Fixed Income Securities Final Problems

Spring 2020

Question 1

From the following site https://www.treasury.gov/resource-center/data-chart-center/interest-rates/pages/TextView.aspx?data=yieldYear&year=2020
Download the daily constant maturity US treasury yields. (CMY) and regards them as zero-coupon bond yields.

A)

Estimate daily continuous yield curve and instantaneous forward rate curve by fitting a cubic spline function to the above discrete CMY.

B)

Graph the end on the months yield curves and instantaneous forward rate curve, and comment on the monthly changes of the two curves.

Question 2

For ten year US Government bonds futures contract expiring in June 2020(TYM0), the following bonds are deliverable.(Details of bonds are in file "TYM0_dlv_20200403.xlsx")

A)

For each of deliverable bonds using the estimated yield curve in 1) find the time series of daily price of the bonds in 2020.
Price Formula is the following:

$$P_t(T_j, C_j) = \Sigma_{i=1}^{N-1} \frac{C_j}{[1 + y(t, T_i)]^{\frac{(T_i - t)}{365}}} + \frac{(100 + C_j)}{[1 + y(t, T_j)]^{\frac{(T_j - t)}{365}}}$$

where T_j is bond maturity and C_j is the coupon payment, N is the number of semi-annual coupon payment, $y(t, T_i)$ is the interpolated yield T_i at t

B)

Find the daily rate of return of each bond and conversion factor adjusted return (conversion factor adjusted return is simply the daily return multiply by the conversion factor)

C)

Compare and comment on the conversion factor adjusted return of the above bonds.