FE-680 – Assignment 2

Submit complete solutions to all problems in a single PDF. If you wrote codes to solve the problems (C++, R, MATLAB, Mathematica, Python, etc) please attach these files as well. No late submissions will be accepted after the due date. This is an individual assessment; no collaboration is allowed.

Problem 1

What is the value of a European swap option that gives the holder the right to enter into a 6-year annual-pay swap in 3 years where a fixed rate of 3.8% is paid and LIBOR is received? The swap principal is $5 million. Assume that the yield curve is flat at 3.7% per annum with annual compounding and the volatility of the swap rate is 25%.

Problem 2

Find the value of a 4-year collar that guarantees that the min and max interest rates on a LIBOR-based loan (with quarterly resets) are 3.0% and 4.0% respectively. The LIBOR zero curve (continuously compounded) is currently flat at 3.6%. Use a flat volatility of 22%. Assume that the principal is $5 mill.

Problem 3

The payoff from a derivative will occur in 7 years. It will equal the average of the one-year risk-free interest rates observed at times 1, 2, 3, 4, 5, 6, and 7 years applied to a principal of $5 mill. The risk-free yield curve is flat at 5% with annual compounding and the volatilities of all rates are 22%. Assume perfect correlation between all rates. What is the value of the derivative?

Problem 4

Assume that the risk free-rate yield curve is flat at 5% (with continuous compounding). The payoff from a derivative occurs in 5 years. It is equal to the 6-year rate minus the 2-year rate at this time, applied to a principal of $1 million with both rates being continuously compounded. Calculate the value of the derivative. Assume that the volatility for all rates is 30%.