You are given the following table of interest rates:

Calendar Year of Original Investment	Investment Year Rates		Portfolio Rates
y	i_1^y	i_2^y	i^{y+2}
2001	7.00	7.05	7.54
2002	7.10	8.02	8.30
2003	a	b	c
2004	8.50	8.65	
2005	8.80		

Suppose \$1000 invested on January 1, 2003 for three years under the investment year method will accumulate to \$1265.75; under the portfolio method, the \$1000 will

accumulate to 1287.26; and if the balance is withdrawn at the end of each year and reinvested at the new money rate, the \$1000 will accumulate to \$1286.01. Find b . Note: After funds have already been invested for two years under the investment year method, they begin earning interest at the portfolio rate.

7. A one-year zero-coupon bond has a price of \$945.63. A two-year zero-coupon bond has a price of \$883.32. A three-year zero-coupon bond has a price of \$825.06. A three-year 5% annual-coupon bond has a price of X . All these bonds have face (and redemption) values of \$1,000. Find X , the price of the three-year annual-coupon bond.
8. Assume that the term structure of interest rates (the yield curve) has the following form: $r(t) = (50t)^{0.25}$, where $r(t)$ is the spot rate of interest for an investment of length t , expressed as an annual percentage rate. Determine the price of a four-year, \$1,000 face value, 10% annual coupon bond.
9. You are given the following term structure (yield curve) of interest rates:

Years	Annual Spot Rate
1	5%
2	6%
3	7%

Find the one-year forward rate two years from now (i.e., the interest rate anticipated between time-points 2 and 3).

10. (Broverman exercise 6.3.3) A 6-month T-Bill of face amount 100 can be bought today for 97.800, and a 1-year T-Bill of face amount 100 can be bought today for 95.400. Find the forward rate of interest for the 6 month period beginning 6 months from today, quoted as a nominal annual rate of interest compounded semi-annually.