Actividad 5.3 Máxima Verosimilitud

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In [21]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import statsmodels.api as sm
```

In [22]:
```
# Carga de archivo excel, tomando la hoja de calculo "OML"
df = pd.read_excel(r'../data/raw/MLE Datos.xlsx', sheet_name='OLS')
df
```

Out[22]:

	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

In [23]:
```
X = df['X']
y = df['Y']
```

In [24]:
```
# Obtenemos la media de X y Y
mean_x = np.mean(X)
mean_y = np.mean(y)
```

In [25]:
```
#Calculamos Theta 0 y Theta 1
theta_1 = np.sum((X - mean_x) * (y - mean_y)) / np.sum((X - mean_x) ** 2)
theta_0 = mean_y - (theta_1 * mean_x)
```

In [26]:
```
# Ecucacion de la recta de la regresion lineal
print(f'Ecuacion de la regresion lineal: Y = {theta_0} + {theta_1}X')
```

```
Ecuacion de la regresion lineal: Y = 5.790526315789471 + 1.7606165413533834X
```

In [27]:
```
model = sm.OLS(y, sm.add_constant(X)).fit()
model.summary()
```

Out[27]:

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:	Fri, 01 Nov 2024	**Prob (F-statistic):**	4.82e-11
Time:	21:11:14	**Log-Likelihood:**	-51.061
No. Observations:	20	**AIC:**	106.1
Df Residuals:	18	**BIC:**	108.1
Df Model:	1		
Covariance Type:	nonrobust		

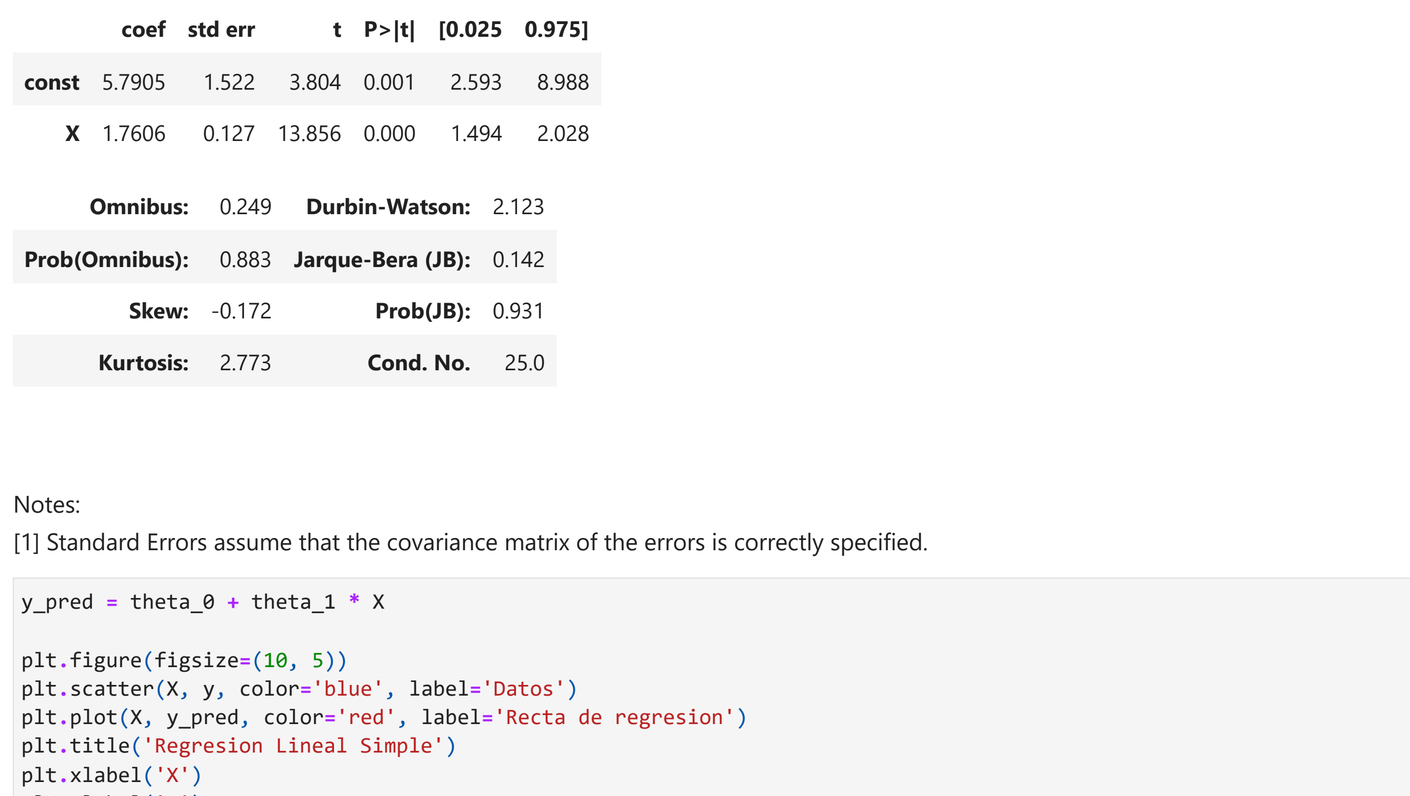
	coef	std err	t	P>|t|	[0.025	0.975]
const	5.7905	1.522	3.804	0.001	2.593	8.988
X	1.7606	0.127	13.856	0.000	1.494	2.028

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.

In [28]:
```
y_pred = theta_0 + theta_1 * X

plt.figure(figsize=(10, 5))
plt.scatter(X, y, color='blue', label='Datos')
plt.plot(X, y_pred, color='red', label='Recta de regresion')
plt.title('Regresion Lineal Simple')
plt.xlabel('X')
plt.ylabel('Y')
plt.legend()
plt.grid(True, color='gray', linestyle='--', linewidth=0.5)
plt.show()
```



Podemos concluir por la R cuadrada que el modelo se está ajustando a los datos, además, se puede observar por medio de la gráfica que la bariable independiente (X), tiene una correlación positiva con la variable depenediente