homework #1 Immunization

Collect 1 year weekly prices of selected (2, 5, 10) Treasuries and trade a barbell (butterfly) strategy. Make sure that the following constraints are met:

$$w_{2y}P_{2y} - 2w_{5y}P_{5y} + w_{10y}P_{10y} = 0$$

$$w_{2y}D_{2y} - 2w_{5y}D_{5y} + w_{10y}D_{10y} = 0$$

$$w_{2y}C_{2y} - 2w_{5y}C_{5y} + w_{10y}C_{10y} > 0$$

where P is price, D is duration, and C is convexity.
(note: there is no unique solution so it is a judgment call which portfolio you like to form)

Rebalance weekly (i.e. solve for weights weekly). Note when you rebalance, a profit or loss will occur. Show weekly P&Ls. At the end of the period, report the cumulative P&L.

For duration and convexity calculations, you could use MaCaulay (need to calculate the yield of each bond first).

(bonus) The correct duration and convexity to use should be key rate duration and convexity. But for this, you need a yield curve. So

1. bootstrp a yield curve (zero curve)
2. use the yield curve to price your bonds (2, 5, 10) by using a spread
3. perturb the three key rates (i.e. 2, 5, 10) and numerically calculate duration and convexity (both in dollars)
4. implement barbell trading strategy

due on 3/4 (paper submission only)