Problem Set 8: Bond Portfolio Management and Derivatives Definitions and Payoffs

I. Duration and Interest Rate Sensitivity: Consider the 4¾ Feb 96 U.S. Treasury note on the 8/15/94. Suppose this note’s YTM expressed as an APR with semiannual compounding is 5.5%.
   A. What is the price of the note?
   B. What is its Macaulay duration and “modified duration”?
   C. Suppose the yield curve shifts up to 6%.
      1. What is the price of the note now?
      2. What is the price implied by Macaulay duration?
      3. Discuss any difference between the two prices.
   D. Suppose the yield curve shift down to 5%.
      1. What is the price of the note now?
      2. What is the price implied by Macaulay duration?
      3. Discuss any difference between the two prices.

II. Immunization: Today is 8/15/94. XYZ is a pension fund that must make five payments of $5M per year for the next 5 years (the first payment is made in 1 year on the 8/15/95). XYZ can invest in U.S. Treasury notes (6e Feb 96) and in U.S. Treasury Aug 04 strips. The yield curve is flat and expected to remain flat. Its current level is 6% expressed as an APR with semiannual compounding.
   A. What is the current value of XYZ’s liability?
   B. What is the Macaulay duration of:
      1. XYZ’s liability?
      2. the note?
      3. the strip?
   C. For XYZ’s investments to still be able to satisfy its liabilities after a change in the interest rate, how much should XYZ invest in the notes and how much in the strips?

III. Options:
   A. BKM, Chapter 20, Question 6, part a.
   B. BKM, Chapter 20, Question 23.