STAT 6351: Assignment #7

Notes

This assignment is concerned with multivariate conditional mean modeling: VAR, VECM, and cointegration.

Questions

1. Consider the monthly US 1-year and 3-year Treasury constant maturity rates from April 1953 to March 2004. The data can be obtained from the Federal Reserve Bank of St. Louis or from the file `m-gs1n3-5304.txt` (1-year, 3- year, dates). (Example 8.6 in AFTS uses a shorter data span.) Here we use the interest rates directly without the log transformation and define $x_t = (x_{1t}, x_{2t})'$, where x_{1t} is the 1-year maturity rate and x_{2t} is the 3-year maturity rate.

   (a) Identify a suitable VAR model for the bivariate interest rate series. Write down the fitted model (once you are satisfied with the fit).

   (b) Compute and plot the impulse response functions (IRFs) of the fitted VAR model. Interpret the off-diagonal IRF plots. Do they suggest the presence of any lead-lag relationships between the two series?

   (c) Use the fitted VAR model to produce 1-step to 12-step-ahead forecasts of the series.

   (d) Are the two series cointegrated, when a constant term is used? (Use the option `ecdet="const"` in function `ca.jo` of package **urca**, and a 5% significance level to perform the test.)

   (e) If the series are cointegrated, build an ECM for the series. Write down the fitted VECM model. (Use the option `include="const"` in function `VECM` of package **tsDyn**.)

   (f) Use the fitted VECM to produce 1-step to 12-step-ahead forecasts of the series.

   (g) Compare the forecasts produced by the VAR model and the VECM.