Homework 4, FRE-6971, due 4/30/2018, 6pm

Problem 1 (20 points)

Read Chapters 1-2 of Duffie, Pan, Singleton paper on Transform Analysis in Affine Asset Pricing

1-Factor Affine model:

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

1. Initially assume $\gamma = 0$, and derive the expressions for Eurodollar futures rate in the above model
2. How can we compute a Eurodollar futures rate if $\gamma \neq 0$? Explain all steps
3. Extra credit: Build a Jupyter Notebook to demonstrate your calculations using $\mu = 0.005$, r(0)=0.015, k=0.1, $\sigma = 0.008$, $\gamma = 0.005$

Problem 2 (40 ponts):

DatasetA: Settle prices of first 8 rolling Eurodollar futures you got from Quandl.

DatasetB: Settle prices of first 8 Constant-Maturity Eurodollars you have constructed by interpolation using DatasetA and a panel of IMM dates in your class resources (immDate.csv)

Sample1: Jan-2004 through Dec-2006

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

Use the following 4 WSPRs: {1,2}, {1,3}, {7,8},{6,8}

1. Use Sample1/DatasetA to construct the 4 WSPR using CCA and/or level regression
2. Inspect stationarity and compute summary statistics for these 4 WSPRs in Sample1
3. Inspect stationarity and compute summary statistics for these 4 WSPR 3m out-of-sample
4. Repeat steps 1-3 for DatasetB
5. Compare results produced with DatasetA and DatasetB

Problem 3 (20 points)

Use the inside market data in Figure 1. to setup an ILP to solve for the best price to sell a butterfly [H8-U8-H9] (note that there are 2 contracts on the belly of the butterfly).

Extra credit: Solve this problem using one of the open-source python packages (cvxopt, lpsolve, Xpress are some of the many options available)

Contract	Bid	Size	Ask	Size
H8	9966	8689	9966.5	468
U8	9962	6396	9962.5	2337
H9	9957	2864	9957.5	601
M9	9953.5	3558	9954	665
H8-U8	4	52	4.5	4266
U8-H9	5	1201	5.5	8355
U8-M9	8	1698	8.5	41
H9-M9	3.5	311	4	46827

Figure 1.