# Homework 1: ECON512

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1. The associated graph are depicted below.

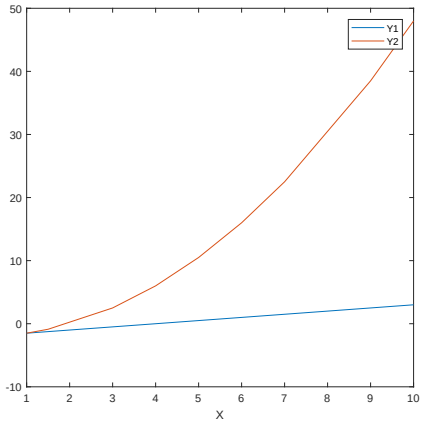


Figure 1

2. Summation is 1000.
3. Here are the results

$$C = \begin{bmatrix} 29 \\ 133 \\ 43 \end{bmatrix}$$

$$D = \begin{bmatrix} -3.2505 \\ 0.3961 \\ 0.8037 \end{bmatrix}$$

$E = bA'\iota = 205$, where $\iota$ is a vector which all elements are one

$$F = \begin{bmatrix} 2 & 4 \\ 3 & 12 \end{bmatrix}$$

$$x = A^{-1}b = \begin{bmatrix} -0.1622 \\ 1.2432 \\ -1.1081 \end{bmatrix}$$

4. This is nothing but $B = I_5 \otimes A$

5. With seed 2, the following result arises.

$$A = \begin{bmatrix} 0 & 0 & 1 \\ 0 & 0 & 1 \\ 1 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix}$$

6. Let

$$y_i = \begin{bmatrix} prod_{i1} \\ prod_{i2} \\ \vdots \\ prod_{iT} \end{bmatrix},$$

$$x_i^{'} = \begin{bmatrix} 1 & Export_{i1} & RD_{i1} & cap_{i1} \\ 1 & Export_{i2} & RD_{i2} & cap_{i2} \\ \vdots & \vdots & \vdots & \vdots \\ 1 & Export_{iT} & RD_{iT} & cap_{iT} \end{bmatrix}.$$

Then, OLS estimator $\hat{\beta}$ is computed by

$$\hat{\beta} = \left(\sum_i x_i x_i'\right)^{-1} \left(\sum_i x_i y_i\right),$$

and the corresponding standard errors are squared root of the diagonal components in the following matrix:

$$\left(\sum_i x_i x_i'\right)^{-1} \left(\sum x_i \hat{e}_i \hat{e}_i^{'} x_i^{'}\right) \left(\sum_i x_i x_i'\right)^{-1},$$

where

$$\hat{e}_i = y_i - x_i^{'} \hat{\beta}.$$

Table 1 reports the estimates and relevant standard errors.

Table 1: Estimation Results

| | **Dep: Productivity** |
|---|---|
| Exporters | $0.1210^{***}$ |
| | $(0.009)$ |
| R & D | $0.1399^{***}$ |
| | $(0.0138)$ |
| Capitals | $0.0295^{***}$ |
| | $(0.004)$ |
| Constant | $0.0817^{***}$ |
| | $(0.0345)$ |

*The table displays estimation results of the the model. Dependent variable is productivity of a firm in a certain wave. Standard errors are in parenthesis. Asterisks mark rejection at the 1% (***).*

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% Homework #1 ECON 512                                                   %
% Written by Joonkyo (Jay) Hong, 31 Aug 2018                             %
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%% Problem 1.

X = [1 1.5 3 4 5 6 7 9 10];
Y1 = -2 + .5*X;
Y2 = -2 + .5*X.^2;

figure(1)
plot(X,[Y1; Y2]);
legend("Y1","Y2");
xlabel("X");

%% Problem 2

vec_problem2 = linspace(-10,20,200);
vec_problem2 = vec_problem2';
ans_problem2 = sum(vec_problem2);
ans_problem2

%% Problem 3

A = [2 4 6;
     1 7 5;
     3 12 4];
b = [-2;3;10];

C = A'*b
D = (A'*A)\b
E = b'*A*[1;1;1]
F = A;
F(:,3)=[];
F(2,:)=[];
F
x = A\b

%% Problem 4

B = kron(eye(5),A)
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%% Problem 5

rng(2);
matrix_problem5 = normrnd(10,5,5,3);
ans_problem5 = matrix_problem5;
ans_problem5(ans_problem5<10)=0;
ans_problem5(ans_problem5>=10)=1;
ans_problem5


%% Problem 6

dataset = csvread('datahw1.csv',0,0);

ymat = (dataset(:,5));
xmat = [ones(length(ymat),1) dataset(:,3:4) (dataset(:,6))];

ols_est = xmat'*xmat\xmat'*ymat;
k = length(ols_est);
emat = ymat-xmat*ols_est;
wave = 4;
obs= length(ymat)/4;
center_sand = zeros(k,k);
for i=1:obs
    ei = emat((i-1)*wave+1:i*wave,1); xi = xmat((i-1)*wave+1:i*wave,:);
    center_sand = center_sand + xi'*ei*ei'*xi;
end

ols_cov = (xmat'*xmat)\center_sand/(xmat'*xmat);
ols_se = sqrt(diag(ols_cov));

 disp("              ");
 disp("OLS estimates in Problem 6");
 disp("Parameter Estimates and Standard Errors");
 disp(" beta0        beta1       beta2      beta3");
 disp(num2str(ols_est'));
 disp(num2str(ols_se'));
```