FRE-6971 Final Part 2 of 2, Spring 2023 (due 5/11/2023 by 8pm)

Your work for this final must be independent. Incomplete work is not a failure, but copying somebody else's work is.

Data:

'Constant_Maturity_ED.csv' in the 'Class Materials' folder contains constant-maturity Eurodollar rates produced to mitigate the impact of futures roll. There are 20 time series in the file: 3m future, 6m future.... 5y future rate on 3M LIBOR (ED8=2y, ED12=3y, ED16=4y, ED20=5y)

Historical samples:

1/1/2010 through 1/1/2014, Estimation Sample (A)

1/1/2014 through 1/1/2016 Signal Building Sample (B)

1/1/2016 through 1/1/2018, Testing Sample (C)

1. Use Sample A to compute 3 cointegrated butterflies of ED futures rates: [2y,3y,5y], [3y,4y,5y], [2y,3y,4y]. Weight on the belly of a butterlfy is 1 for all combinations.

2. Let's define z(t,λ) as {x(t) - EMA(x(t), λ)} where x(t) is a cointegrated butterfly at t. Use Sample B to construct the following forecasting models:

    a. AR(1) model fitted to z(t,$\lambda = 0$) (Signal 1), this is a constant mean case

    b. AR(1) model fitted to z(t,$\lambda = 0.05$) (Signal 2)

    c. AR(1) model fitted to z(t,$\lambda = 0.1$) (Signal 3)

    Each model is estimated in a rolling 6m window, and forecast, E[z(t+H)|t], is produced for H=5 days. Note that your forecast for the cointegrated butterffly at t+H will be E[z(t+H)|t]+EMA(t,λ) (we assume that EMA value won't change in H days).

    IF YOU NEED TO SIMPLIFY: Carry out the estimation in the first 6m of Sample B, and keep forecasting model parameters unchanged.

3. EXTRA CREDIT: Can you suggest a method of combining Signals 1, 2 & 3? Call the combination (or mixture of signals) Signal 4.

4. Define one or two signal quality metrics, and explain clearly what you are implementing.

    a. Apply signal quality metrics to Signals 1-3 (or Signals 1-4) in the last year of Sample B

    b. Apply signal quality metrics to Signals 1-3 (or Signals 1-4) in Sample C

    c. Compare and analyze your results across signals & samples