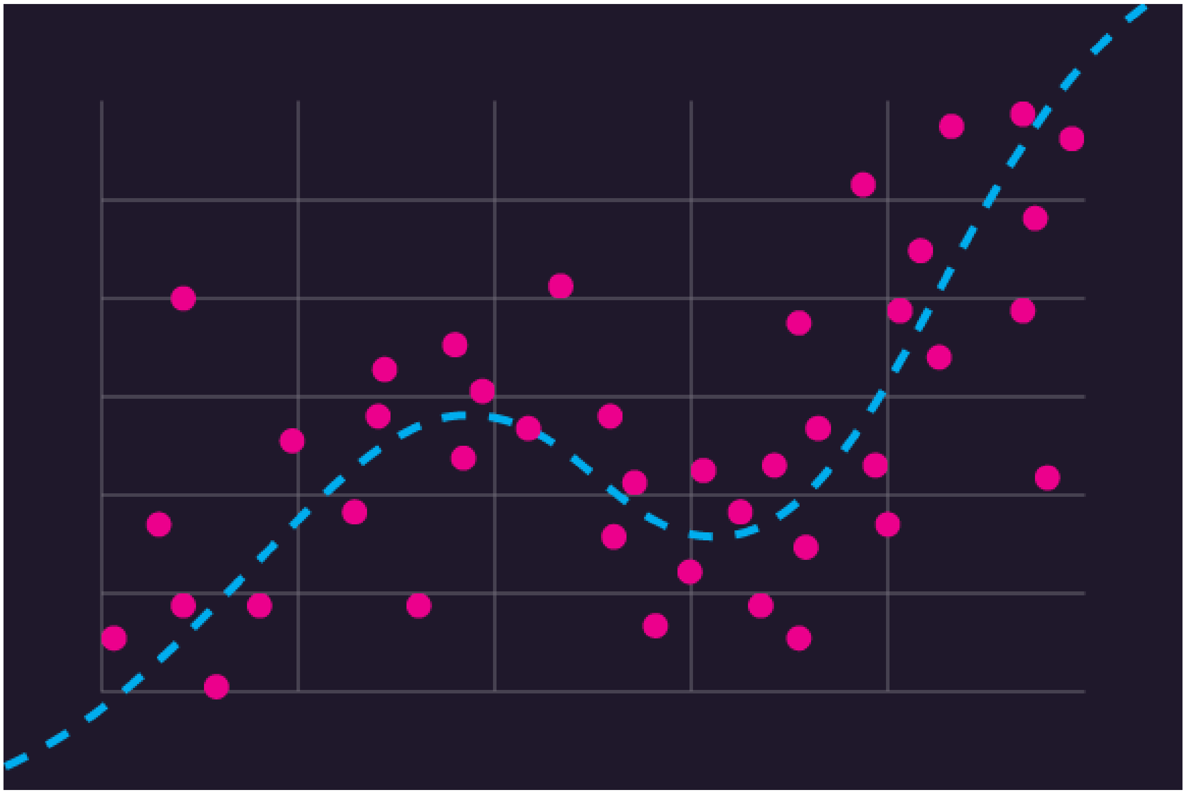
Universidad
Católica del Norte

MODELACIÓN Y SIMULACIÓN AVANZADA

TAREA 1



Estudiante:

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II/2022

a) Derive Standard Least square Regression with the given data

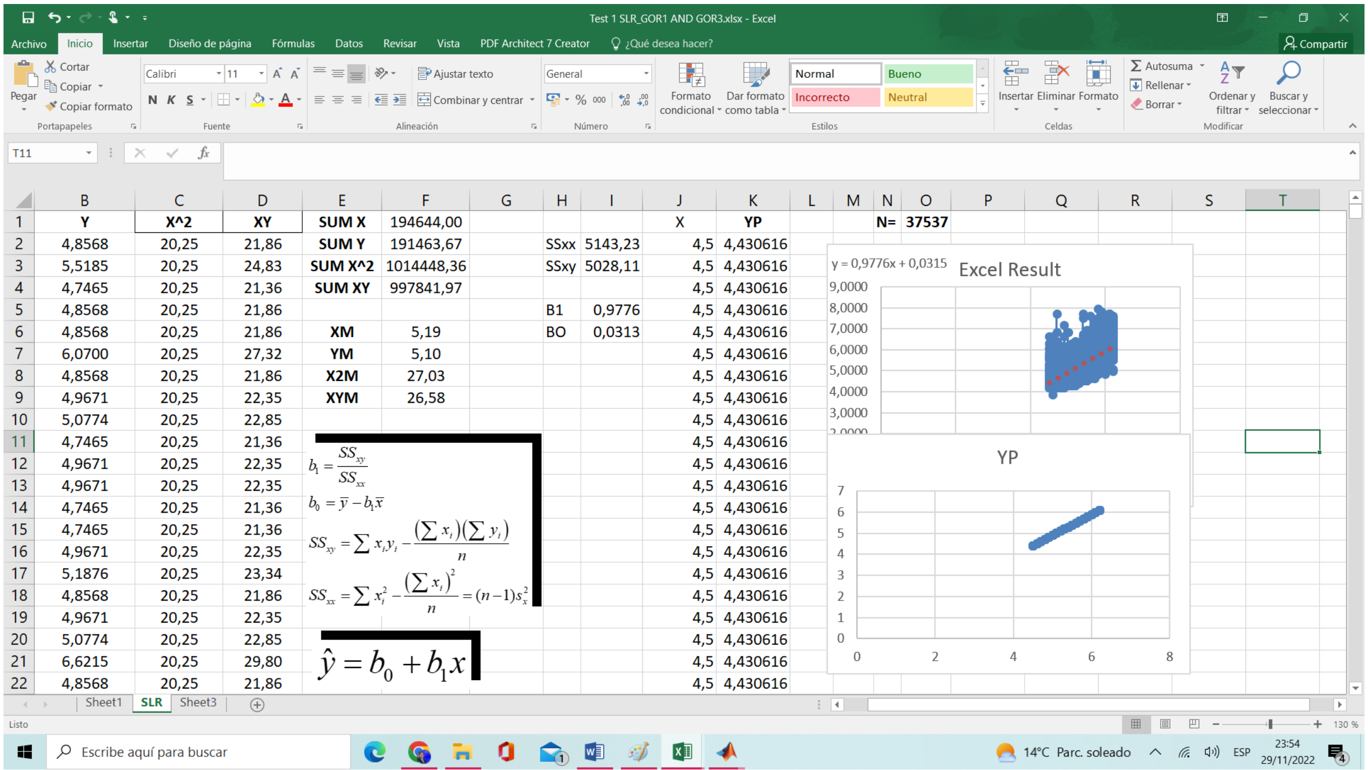

Fig. 1. Simple Lineal Regression with Excel

The same problem was solved from Matlab with the following code:

```
clc; clear all; close all
%T = open('Test 1 SLR_GOR1 AND GOR2.xlsx');
load('valModel.mat');
x=values(:,1);
y=values(:,2);
n=size(x);
x2=x.^2;
xy=x.*y;

SSxy= sum(xy)-(sum(x)*sum(y))/n(1) ;
SSxx= sum(x2)-(sum(x)^2)/n(1) ;

b1=SSxy/SSxx;
b0=mean(y)-b1*mean(x);

Yp=b0+b1*x;

plot(x,y,'*')
```

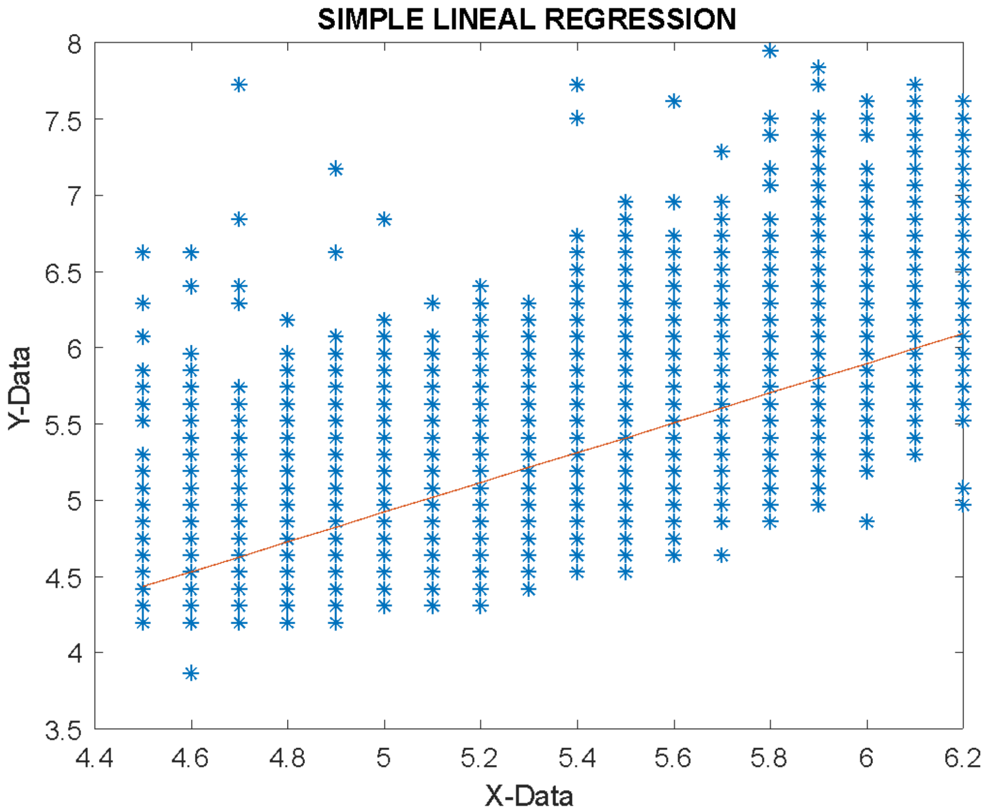

Fig. 2. Simple Lineal Regression with Matlab

In both cases (Excel and matlab) the results were:

$$b_1 = 0.9776$$

$$b_0 = 0.0315$$

$$\hat{y} = b_0 + b_1 x$$

b) Derive Orthogonal Regression with the given data using ita =0.2

	A	B	C	D	E	F	G	H	I	J	K	L
1	MB	Mwg	(X-XM)^2	(X-XM)(Y-YM)	(Y-YM)^2	XM	5,19				X	YP
2	4,5	4,8568	0,47	0,17	0,06	YM	5,10				4,5	3,996124
3	4,5	5,5185	0,47	-0,29	0,17	n	37536				4,5	3,996124
4	4,5	4,7465	0,47	0,24	0,13	Sxx	0,14		-3,25528		4,5	3,996124
5	4,5	4,8568	0,47	0,17	0,06	Sxy	0,13				4,5	3,996124
6	4,5	4,8568	0,47	0,17	0,06	Syy	0,23				4,5	3,996124
7	4,5	6,0700	0,47	-0,66	0,94						4,5	3,996124
8	4,5	4,8568	0,47	0,17	0,06	ita	0,2				4,5	3,996124
9	4,5	4,9671	0,47	0,09	0,02	B1	1,61				4,5	3,996124
10	4,5	5,0774	0,47	0,02	0,00	B0	-3,26				4,5	3,996124
11	4,5	4,7465	0,47	0,24	0,13						4,5	3,996124
12	4,5	4,9671	0,47	0,09	0,02						4,5	3,996124
13	4,5	4,9671	0,47	0,09	0,02						4,5	3,996124
14	4,5	4,7465	0,47	0,24	0,13						4,5	3,996124
15	4,5	4,7465	0,47	0,24	0,13						4,5	3,996124
16	4,5	4,9671	0,47	0,09	0,02						4,5	3,996124
17	4,5	5,1876	0,47	-0,06	0,01						4,5	3,996124
18	4,5	4,8568	0,47	0,17	0,06						4,5	3,996124
19	4,5	4,9671	0,47	0,09	0,02						4,5	3,996124
20	4,5	5,0774	0,47	0,02	0,00						4,5	3,996124
21	4,5	6,6215	0,47	-1,04	2,31						4,5	3,996124
22	4,5	4,8568	0,47	0,17	0,06						4,5	3,996124
23	4,5	4,9671	0,47	0,09	0,02						4,5	3,996124
24	4,5	5,0774	0,47	0,02	0,00						4,5	3,996124
25	4,5	4,9671	0,47	0,09	0,02						4,5	3,996124
26	4,5	5,0774	0,47	0,02	0,00						4,5	3,996124
27	4,5	5,7391	0,47	-0,44	0,41						4,5	3,996124
28	4,5	5,1876	0,47	-0,06	0,01						4,5	3,996124
29	4,5	4,5259	0,47	0,39	0,33						4,5	3,996124

$$\bar{x} = \frac{1}{n}\sum x_i, \quad \bar{y} = \frac{1}{n}\sum y_i,$$

$$s_{xx} = \tfrac{1}{n-1}\sum(x_i - \bar{x})^2,$$

$$s_{xy} = \tfrac{1}{n-1}\sum(x_i - \bar{x})(y_i - \bar{y}),$$

$$s_{yy} = \tfrac{1}{n-1}\sum(y_i - \bar{y})^2.$$

$$\hat{\beta}_1 = \frac{s_{yy} - \delta s_{xx} + \sqrt{(s_{yy} - \delta s_{xx})^2 + 4\delta s_{xy}^2}}{2s_{xy}},$$

$$\hat{\beta}_0 = \bar{y} - \hat{\beta}_1 \bar{x},$$

Sheet1 | SLR | GOR1 | GOR2

Fig. 3. Orthogonal Regression with Excel

The same problem was solved from Matlab with the following code:

```
clc; clear all; close all
T = open('Test 1 SLR_GOR1 AND GOR2.xlsx');
%load('valModel.mat');
x=T.data(:,1);
y=T.data(:,2);;
n=size(x);
xm=mean(x);
ym=mean(y);

%(x-xm)^2
ecux=(x-xm).^2;

%(x-xm)(y-ym)
ecuxy=(x-xm).*(y-ym);

%(y-ym)^2
ecuy=(y-ym).^2;

Sxx= 1/(n(1)-1)  * sum(ecux)  ;
Sxy= 1/(n(1)-1)  * sum(ecuxy);
Syy= 1/(n(1)-1)  * sum(ecuy)  ;

ita=0.2;

B1= ( Syy - ita*Sxx + sqrt ((Syy-ita*Sxx)^2 + 4*ita*(Sxy^2)) )/ (2*Sxy) ;
B0= ym - B1* xm;

Yp=B0+B1*x;

plot(x,y,'*')
hold on
plot(x,Yp)
```

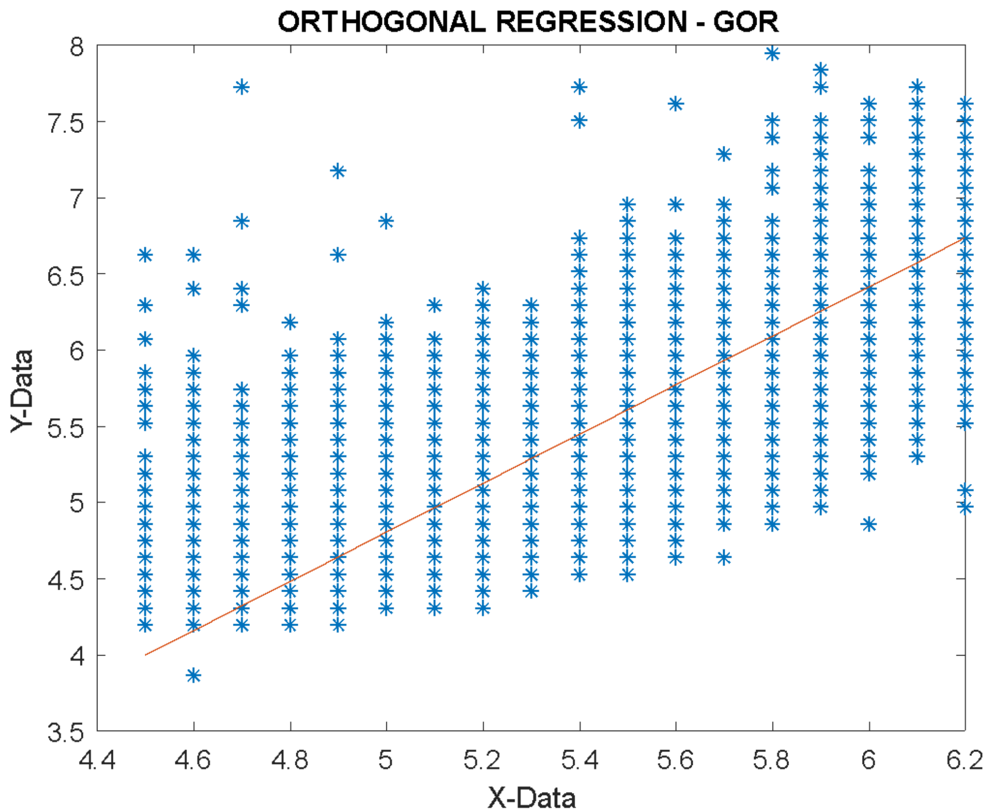

Fig. 4. Orthogonal Regression with Matlab

In both cases (Excel and matlab) the results were::

$$b_1 = \mathbf{1.6114}$$

$$b_0 = -3.2553$$

$$\hat{y} = b_0 + b_1 x$$

c) Derive Modified Orthogonal Regression with the given data using ita = 0.2

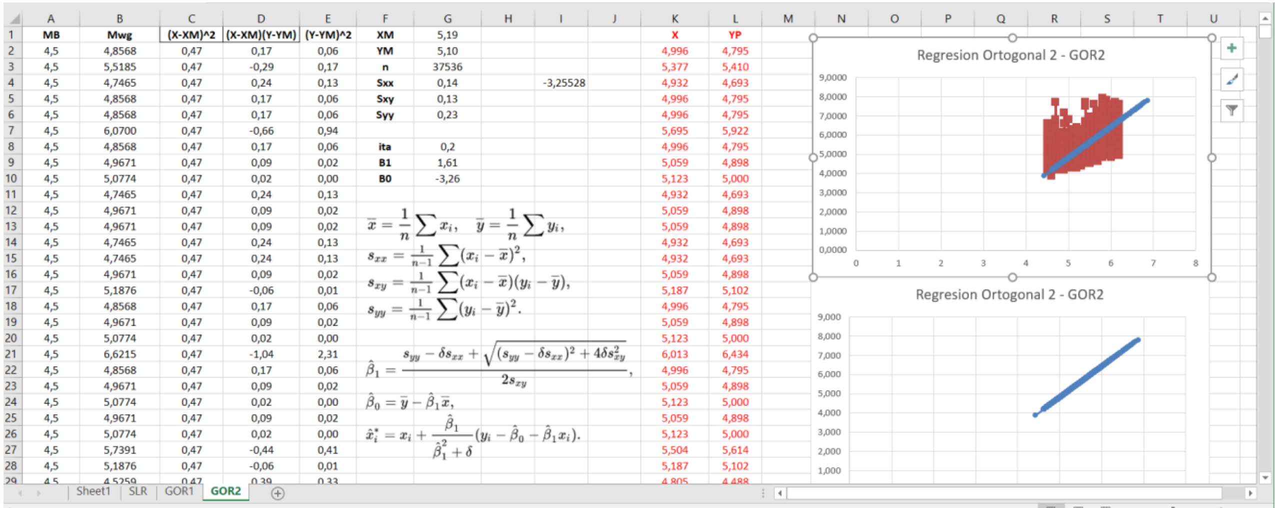

Fig. 5. Modified Orthogonal Regression with Excel

The same problem was solved from Matlab with the following code:

```
clc; clear all; close all
T = open('Test 1 SLR_GOR1 AND GOR2.xlsx');
%load('valModel.mat');
x=T.data(:,1);
y=T.data(:,2);;
n=size(x);
xm=mean(x);
ym=mean(y);


%(x-xm)^2
ecux=(x-xm).^2;


%(x-xm)(y-ym)
ecuxy=(x-xm).*(y-ym);


%(y-ym)^2
ecuy=(y-ym).^2;


Sxx= 1/(n(1)-1) * sum(ecux) ;
Sxy= 1/(n(1)-1) * sum(ecuxy);
Syy= 1/(n(1)-1) * sum(ecuy) ;


ita=0.2;


B1= ( Syy - ita*Sxx + sqrt ((Syy-ita*Sxx)^2 + 4*ita*(Sxy^2)) )/ (2*Sxy) ;
B0= ym - B1* xm;


xi = x+B1/(B1^2+ita) * (y-B0-B1*x);


Yp=B0+B1*xi;


plot(x,y,'*')
hold on
plot(xi,Yp)
```

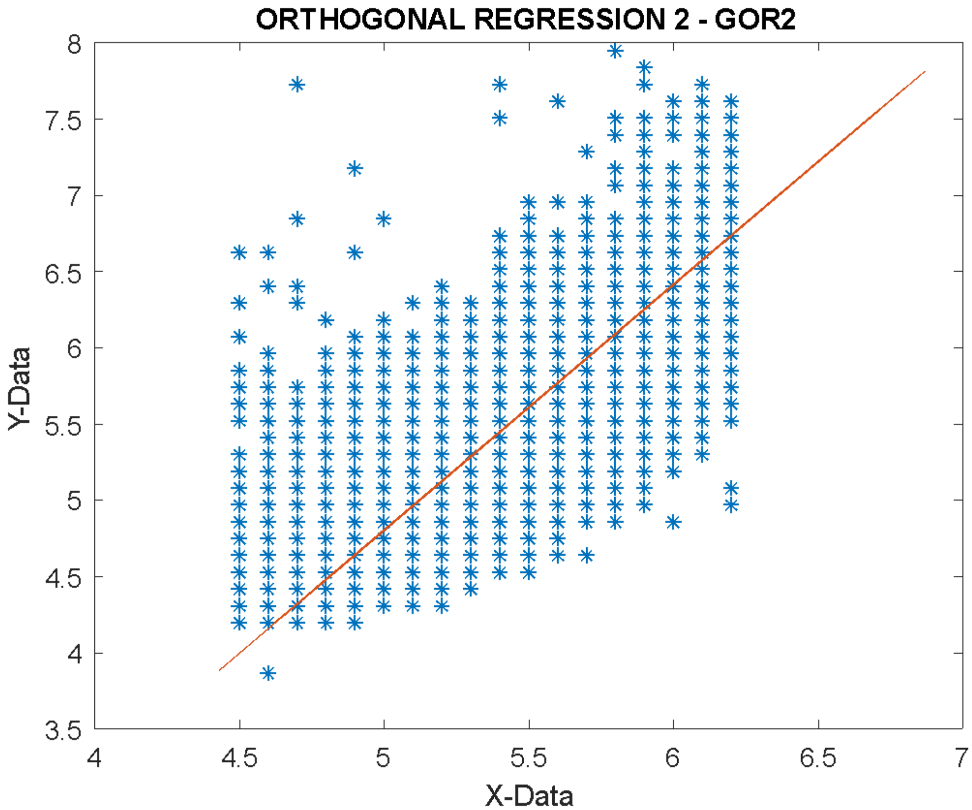

Fig. 6. Orthogonal Regression with Matlab

In both cases (Excel and matlab) the results were::

$$b_1 = \mathbf{1.6114}$$

$$b_0 = -3.2553$$

$$\hat{y} = b_0 + b_1\hat{x}$$