

Due Tuesday, November 21

This assignment covers ARIMA models. The necessary data are contained in the Excel file `dat501.xls` available at <http://u.arizona.edu/~rlo/>. Be sure to attach the supporting computer print out to the completed assignment and make clear where your answers are shown.

The data for this exercise are quarterly time series data from the National Income and Product Accounts and from the Federal Reserve. The data span the period 1960q1-2000q4.

1. Estimate the growth rate model

$$\begin{aligned}y_{1t} &= a_{11}y_{1t-1} + a_{12}y_{2t-1} + b_1 + u_{1t} \\y_{2t} &= a_{21}y_{1t-1} + a_{22}y_{2t-1} + b_2 + u_{2t}\end{aligned}$$

where  $y_{1t} = \ln\left(\frac{m1_t}{m1_{t-1}}\right)$ ,  $y_{2t} = \ln\left(\frac{gdp_t}{gdp_{t-1}}\right)$ ,  $m1$  is a measure of the money supply, and  $gdp$  is nominal gross domestic product.

- a. Solve for the estimated long equilibrium growth rates for the money supply and gross domestic product.
  - b. Show whether or not the system satisfies the necessary (but not sufficient) conditions for stability.
  - c. Show whether or not the system satisfies the necessary and sufficient conditions for stability.
2. Consider the ARIMA(p,d,q) model

$\phi(L)(1-L)^d Y_t = \mu + \theta(L)u_t$ , where  $Y_t = \ln(m1_t/pgdp_t)$  and  $pgdp$  is the implicit price deflator for  $gdp$ .

- a. Empirically identify the orders p,d, and q of the process and estimate the corresponding parameters. Defend your identification of the process.
- b. Use your estimates of the model's parameters to estimate the autocovariance function  $\gamma_k$ ,  $k = 0, 1, 2$  for the variable  $(1-L)^d \ln(Y_t)$ .