

# Actividad 5.3

November 2, 2024

## 1 Máxima Verosimilitud

```
[1]: import pandas as pd
import numpy as np
import statsmodels.api as sm
```

Cálculo de:  $\theta_1$

$$\theta_1 = \frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{\sum_{i=1}^n (x_i - \bar{x})^2}$$

Cálculo de:  $\theta_0$

$$\theta_0 = \bar{y} - \theta_1 \bar{x}$$

```
[7]: dataset=pd.read_csv("models/MLE Datos.csv")
print(dataset)
```

	X	Y
0	1	10.06
1	2	6.60
2	3	10.91
3	4	17.96
4	5	18.47
5	6	9.09
6	7	18.80
7	8	16.39
8	9	18.59
9	10	22.64
10	11	23.58
11	12	30.82
12	13	30.04
13	14	29.49
14	15	32.78
15	16	34.33
16	17	40.98
17	18	36.18

```
18 19 40.25
19 20 37.58
```

```
[10]: X_values=dataset["X"]
      Y_values=dataset["Y"]
```

```
[12]: print(X_values)
```

```
0      1
1      2
2      3
3      4
4      5
5      6
6      7
7      8
8      9
9     10
10     11
11     12
12     13
13     14
14     15
15     16
16     17
17     18
18     19
19     20
Name: X, dtype: int64
```

```
[13]: print(Y_values)
```

```
0      10.06
1       6.60
2      10.91
3      17.96
4      18.47
5       9.09
6      18.80
7      16.39
8      18.59
9      22.64
10     23.58
11     30.82
12     30.04
13     29.49
14     32.78
15     34.33
16     40.98
```

```

17    36.18
18    40.25
19    37.58
Name: Y, dtype: float64

```

```
[16]: # Paso 1: Cálculo de theta_1 y theta_0 usando OLS
```

```

X_mean = np.mean(X_values)
Y_mean = np.mean(Y_values)
print(X_mean)
print(Y_mean)

```

```

10.5
24.276999999999997

```

```
[17]: # Cálculo de theta_1
```

```

theta_1 = np.sum((X_values - X_mean) * (Y_values - Y_mean)) / np.sum((X_values -
↪ X_mean) ** 2)
print(theta_1)

```

```
1.7606165413533834
```

```
[18]: # Cálculo de theta_0
```

```

theta_0 = Y_mean - theta_1 * X_mean
print(theta_0)

```

```
5.790526315789471
```

```
[19]: # Paso 2: Verificación
```

```

X_with_const = sm.add_constant(X_values) # Columna el intercepto
model = sm.OLS(Y_values, X_with_const).fit()
theta_0, theta_1, model.summary()

```

```

[19]: (5.790526315789471,
1.7606165413533834,
<class 'statsmodels.iolib.summary.Summary'>
"""

```

```

                                OLS Regression Results
=====
Dep. Variable:                  Y      R-squared:                0.914
Model:                            OLS      Adj. R-squared:          0.910
Method:                    Least Squares      F-statistic:            192.0
Date:                Thu, 31 Oct 2024      Prob (F-statistic):      4.82e-11
Time:                        12:57:07      Log-Likelihood:         -51.061
No. Observations:                20      AIC:                   106.1
Df Residuals:                    18      BIC:                   108.1
Df Model:                        1
Covariance Type:                nonrobust
=====
                                coef      std err          t      P>|t|      [0.025      0.975]
=====

```

```

-----
const          5.7905      1.522      3.804      0.001      2.593      8.988
X              1.7606      0.127     13.856      0.000      1.494      2.028
=====
Omnibus:                0.249   Durbin-Watson:                2.123
Prob(Omnibus):          0.883   Jarque-Bera (JB):          0.142
Skew:                   -0.172   Prob(JB):                  0.931
Kurtosis:               2.773   Cond. No.                  25.0
=====

```

Notes:

```

[1] Standard Errors assume that the covariance matrix of the errors is
correctly specified.
"""
)

```

La ecuación de la regresión lineal es entonces:

$$y=5.79+1.76x$$

[ ]: