Midterm for Math 361

Quantitative Methods for Fixed-Income Securities

April 7, 2005

Problems:

1 Give the definitions of

1.1 (2) a yield curve;

1.2 (2) a spot-rate curve; and

1.3 (2) a forward-rate curve.

Also,

1.4 (2) express a coupon bond price in terms of yields;

1.5 (2) express a coupon bond price in terms of spot rates;

1.6 (2) express a coupon bond price in terms of forward rates;

1.7 (2) express a forward rate in terms of spot rates; and

1.8 (2) express a spot rate in terms of forward rates.

2 (4) With the coupon bond of 5.5s of July 15, 2008, explain how to calculate the yield of a bond today, April 7, 2005. Suppose the price today is $110.

3 Suppose that both 5.5s of April 7, 2008 and 5s of April 7, 2006 are par bonds. Do the following:

3.1 (4) Calculate the DV01s of the two bonds;

3.2 (2) Calculate the modified durations of the two bonds;

3.3 (2) Suppose that you long one unit of 5.5s of April 7, 2008, calculate the units of 5s of April 7, 2006 that you need to *short sell* to neutralize duration.

4 **(6 extra credits)** Use bond price formula to derive an expression of convexity for par bonds. Then, calculate the convexity of the portfolio in Problem 3. According to the sign of the convexity, explain if the portfolio is a desirable one.

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