Econ 7393
Time Series Analysis 1
Spring 2008

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Problem Set 1

Due date: Thursday, January 24, in class.

1. Compute the sequence of dynamic multipliers, *i.e.* $\frac{\partial y_{t+j}}{\partial w_t}$ for the following 2nd order linear difference equations:

$$y_t = 1.1 y_{t-1} - 0.2 y_{t-2} + w_t$$

$$y_t = 0.75 y_{t-1} - 0.5 y_{t-2} + w_t .$$

If the eigenvalues are complex, calculate the period of the dynamic multipliers.

2. Compute the sequence of dynamic multipliers for the following 3rd order linear difference equation:

$$y_t = 0.5 y_{t-1} + 0.3 y_{t-2} - 0.1 y_{t-3} + w_t .$$

3. Plot and print the dynamic multipliers for $j = 0, 1, \ldots, 20$ using Gauss.

Gauss hints for this homework assignment

new; @ this clears any variables that you may have defined in a previous program @
library pgraph; @ allows you to plot graphs in Gauss @

phi=0.5; @ coefficient in the first order difference equation @

dm=zeros(20,1); @ this creates a 20 x 1 vector of zeros where we can store the dynamic multipliers @

/* the following is a "do loop." Loops are very useful in Gauss. */

j=1;
do until j>20;

dm[j]=phi^j; @ this just states that the jth multiplier is phi raised to the jth power @

j=j+1;
endo;

dm=1|dm; @ this just stacks a 1 on top of the 20 x 1 vector. This is done since all dynamic multipliers are 1 when j=0 @

/* Now, we will plot the 21 x 1 sequence. The main command is the "xy" command. */

x=seqa(0,1,21); @ This defines the x-axis, which in this case is an arithmetic sequence ranging from 0 to 20, in increments of 1. Thus, the first argument of seqa is the start of the sequence, the second argument is the increment, and the third argument is the number of increments. For example, seqa(0,-1,3); would produce a 3 x 1 vector with elements 0, -1, and –2. @

/* The following commands title the graph, and label the axes */

title("Dynamic Multiplier for a First Order Difference Equation");
xlabel("j");
ylabel("dynamic multiplier");

xy(x,dm);
end; @ end of program @

You will need to use trigonometric functions for one of the 2nd order difference equations. In Gauss, sine and cosine are just denoted as:

sin() and cos()

For example, the following line calculates $\sin(\pi) + \cos^2(0)$:

```
y = sin(pi) + cos(0)^2;
```

If you want to plot the sine function from 0 to π, type the following;

```
omega=seqa(0,0.01,315);

y=sin(omega);
```

@ You may also want to take the sine of each element separately. The following loop will work as well @

```
y=zeros(rows(omega),1);

i=1; do until i>rows(omega);

y[i]=sin(omega[i]);

i=i+1; endo;

xy(omega,y);

end;
```