

ROCHESTER INSTITUTE OF TECHNOLOGY
DEPARTMENT OF ECONOMICS
ECON 458: ECONOMIC FORECASTING
Spring 2004

Problem Set 5

Due date: Wednesday, May 5th

This problem set is worth 40 points.

Problem 1 (20 points)

Consider the AR(2) process

$$y_t = \alpha_1 y_{t-1} + \alpha_2 y_{t-2} + \varepsilon_t$$

(a) When is a process homogeneous (integrated) of order one?

(b) Show that y_t above can be rewritten as

$$y_t = \beta_1 y_{t-1} + \beta_2 \Delta y_{t-1} + \varepsilon_t$$

where $\beta_1 = \alpha_1 + \alpha_2$ and $\beta_2 = \alpha_2$.

(c) Show that it can also be written as a regression of Δy_t on y_{t-1} and Δy_{t-1} .

(d) Show that if $\beta_1 = 1$, the AR(2) process is really an AR(1) process in first differences; that is, the AR(2) process is integrated of order 1.

Problem 2 (10 points)

A linear regression model $y_t = \beta_0 + \beta_1 x_t + \varepsilon_t$ for time series data (y_t, x_t) is fitted by the ordinary least squares estimation procedure. An analysis of the residuals $\varepsilon_t = y_t - (\hat{\beta}_0 + \hat{\beta}_1 x_t)$ reveals that the errors follow a random walk ($\varepsilon_t = \varepsilon_{t-1} + \eta_t$, where $\{\eta_t\}$ is a white noise sequence). The investigator claims that the usual regression analysis (least squares estimates and tests concerning β_0 and β_1) is not affected by the presence of the random walk term. Comment on this. If you feel that the analysis is affected, discuss how a remedy could be found. Make sure you explain what it means for a series to be nonstationary and how you would recognize it as such.

Problem 3 (10 points)

Match ARIMA models with their names (choose the BEST name for each formula):

(a) ARIMA (0,0,1)

(b) ARIMA (0,1,1)

(c) ARIMA (1,0,0)

(d) ARIMA (1,1,0)

(e) ARIMA (1,1,1)

1. $y_t - y_{t-1} = \alpha + \beta y_{t-1}$

2. $y_t = \alpha + \beta y_{t-1}$

3. $y_t - y_{t-1} = \alpha + \beta y_{t-1} + \gamma(y_{t-1} - y_{t-2})$

4. $y_t = \alpha + \beta y_{t-1}$

5. $y_t - y_{t-1} = \alpha + \gamma(y_{t-1} - y_{t-2})$