

Problem set 3: Fixed Income Analysis

Problem 1

Suppose you fit the discount function

$$d(t) = \exp(-y(t)t) \tag{1}$$

to data where the function y is given by the Nelson-Siegel function.

- a) Give an interpretation of $y(t)$.

- b) Suppose you found $a = 0.015$. The next day you find $a = 0.016$. The parameters b and c were unchanged. What happened to the term structure?

- c) Describe the term structure in the Nelson Siegel model if $b_2 = b_3 = 0$.

Problem 2

Open the spreadsheet "discountFNs2015-noBB.xlsm" spreadsheet to analyze the February 2036, 4.5% Treasury bond. Remember that this is the bond that on February 3d we found to be trading at about 142.67 with a theoretical price of 140.2. Make sure that the date in

Create a new tab in the spreadsheet to "manually" compute the value of the bond. To do this, let column A (say) represent the time in years from 2/4/2015 until the various cash flows, and then a second column, B, with the cash flows (remember we did this for an old 2010 maturity bond in class). Next, create a new column, C, that computes the zero coupon ytm using the Nelson Siegel function. Compute the discount function $(1 + y(t))^{-t}$ in column D, where $y(t)$ are the zero coupon yields in column C. Finally, use this information to compute the present value of all the cash flows, and then the theoretical value of the bond.

Does the value of the bond computed in this fashion differ markedly from the theoretical value computed with Visual Basic (140.2)?

Problem 3

Go to a Bloomberg terminal and

- a) Write down the most recent dirty price, YTM, duration, risk, convexity, of the Feb 2036 4.5 Treasury.

- b) Suppose you had sold 1M worth of this bond on Feb 4th. What would your capital gain (loss) have been?

- c) Was your capital gain or loss in b) due to a mis-pricing of the bond on Feb 4th, or did interest rate changes overall cause the capital gain/loss? To answer this question, consider comparing the trade to other trades you could have done using bonds with similar maturity.

Problem 4

Consider the function

$$f(x, y, z) = \frac{x^2}{z} e^{-y-x^2}$$

Write a visual basic function to compute this. Call the function from excel with parameters $z = 2, x = 3, y = -4$.

Keep the parameters x and y constant and plot the function for $z = 0.01, \dots, 4$.