

Summer Course
Advanced Time Series and Forecasting
Assignment 1

See “rates.doc” for a description of the data file.

For all questions, use 1962:1 through 2012:6 as the sample period. Use the first 24 observations (1960:1 through 1961:12) for initial conditions and differencing transformations.

You are to calculate the following. You should write your own code (recommendation: use R), but can borrow from pre-existing code where you feel comfortable doing so.

You may or may not be able to complete all parts of each assignment each day. Get done what you can!

The goal is to build a forecasting model for the unemployment rate.

1. Start by plotting the unemployment rate against time. Is the series trending? Volatile? Cyclical?
2. Estimate an AR(4) model (always include an intercept!) by least-squares. Report coefficient estimates, robust standard errors, and a one-step point forecast for July 2012.
3. Estimate a set of autoregressions (always include an intercept!) by least-squares, AR(1) through AR(24). For each, calculate the CV information criterion. If you wish, also calculate the BIC, AIC, AIC^c, Mallows, Robust Mallows, and FPE information criteria.
4. Based on the criteria, select an AR model.
5. Use this model to make a one-step point forecast for July 2012.
6. Report coefficient estimates and robust standard errors.
7. Now consider the other variables in the data set. After making suitable transformations, include these variables in your model. Using the information criteria, select a forecasting model.
8. Use this forecasting model to make a one-step point forecast for July 2012.

In R, the transpose of a matrix \mathbf{x} is $\mathbf{t}(\mathbf{x})$, regular matrix multiplication is $\mathbf{a} \%*\% \mathbf{b}$ and element-by-element multiplication is $\mathbf{a} * \mathbf{b}$. The following R commands will be useful. (Type “help(*command*)” to learn about a *command*.)

```
read.table
as.matrix
plot
matrix
cbind
solve
rowSums
which.min
for
```