Session 7: Introduction to Matlab 2 – Scripts and Loops

Doing Economics with the Computer

1 The Topic

Today's objective is to develop your Matlab skills along two dimensions: Writing script files and controlling the flow (the $for, if, while$ commands).

1.1 Script M-files

Example 1 : Open a new M-File, write disp('hello world'); save the file as example1.m and run it from the Matlab prompt by typing example1.

Example 2 : Write and run the following script M-file: a = [1 2]; b = [3 4]; c = a + b. Type the name of the variables a, b, c in the Matlab prompt and see what happens.

Example 3 : Add comments to the above script: a = [1 2]; b = [3 4]; c = a + b

1.2 Controlling the flow

1.2.1 The *for* loop

Example 4: for i = 1:10; disp(i); end;

Example 5: for i = 1:10; x(i)=2^i; end; x

Example 6: for i = 1 : 10; x(i)=i^2; end; x

Example 7: A=zeros(5,5); for i=1:5; for j=1:5; A(i,j)=i^j; end; end; A

Example 8: for i = 1:2:9; disp(i); end;

Example 9: x = zeros(10,1); for i = [2 4 6 8 10]; x(i) = 2^i; end; x;

Exercise 1: Geometric series

Consider the geometric series $x(n) = q^{n-1}, n = 1, 2, \ldots$.

a) Calculate the values of the geometric series for n = 1:10, q = 0.5 and store the results in a vector S1.

b) Compute the sum $s(n) = 1 + q + q^2 + q^3 + \cdots + q^{n-1}$ for q = 0.5 and n = 10.

c) Store the values of the geometric series for n = 1:10 and q = 0.2 in the first row of a matrix S. Store the values for q = 0.5 and q = 0.8 in rows 2 and 3.

Exercise 2: Difference equations

Let $y_{t+1} = f * y_t + w_{t+1}$. Assume that f = 0.7, $y_1 = 1.5$ and $w_t = 0$ for all periods t.

a) Generate the time path of y for t = 1, 2, . . . , 20 using a *for* loop. Plot the time path of y. What happens if f = 1?

b) Consider a temporary change in w: $w_2 = 1$. How is the time path of y affected? Compute and plot the impulse response function.

c) Consider a permanent change in w: $w_t = 1$ for t = 2, 3,.. How is the time path of y affected? Compute and plot the immediate and future effects.

d) Let's assume that w_t is a stochastic variable, a normally distributed random variable: w_t N(0, $s^2 = 0.1$). Generate a sequence w_t for t = 2, .., 20. Compute and plot the time path of y. Compare this to the time path under (a).

e) Consider the non-linear stochastic difference equation $y_{t+1} = w_t * y_t^m + k$ where w is a random number from a uniform distribution. Let $m = 0.5, y_1 = 2$ and $k = 1$. Suppose that when $t = 10$, k becomes 2 and remains at this level thereafter. Plot the path of the difference equation over 50 periods.

1.2.2 The *if* statement

Example 10: a = 4; b = 3; if a >b; disp('a is bigger than b'); end;

Example 11: a = 2; b = 3; if a > b; disp('a is bigger than b'); else; disp('a is smaller or equal to b'); end;

Example 12 : a = 2; b = 3; if a > b; disp('a is bigger than b');
elseif a == b; disp('a is equal to b');
else; disp('a is smaller than b'); end;

Example 13: a = 2; b = 3; c = 3;
if $(a < b)\&(b \sim= c)$; disp('a is smaller than b and b is not equal to c'); end;

Example 14 : $x(1) = 1$; for i = 1:1000; $x(i+1) = x(i) * 2$; if $x(i+1) > 100$; break; end; end; x

Exercise 3: An (almost)infinite geometric series.
Calculate the sum of a geometric series $s(n) = 1 + q + q^2 + q^3 + \cdots + q^{n-1}$ for q = 0.5 and $n \to \infty$ using a *for* loop. Stop the loop when the value of s(n) equals approximately s(n-1). Example 14 may give you an idea of how to do this.

Exercise 4: The solution to a difference equation.

The difference equation $y_{t+1} = f * y_t + w_{t+1}$ converges towards a certain value when w is a constant and $-1 < f < 1$. Calculate this value when $y_1 = 1$,$w = 1$ using a *for* loop (terminate the loop when the value of y_t no longer changes.

1.2.3 The *while* loop

Example 15: i = 0; while i <= 9; i = i+1; disp(i); end;

Example 16: x = 1; while x <= 100; x = x*2; end; x

Exercise 5: Redo exercise 4 using a `while` loop in order to get the value at which the change in successive values of the difference equation is "negligible". Example 16 may help.

2 Homework

Exercises 2c, 2e, 4.[1]

[1] Note that this homework is not part of the 6 assignments.