

Assignment #3

Futures, Options and other Derivatives

- 5.33. Assume that a bank can borrow or lend money at the same interest rate in the LIBOR market. The 91-day rate is 10% per annum, and the 182-day rate is 10.2% per annum, both expressed with continuous compounding. The Eurodollar futures price for a contract maturing in 91 days is quoted as 89.5. What arbitrage opportunities are open to the bank?
- 5.35. Portfolio A consists of a one-year zero-coupon bond with a face value of \$2,000 and a 10-year zero-coupon bond with a face value of \$6,000. Portfolio B consists of a 5.95-year zero-coupon bond with a face value of \$5,000. The current yield on all bonds is 10% per annum.
- Show that both portfolios have the same duration.
 - Show that the percentage changes in the values of the two portfolios for a 0.1% per annum increase in yields are the same.
 - What are the percentage changes in the values of the two portfolios for a 5% per annum increase in yields?

- 5.36. The following table gives the prices of bonds:

Bond principal (\$)	Time to maturity (years)	Annual coupon* (\$)	Bond price (\$)
100	0.50	0.0	98
100	1.00	0.0	95
100	1.50	6.2	101
100	2.00	8.0	104

* Half the stated coupon is assumed to be paid every six months.

- Calculate zero rates for maturities of 6 months, 12 months, 18 months, and 24 months.
 - What are the forward rates for the periods: 6 months to 12 months, 12 months to 18 months, 18 months to 24 months?
 - What are the 6-month, 12-month, 18-month, and 24-month par yields for bonds that provide semiannual coupon payments?
 - Estimate the price and yield of a two-year bond providing a semiannual coupon of 7% per annum.
- 5.38. A portfolio manager plans to use a Treasury bond futures contract to hedge a bond portfolio over the next three months. The portfolio is worth \$100 million and will have a duration of 4.0 years in three months. The futures price is 122, and each futures contract is on \$100,000 of bonds. The bond that is expected to be cheapest to deliver will have a duration of 9.0 years at the maturity of the futures contract. What position in futures contracts is required?
- What adjustments to the hedge are necessary if after one month the bond that is expected to be cheapest to deliver changes to one with a duration of seven years?
 - Suppose that all rates increase over the three months, but long-term rates increase less than short-term and medium-term rates. What is the effect of this on the performance of the hedge?