

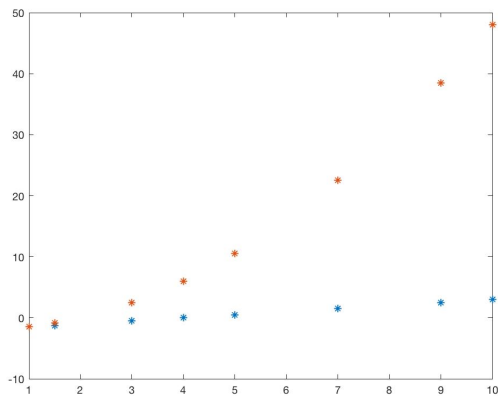
Econ 512
Fall 2018

Solution to Homework 1 – Introduction/Review of Matlab Basics
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1. The matlab codes are given by:

```
X=[1 1.5 3 4 5 7 9 10];  
Y1=-2+0.5*X;  
Y2=-2+0.5*X.^2;  
figure  
plot(X,Y1,'*',X,Y2,'*')
```

The relationships between X and Y1, Y2 are plotted as:



The blue stars are for Y1 and the red stars for Y2.

2. The matlab codes are given by:

```
step=(20-(-10))/199;  
X_2=-10:step:20;  
s=sum(X_2)
```

The output which is the sum of the elements of generated vector is 1000.

3. The matlab codes are given by:

```
A=[2, 4, 6;  
    1, 7, 5;  
    3, 12, 4];  
b=[-2; 3; 10];  
C=A'*b  
D=(A'*A)\b  
E=sum(A)  
F=A([1,3],1:2)  
x=A\b
```

The output are: $C = \begin{bmatrix} 29 \\ 133 \\ 43 \end{bmatrix}$, $D = \begin{bmatrix} -3.2505 \\ 0.3961 \\ 0.8037 \end{bmatrix}$, $E = 205$, $F = \begin{bmatrix} 2 & 4 \\ 3 & 2 \end{bmatrix}$ and the solution to $Ax = b$ is $x = \begin{bmatrix} -0.1622 \\ 1.2432 \\ -1.1081 \end{bmatrix}$.

4. The matlab codes are given by:

```
I=eye(5);
B=kron(I, A)
```

We use kronecker product to generate matrix B.

5. The matlab codes are given by:

```
A5= normrnd(10,5,5,3)
A5(A5<10)=0;
A5(A5>=10)=1;
disp(A5)
```

We use 'normrnd' to generate the matrix A and then convert it a new matrix by the above codes.

6. The matlab codes are given by:

```
M = csvread('datahw1.csv');
save('datahw1.mat','M');
load('datahw1.mat');
x1 = M(:,3); % export
x2 = M(:,4); % RD
y = M(:,5); % prod
x3 = M(:,6); % capital
X=[x1 x2 x3];
% Since the matlab does not have a OLS regression function for multivariate
% regression that returns both the coefficients and their standard errors,
% I use a new function to find it.
[b_hat, se]= ols(y, X, 1)
```

The reported estimates and heteroskedastic standard errors are:

$\hat{\beta}_1=0.0817$, $\hat{\beta}_2=0.1201$, $\hat{\beta}_3=0.1399$, $\hat{\beta}_4=0.0295$
 $se(\hat{\beta}_1)=0.0193$, $se(\hat{\beta}_2)=0.0061$, $se(\hat{\beta}_3)=0.0089$, $se(\hat{\beta}_4)=0.0020$.

The function *ols* is given below:

```
function[b_hat, se] = ols(Y, X, hetero)
% Y - dependent variable
% X - regressors (without a constant)
% hetero - 1 if using heteroskedasticity and 0 if using homoskedasticity
[n, ~] = size(X);

if numel(Y) ~= n
    error('Incompatible data.')
end

% Get estimates
X1 = [ones(n, 1) X]; XX1 = X1' * X1;
b_hat = XX1 \ (X1' * Y);
r_hat = Y - X1 * b_hat;

% Get asyvar.
switch hetero
    case 1
        X2 = bsxfun(@times, X1, r_hat);
        avar = XX1 \ (X2' * X2) / XX1;
    otherwise
        avar = (r_hat' * r_hat) * inv(XX1) / n;
```

```

end

se = sqrt(diag(avar));

end

```

Output file
Econ512_HW1

```

s =

    1000

```

```

C =

    29
   133
    43

```

```

D =

   -3.2505
    0.3961
    0.8037

```

```

E =

    205

```

```

F =

     2     4
     3    12

```

```

x =

   -0.1622
    1.2432
   -1.1081

```

```

B =

     2     4     6     0     0     0     0     0     0     0     0     0     0
0      0
     1     7     5     0     0     0     0     0     0     0     0     0     0
0      0
     3    12     4     0     0     0     0     0     0     0     0     0     0
0      0

```

	0	0	0	2	4	6	0	0	0	0	0	0	0
0	0												
	0	0	0	1	7	5	0	0	0	0	0	0	0
0	0												
	0	0	0	3	12	4	0	0	0	0	0	0	0
0	0												
	0	0	0	0	0	0	2	4	6	0	0	0	0
0	0												
	0	0	0	0	0	0	1	7	5	0	0	0	0
0	0												
	0	0	0	0	0	0	3	12	4	0	0	0	0
0	0												
	0	0	0	0	0	0	0	0	0	2	4	6	0
0	0												
	0	0	0	0	0	0	0	0	0	1	7	5	0
0	0												
	0	0	0	0	0	0	0	0	0	3	12	4	0
0	0												
	0	0	0	0	0	0	0	0	0	0	0	0	2
4	6												
	0	0	0	0	0	0	0	0	0	0	0	0	1
7	5												
	0	0	0	0	0	0	0	0	0	0	0	0	3
12	4												

A5 =

24.5400	8.6377	8.2308
14.1261	15.4921	5.8821
16.8949	8.6106	2.1147
4.7091	13.5077	12.5399
7.6569	-0.2591	11.4099

2	4	6
1	7	5
3	12	4

b_hat =

0.0817
0.1201
0.1399
0.0295

se =

0.0193
0.0061
0.0089
0.0020