

Interest Rates and Credit Risk Assignment #1 January 27, 2010

This assignment is due in class on Wednesday February 11, 2010.

Exercise 1. (NOT TO BE HANDED IN)

1. Read notes Ch 1,2,3,4.
2. Go to the Bank of Canada website
http://www.bankofcanada.ca/en/rates/yield_curve.html
and download the yield curve data for the month of September 2009. Load this data into EXCEL or Matlab. Plot the yield curve for the last day of the month. Compute the equivalent set of zero coupon bond prices, and plot these for the last day of the month.

Exercise 2. Let Δt be a fixed time interval, and N a positive integer. Consider a contract that pays the holder a sequence of payments of the amounts $L_{t_{i-1}}(t_i)$ on the dates $t_i = i\Delta t, i = 1, 2, \dots, N$. Find the fair value of the contract at time 0.

Exercise 3. An *interest rate swap* can be defined for any increasing sequence of times $t_0 = 0 < t_1 < t_2 < \dots < t_N = T$ as follows. The contract “swaps” interest payments at a fixed simple rate K for interest payments paid at the natural floating (random) rate. That is, on the dates $t_i, i = 1, 2, \dots, N$, the “fixed leg” pays $(t_i - t_{i-1})K$, while the “floating leg” pays $(t_i - t_{i-1})L_{t_{i-1}}(t_i)$. Find the fair value V_0 of the swap at time 0. Compute the value of K that makes the swap have $V_0 = 0$.

Exercise 4. Course Notes Exercise 11.

Exercise 5. Course Notes Exercise 12.

Exercise 6. Course Notes Exercise 16.

Exercise 7. Course Notes Exercise 17.

Exercise 8. Course Notes Exercise 18.

Exercise 9. Course Notes Exercise 19.

Exercise 10. Consider the Vasicek model with risk neutral parameters $\kappa = 1.0, \theta = 0.03, \sigma = 0.2, r_0 = 0.03$. Compute the par coupon rate at time 0 for a 10 year bond with half yearly coupons (you will need to write a Matlab or similar script). Compute the swap rate for a 5 year loan with monthly payments.