Midterm for Math 4511

Quantitative Methods for Fixed-Income Securities

3-4:20pm, October 27, 2011

Problems (with credits indicated in parentheses):

1 Finish the following list of jobs.
   - 1.1 (2) express a coupon bond price in terms of its yield;
   - 1.2 (2) express a coupon bond price in terms of spot rates;
   - 1.3 (2) express a coupon bond price in terms of forward rates;
   - 1.4 (2) express a forward rate in terms of spot rates;
   - 1.5 (2) express a spot rate in terms of forward rates;
   - 1.6 (2) express a par yield in terms of discount bonds;
   - 1.7 (2) express a discount bond price in terms of par yields; and
   - 1.8 (2) express a par yield in terms of forward rates.

2 Suppose that the forward-rate curve is flat, answer the following questions with justifications.
   - 2.1 (4) Whether the spot-rate curve is flat?
   - 2.2 (4) Whether the par-yield curve is flat?

3 Explain how to calculate the YTM of a bond today (October 27, 2011) using the coupon bond of 5.5s of September 15, 2014.
   - 3.1 (4) Suppose that the clean price today is 108-8, write down the equation satisfied by the YTM.
   - 3.2 (2) Solve for the YTM, if you can (Approximate answer acceptable).

4 (10) Information of 10-, 15- and 30-yr coupon bonds is given below. Daily volatilities of the three bond yields (in bps) are 6.36, 5.21 and 4.80, respectively; correlations between the 10- and 15-yr yields and between the 15- and 30-yr yields are 0.62 and 0.45, respectively; and the durations of the three bonds are 6.5, 10.4 and 14.75, respectively. Suppose that you have long a 15-yr bond with market value of $10m, how much of the 10- and 30-yr bonds you should long or short for hedging?

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