Homework 4, 4/18/2017, FRE-6971

Problem 1 (20 points)

Read Chapter 3 of the Fisher & Gilles paper.

1-Factor Affine model:

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

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

where functions A & B satisfy the Ricatti equations:

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

Problem 2 (40 ponts):

Read Diebold & Li paper on Dynamic Nelson-Siegel model (DNS).

Dataset: CMT-all.xlxs, sample: 2007-on.

Carry out estimation of DNS parameters in the following way:

1. Step 1: Assume a value of λ, and fit $\beta_1(t), \beta_2(t), \beta_3(t)$ to a set of yields observed on day t (repeat for all days in the dataset)

2. Step 2: Find λ that bests fits the whole dataset (Step1 needs to be repeated on each iteration, as you search for optimal λ). You can use an optimization package, or write your own code - be creative.

3. Construct PCAs from the levels of yields. Compare time series of $\beta_1, \beta_2, \beta_3$ to first 3 PCA factors, and analyze your results