Fixed Income
Study Questions for quiz on basic duration material

Problems. Show all work. Remember you will use your (financial) calculator on the quiz so you should practice answering the questions with a calculator. (You can check your answers on a spreadsheet.) At this point we continue to abstract from day-count convention issues, so assume that every coupon period is exactly one-half of a year, and that your trades settle on coupon payment dates, so that the dirty price equals the clean price for all coupon-paying securities.

1. Suppose the yield curve is flat at 4.5% (continuously compounded). Form a $500,000 portfolio with 60% invested in one-year STRIPS and 40% invested in 25-years STRIPS.

   (a) Form an alternative $500,000 portfolio that has 100% invested in a STRIPS with exactly the same duration as this portfolio.

   (b) Consider a 100 basis point upward shift in the yield curve. What are the resulting returns on the 2 portfolios? How do these relate to the portfolios' durations?

   (c) Consider a 100 basis point downward shift in the yield curve. What are the resulting returns on the 2 portfolios? How do these relate to the portfolios' durations?

2. Suppose that the yield curve is flat at 4% (continuously compounded). Consider a 3.5% 3-year note.

   (a) In the spirit of representing this coupon note as a portfolio of zero-coupon bonds, show the "portfolio weights" of each cash flow.

   (b) What is this note's duration?

   (c) What is the duration of a 3-year zero coupon bond? Explain the relationship between these two securities, and what this has to do with reinvestment risk.

3. Suppose that the yield curve is flat at 15% (continuously compounded). Consider a 15% 6-year note that makes annual coupon payments.

   (a) What is this note's price? Why is this note selling at a discount when its coupon rate equals the spot rate on all cash flow dates?

   (b) In the spirit of representing this coupon note as a portfolio of zero-coupon bonds, show the "portfolio weights" of each cash flow.

   (c) What is the duration of this note?

   (d) Now suppose that the yield curve is flat at 3% (continuously compounded). What is the duration of this 15% 6-year note that makes annual coupon payments? How does this note's duration change when the yield curve shifts? Why? How can you reconcile this with the fact that the duration of a zero-coupon bond is not related to the bond's price (or to the spot rate)?