

# Assignment 1 - Math 772

## Credit Risk and Interest Rate Modeling

17/01/2003

1. For either the Vasicek **or** the CIR model:
  - choose a reasonable set of parameters under the measure  $Q$ ;
  - simulate the short rate process over the interval of one year using a discrete version of its SDE and plot 3 of its sample paths;
  - plot the mean and the variance of the process over time;
  - obtain an expression for the maximum likelihood estimators of the model parameters;
  - estimate the model parameters based on the simulations you generated and confirm with your initial parameters.
2. For either the Dothan **or** the Exponentiated Vasicek model:
  - choose a reasonable set of parameters under the measure  $Q$ ;
  - simulate both the short rate and the bank account process over the interval of one year;
  - calculate  $E^Q[C_t]$  for 3 different values of  $t$ .
3.
  - Solve the SDE for the Hull–White Extended Vasicek model explicitly and verify the expressions for  $E^Q[r_t]$  and  $\text{Var}^Q[r_t]$ .
  - Verify that the deterministic-shift extension of the Vasicek model is equivalent to the Hull–White Extended Vasicek model.