

**ECONOMICS 7344 – MACROECONOMIC THEORY II, Spring 2006**

Homework 4. Monday February “13.” “Due” Monday February 20 (don’t turn it in, we will go over the questions in class Monday because the first midterm is on Wednesday 22nd).

1. (24% of midterm 1, Spring 2005) Assume that income follows the AR(1) process

$$y_t = 2 + 0.5y_{t-1} + e_t \quad (*)$$

where  $e_t$  is white noise with variance 3.

- Is this time-series process stable?
- Assume that  $y_0$  is a random variable. For what values of the mean  $E(y_0)$  and the variance  $\text{var}(y_0)$  will the time series  $y_t$ ;  $t = 0, 1, 2, \dots$  be stationary?
- What is  $E_1 y_3$  if  $y_1 = 5$  and  $y_0 = 2$ ?
- Write the infinite Moving Average model that is equivalent to the AR(1) model (\*) [assuming that the process now is defined for any integer value of  $t$ ]. (Half the points are from getting the correct mean term.)

2. (4% Core Spring 2004) Assume that income follows the ARMA process

$$y_t = 3 + 2.0y_{t-1} + e_t$$

where  $e_t$  is white noise.

- Is this time-series process stable?
- If  $y_0 = 2$ , what is  $E_0 y_1$ ?

3. (12% Final Exam 2004) Assume that income follows the ARMA process

$$y_t = 3 + 0.3y_{t-1} + e_t$$

where  $e_t$  is white noise.

- Is this time-series process stable?
- What is  $E_{t-2} y_t$  if  $y_{t-2} = 5$  and  $y_{t-3} = 10$ ?

4. (20% Midterm 1, 2003) Consider the AR model

$$y_t = 37 + 0.8y_{t-1} + u_t ,$$

where  $u_t$  is iid.

a) Is this model stable?

Now assume that you have the model

$$y_t = 13 + u_t + 0.2u_{t-1} + .4u_{t-2} .$$

b) Calculate the variance of  $y_t$  and all auto-covariances.

c) Consider the model in a). If  $y_0 = 10$ , what is  $E_0y_1$ ? What is  $E_0y_2$ ?

d) Consider the model in b). If  $u_0 = 10$ ,  $u_{-1} = 0$ , and  $u_{-2} = 10$ , what what is  $E_0y_1$ ? What is  $E_0y_2$ ?