FRE-GY-6971, Homework #2, Due 4/14/2017, 11am, 60 pts

1. Definitions:
   1. Sample1: 1/2/2012 to 12/31/2015
   2. WFLY: 5Y\*w1 – 7Y + 10Y\*w2, weights = (w1,-1,w2)
2. Build a Jupyter Notebook to do the following:
   1. Download a panel of CMT rates into pandas dataframe & remove ‘1M column from the dataset
   2. Perform PCA on the dataset using Sample1
   3. Use this PCA model to analyze the CMT curve move on the Election Day: 11/8/2016 to 11/9/2016
      1. Plot CMT curve move vs the move explained by the first PCA factor, first 2 PCA factors, first 3 PCA factors
      2. Explain your calculations and results
   4. Compute weights of the WFLY to make sure that WFLY does not have PCA1,2 risk exposure in Sample1. Let’s call this combination WFLY1
   5. Choose weights of the WFLY from cointegration analysis (weights correspond to the best cointegrated vector). Let’s call this combination WFLY2
      1. Use Chou-Ng estimation procedure or Box-Tiao (for extra credit)
3. Compute Half-Life & ADF statistic for WFLY1, WFLY2 using Sample1, compare results
   1. Note that you are using time series of levels, not daily differences
4. Repeat Step #3 out-of-sample: using 3m, 6m, 12m out of sample periods
   1. How do out-of-sample results compare across periods and combinations?
5. Read d’Aspremont’s paper: Identifying Small Mean-Reverting Portfolios
   1. Explain the rationale for sparse decomposition algorithms
   2. Describe & compare results in Figures 1 and 6