1. You have been told that the yield on a particular 10yr bond is 2.5%. This bond pays an 3.5% coupon with semi-annual compounding (i.e., it is a US Treasury bond). What will its price be?

2. Rounded to two decimal places (e.g. x.xx%), what is the yield to maturity on a 30 year US Treasury bond with a 3% coupon and a market price of 93.41? [HINT: if you don't have a financial calculator, you will have to use trial and error to solve this.]

3**.** Exactly one year ago you borrowed $300,000 to finance the purchase of an investment property via a 30 year 3.9% mortgage. Interest compounds monthly, and you make monthly payments on the mortgage.

(i) To the nearest dollar, what are the montly payments?
(ii) To the nearest dollar, how much do you now owe the lender? In other words, what is the current principal balance on the loan?

What is the interest component that you have paid to the bank so far (i.e., over the one year life of the loan to date)?

4. The 5.75% coupon, 10-yr US Treasury bond is priced at 100.83, with a yield of 5.64%.

(i) Its DV01 (dollar duration) is 8.00. If its yield moves instantaneously to 5.69%, what will its price be (as estimated using DV01)?
(ii) What is its "real" new price (using the price-yield formula)?

5. See spreadsheet ps1_bonds.xls. The data are daily closing yields on 2yr and 10yr Treasurys, and 10yr BAA corporate bonds (bonds issued by US corporations that have a BAA credit rating) over a 10 year period. Assume that the coupon on each bond is 6% (with semi-annual compounding).

When handing in your solution to this question, please do NOT just print the entire spreadsheet with your solutions. Simply print out the top section of the spreadsheet that is outlined in the black box. All of the returns and volatilities that you need to submit for the homework should be calculated in the highlighted cells in that black box at the top of the spreadsheet.

(*NOTE: any particular bond's maturity will go down over time – a bond that has 10 years to maturity today will obviously only have 5 years to maturity in 5 years time. The yields provided in this spreadsheet are yields on whatever bond is closest to a 2yr or 10yr maturity on each date in the series*.)

Step 1: Calculate the price of each bond over the entire series of data.

Step 2: Calculate and report the *volatility* (= standard deviation) of each bond's *yield* over the series, using the =STDEV function in Excel.

Step 3: Calculate and report the *annualized* yield volatilities. To convert from daily to annualized volatility, you need to multiply the daily standard deviation by 15.87.

Step 4: Calculate the daily rate of return on each bond's price over the entire series. The rate of return on day *n* is simply $(P_n - P_{n-1}) / P_{n-1}$.

Step 5: Calculate and report the average daily returns on the bonds. Also report their average *annualized* returns. Think carefully about how to convert from *daily* to *annual* return for these data series.

Step 6: Calculate and report the rate of return volatility for each bond over the entire series. These numbers represent the bonds' *price* volatility.

Step 7: Now convert your daily rate of return volatilities into annual volatilities using the same method as in Step 3 above, and report them.

Step 8: respond to the following questions:

(i) Why do we calculate price volatility using returns, rather than simply calculating the volatility of the prices themselves?

(ii) What do you notice about relative price volatility of the 2yr and 10yr bonds, vs relative yield volatility?

(iii) In Steps 3 and 7, we multiplied *daily* volatilities by 15.87 to convert them to *annual* volatilities. Do you know *why* we multiply by 15.87 to get from daily to annual volatility?