

## Preparations for Matlab seminar econ4510

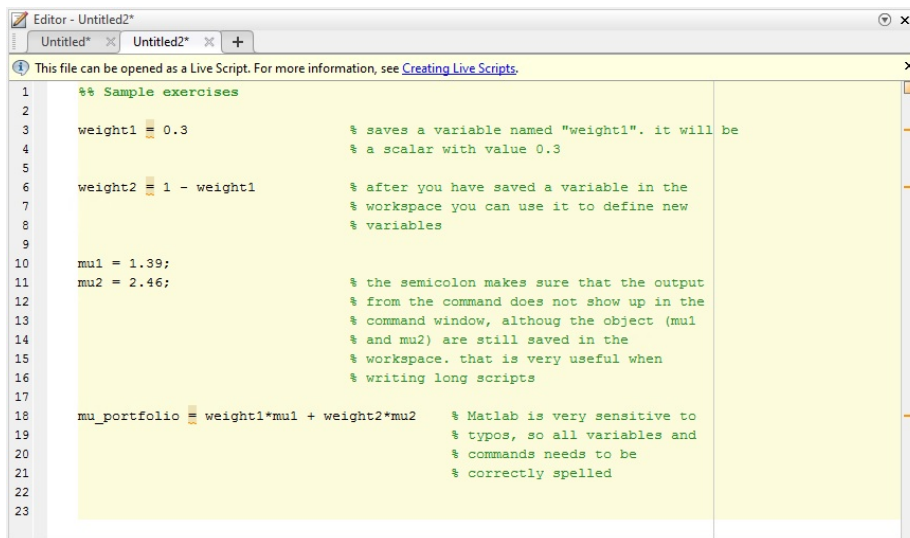
You should think of Matlab as a very advanced calculator. It can perform a complex set of tasks for you as long as you know how to write down the instructions.

Open Matlab through [kiosk.uio.no](http://kiosk.uio.no). Begin by watching this video: <https://se.mathworks.com/videos/getting-started-with-matlab-68985.html>.

Matlab can do all kinds of simple commands directly in the command window, but normally we use what is called a "script" to perform a sequence of commands. In the seminar you will get a script that is almost finished, but where you will have to fill in some parts of the commands. I will only ask you to fill in the math, not anything very advanced.

There are two types of operations that we will use now: simple commands and loops.

A simple command is an expression that tells matlab to save an object in the workspace, as well as the shape of the object and the value. Simple commands can be mathematical expressions or pre-defined commands.



```
Editor - Untitled2*
Untitled2* x Untitled2* x +
This file can be opened as a Live Script. For more information, see Creating Live Scripts.
1 %% Sample exercises
2
3 weight1 = 0.3 % saves a variable named "weight1". it will be
4 % a scalar with value 0.3
5
6 weight2 = 1 - weight1 % after you have saved a variable in the
7 % workspace you can use it to define new
8 % variables
9
10 mu1 = 1.39;
11 mu2 = 2.46; % the semicolon makes sure that the output
12 % from the command does not show up in the
13 % command window, although the object (mu1
14 % and mu2) are still saved in the
15 % workspace. that is very useful when
16 % writing long scripts
17
18 mu_portfolio = weight1*mu1 + weight2*mu2 % Matlab is very sensitive to
19 % typos, so all variables and
20 % commands needs to be
21 % correctly spelled
22
23
```

If you end the command by a semicolon the object you saved will not appear in the command window, but will still be saved in the workspace.

A loop is a way of telling Matlab to perform the same command a given number of times.

```
22 %% Sample loop
23
24 weight1 = [.1 .2 .3 .4 .5 .6 .7 .8 .9]; % tells Matlab that "weight1"
25 % is a vector with 9 elements
26 % and their values
27
28 weight2 = ones(1,9) - weight1; % to get a vector of the
29 % weights on the other asset we
30 % need to subtract weight 1
31 % from a 1x9 vector of ones
32
33 mu1 = 1.82;
34 mu2 = 3.01; % you can assign a new value to a variable at any time.
35 % the old value will be lost
36
37
38 mu_portfolio = zeros(1,9); % we make an all-zero vector for the
39 % portfolio means. next we'll use a loop to
40 % fill this vector with the calculated
41 % values
42
43 for i = 1:9 % telling Matlab to perform the commands inside the
44 % loop nine times, for all numbers 1,2,3,4,5,6,7,8
45 % and 9.
46
47     mu_portfolio(i) = weight1(i)*mu1 + weight2(i); % tells matlab to
48 % replace element i in
49 % the vector
50 % mu_portfolio by
51 % calculating the mean
52 % using element number
53 % i of vectors weight1
54 % and weight2
55
56 end
57
58 % If you now type mu_portfolio in the command window, the portfolio means
59 % for the nine different sets of weights will appear
60
61
62
63
```

If you want to find out how to do something in Matlab ( e.g. take the log or the square root of a number) the first thing you should do is to google it (type "square root matlab" in google).

## Exercises

I won't go through these in the seminar, but you should do them to get familiar with using Matlab. If you have never tried using Matlab before, you should at least find time to do the first two, they only

require you to copy some text.

The last exercise is useful to understand the exercise we will do in Matlab in class.

- (a) Replicate the first example above using the command-window in matlab.
- (b) Replicate the second example by copying the commands into a matlab script. You open a script by clicking "New Script" in the Home-tab in Matlab.
- (c) Using Matlab:

Imagine you have a stock that has value 12 in January, value 13 in February, value 11 in March, value 12.5 in April, value 14 in May, value 15 in June, value 16 in July, value 17 in August, value 17 in September, value 16 in October, value 15 in November and value 14 in December.

Calculate the monthly gross and net return for each month, and annualize the return.

Gross return in month  $m$  is given by the value in that month divided by the value in the month before.

Net return is given by gross return minus 1, or approximated by the logarithm of gross return.

Annualized return is given by net return to the power of twelve.

- (d) Using pen and paper:

Imagine you have five different assets that are all correlated to each other. You want to create a portfolio that contains all of these five assets. Write down the mean return of this portfolio and its variance.

Draw a sigma-mu diagram, and pick a location for each of the

assets. If you were to draw 1000 random portfolios of these assets, how would they be placed in the diagram?

Draw the minimum-variance frontier in the diagram.