Term Structure Modeling

1. Construct a forward rate curve for interest rates from the following data: 1) overnight Fed funds 5.2%, 2) 3 month LIBOR Eurodollar deposit rate 5.2%, 3) 6 month LIBOR rate, 5.25%, 4) 1yr LIBOR Eurodollar deposit rate of 5.3%, 5) 5 year swap rate 5.5%, 6) 10yr swap rate 5.7%, 7) 30 year bond with coupon 5.9% selling at par. Construct also a discount curve par yield curve.

2. Take the forward rate curve constructed in the previous problem and build a one-factor modified-Vasicek model for the forward curve dynamics with the following parameters: $\kappa = 0.2$, $\theta = 0.063$, $\sigma = 0.01$. Using this model price a 5-year call option on a 10 year coupon bond (i.e., maturing ten years from now) with semi-annual coupons of 6.00% and a strike at par. To compute the value of this option, use 1) Monte-Carlo simulation, 2) Jamshidian's trick to convert the bond option into a portfolio of caplets that can be evaluated analytically.