

Homework 3, FRE-6971, due 4/21/2018, 7pm

Problem 1 (5 points)

Read Chapter 3 of the Fisher & Gilles paper.

1-Factor Affine model:

$$dr(t) = \{\mu - \kappa r(t)\}dt + \sqrt{\gamma r(t) + \sigma} dW(t)$$

Show that $p(t, T) = e^{A(t, T) - B(t, T)r(t)}$

where functions A & B satisfy the Ricatti equations:

$$\begin{aligned}\frac{dA}{dt} - \mu B + \frac{1}{2}\sigma B^2 &= 0 \\ \frac{dB}{dt} - \kappa B - \frac{1}{2}\gamma B^2 + 1 &= 0\end{aligned}$$

Problem 2 (15 points)

Assume $[r(0), \mu, \kappa, \gamma, \sigma] = [0.01, 0.0025, 0.05, 0, 0.01]$ in the above model. Find the analytical solution for the zero-coupon bond price, starting from the no-arbitrage condition we discussed in class, and compare the result with the solution of the above system of ODEs.

Problem 3 (40 points):

Dataset: Settle prices of first 8 (most liquid) rolling Eurodollar futures you got from Quandl.

Sample1: Jan-2004 through Dec-2006

Weighted Spread (WSPR): $f_i - w * f_j, i \neq j, 1 \leq \{i, j\} \leq 8$

f_i is a futures rate of the i-th rolling Eurodollar.

1. Using Sample1 construct all possible cointegrated WSPR using CCA and/or level regression. How many possible combinations will you have?
2. Inspect stationarity of all WSPRs in Sample1, and choose the best 5
3. Inspect stationarity of all WSPR 3m out-of-sample, and choose the best 5
4. Compare results of Steps 2 & 3, analyze results