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ECONOMICS 7344 – MACROECONOMIC THEORY II, Spring 2013

Homework 2. Thursday January 24. Due Monday January 28.

1. (24% of Midterm 1, Spring 2005 (numbers slightly changed)) Assume that income follows the AR(1) process

$$y_t = 2 + 0.8 y_{t-1} + e_t \quad (*)$$

where e_t is white noise with variance 3.

a) Is this time-series process stable?

b) 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; $t = 0, 1, 2, ...$ be stationary?

c) What is $E_1 y_3$ if $y_1 = 4$ and $y_0 = 2$?

d) 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. (10% of core exam January 2008) Consider an IS/LM framework. The demand for money is

$$M^d = 0.5Y - 0.5i$$

where Y is output and $i = r + \pi$ where r is the real rate of interest and π is the rate of inflation. Further assume that output demand is

$$Y = C + G + I$$

where $C = 0.8Y$ and $I = 0.1Y - 0.1r$.

a) Derive the IS-curve (you need to find the exact coefficients implied by the information you are given).

b) If $G = 1$, $M = 4$, and $\pi = 0$ find Y.

c) Derive the aggregate demand curve; i.e., a relation between Y and π. (Again, you need to find the exact function implied by the information given.)

3. 1. (30% of Midterm 1, 2010, the percentages are from the exam) Assume that y_t follows the AR(2) process

$$y_t = 200 + 0.5y_{t-1} + 0.3y_{t-2} + e_t \quad (*)$$

where e_t is white noise with variance 4.

a) (8%) Is this process stable? (You need to show why).

b) (8%) Find the mean and variance of y_t assuming that y_t is stationary.

Assume that you are told that $y_1 = 500$ and $y_0 = 400$. (But for question d) you should still think of these as realizations from the stationary distribution.)

c) (6%) What is the conditional expectation $E(y_3|y_0, y_1)$?

The one below is for extra points. I don't think anybody could do during the midterm, you have to use the formula for conditional expectation in a bivarate normal, if you have not been taught that, you can skip it.

d) (8%) Prove that $E(y_1|y_0) = E(y_0|y_1)$? (Hint: One way is to make the assumption that y_1 and y_0 are jointly normally distributed and drawn from the stationary distribution and use what you know from 6331.)