# Modelo Regresión Casos Covid en el Ecuador

Generar un modelo de regresión de los casos confirmados de COVID dentro del Ecuador, el mismo que permita predecir el comportamiento y/o predicción de la pandemia, tomar los datos desde el inicio e identificar etapas: Confinamiento, Toques de Queda, Feriados, etc.

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## SIMULACIÓN

In [1]:

```
# Librerias
import pandas as pd
import numpy as np
from datetime import datetime,timedelta
from sklearn.metrics import mean_squared_error
from scipy.optimize import curve_fit
from scipy.optimize import fsolve
from sklearn import linear_model
from sklearn.preprocessing import PolynomialFeatures
import matplotlib.pyplot as plt
import altair as alt
print ('Librerias Importadas')
```

```
Librerias Importadas
```

In [2]:

```
df = pd.read_csv('./datos_ecuador.csv')
df.head()
```

Out[2]:

| | iso_code | continent | location | date | total_cases | new_cases | new_cases_smoothed | total_deaths | new_deaths | new_deaths_smoothed | ... | gdp_per_capita | extreme_poverty | cardiovasc_death_rate | diabetes_prevalence | female_smokers | male_smokers | handwashing_facilities | hospital_be |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | ECU | South America | Ecuador | 1/3/2020 | 6.0 | 6.0 | NaN | NaN | NaN | NaN | ... | 10.581.936 | 3.6 | 140.448 | 5.55 | 2.0 | 12.3 | 80.635 | |
| **1** | ECU | South America | Ecuador | 2/3/2020 | 6.0 | 0.0 | NaN | NaN | NaN | NaN | ... | 10.581.936 | 3.6 | 140.448 | 5.55 | 2.0 | 12.3 | 80.635 | |
| **2** | ECU | South America | Ecuador | 3/3/2020 | 7.0 | 1.0 | NaN | NaN | NaN | NaN | ... | 10.581.936 | 3.6 | 140.448 | 5.55 | 2.0 | 12.3 | 80.635 | |
| **3** | ECU | South America | Ecuador | 4/3/2020 | 10.0 | 3.0 | NaN | NaN | NaN | NaN | ... | 10.581.936 | 3.6 | 140.448 | 5.55 | 2.0 | 12.3 | 80.635 | |
| **4** | ECU | South America | Ecuador | 5/3/2020 | 13.0 | 3.0 | NaN | NaN | NaN | NaN | ... | 10.581.936 | 3.6 | 140.448 | 5.55 | 2.0 | 12.3 | 80.635 | |

5 rows × 59 columns

In [387…

```
df = df.loc[: , ["date","total_cases"]]
FMT = '%d/%m/%Y'
date = df['date']
df['date'] = date.map(lambda x : (datetime.strptime(x, FMT) - datetime.strptime("01/03/2020", FMT)).days)
df = df.dropna()
df = df.drop(df[df['total_cases']<1].index)
df.head()
```

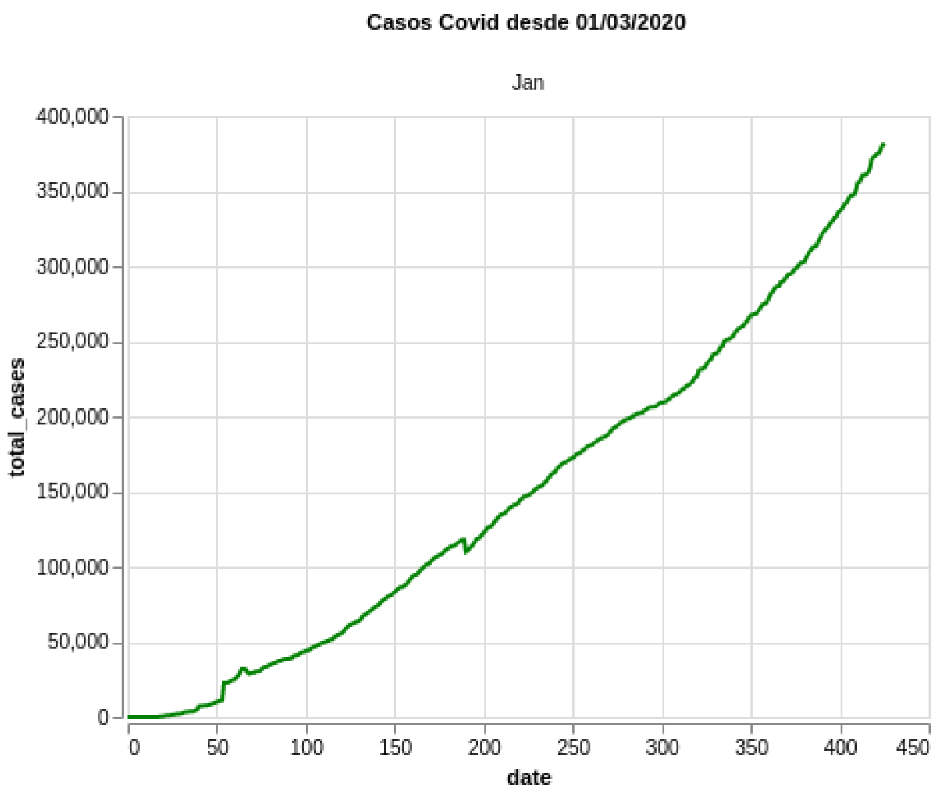
Out[387…

| | date | total_cases |
|---|---|---|
| **0** | 0 | 6.0 |
| **1** | 1 | 6.0 |
| **2** | 2 | 7.0 |
| **3** | 3 | 10.0 |
| **4** | 4 | 13.0 |

In [388…

```
df.reset_index(inplace=True)
img= alt.Chart(df).mark_line().encode(
x=alt.X('date'),
y=alt.Y('total_cases'),
tooltip=['date', 'total_cases'],
color=alt.condition( alt.datum.total == 1200000,alt.value('green'),alt.value('green')),
column=alt.Column('month(arrived_at)',title='Casos Covid desde 01/03/2020'))
img
```

Out[388…



In [389…

```
x = list(df.iloc [:, 1])
y = list(df.iloc [:, 2])
```

## Regresión Lineal

In [390…

```
#Nuestra Regresión Lineal
lineal = linear_model.LinearRegression()

# Entrenamos el modelo
lineal.fit(np.array(x).reshape(-1, 1) ,y)
```

Out[390…

```
LinearRegression()
```

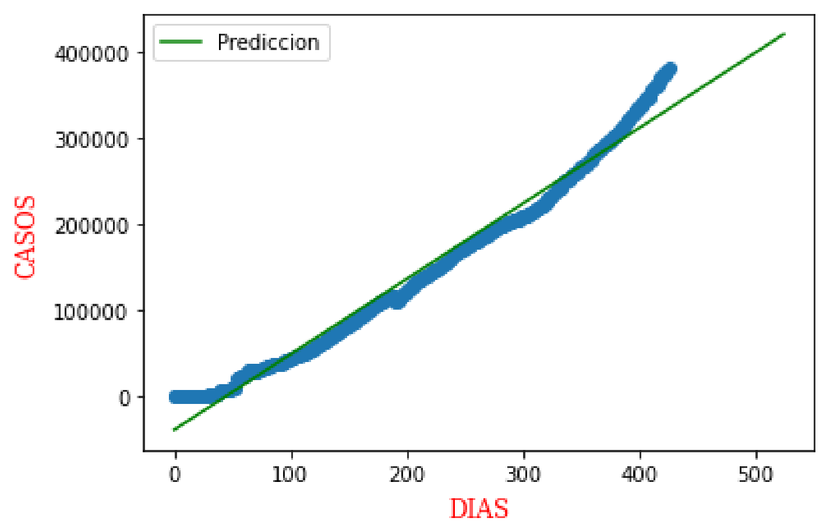
In [391…

```
prediction = lineal.predict([[425]])
print(int(prediction )  ,"NUMERO DE CASOS TOTALES AL 30/04/2021")
```

```
334050 NUMERO DE CASOS TOTALES AL 30/04/2021
```

In [392…

```
#Graficar
plt.scatter(x, y)
line = np.array(range(min(x), max(x)+100) )
plt.plot(x_real, lineal.predict(line.reshape(-1, 1)), color='green' , label='Prediccion')
plt.xlabel('DIAS' ,family='serif',
           color='r',
           weight='normal',
           size = 12,
           labelpad = 6)
plt.ylabel('CASOS',family='serif',
           color='r',
           weight='normal',
           size = 12,
           labelpad = 6)
plt.legend()
plt.show()
```



## Regresión Polinomial

In [393…

```
p = PolynomialFeatures(degree = 8)
polinomX = p.fit_transform(np.array(x).reshape(-1, 1))
lin = linear_model.LinearRegression()
lin.fit(polinomX, y)
```

Out[393…

```
LinearRegression()
```

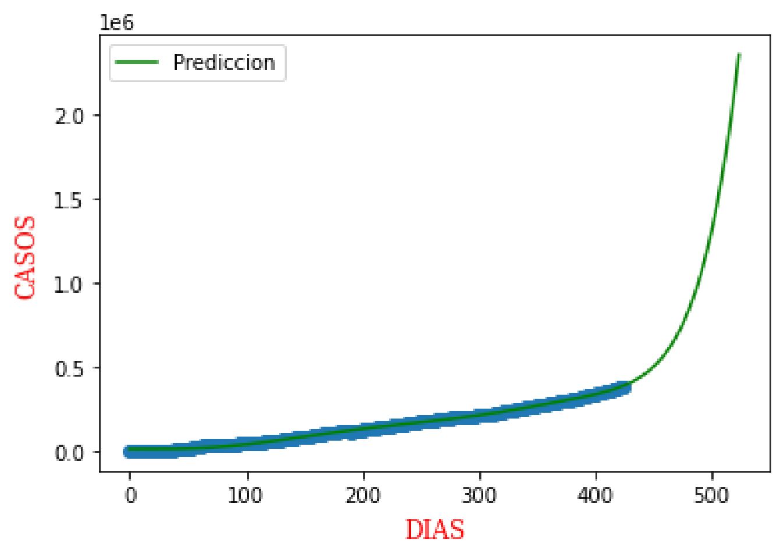
In [394…

```
prediction = lin.predict(p.fit_transform([[425]]))
print(int(prediction )  ,"NUMERO DE CASOS TOTALES AL 30/04/2021")
```

```
387291 NUMERO DE CASOS TOTALES AL 30/04/2021
```

In [395…

```
plt.scatter(x, y)
datos = np.array(range(min(x), max(x)+100))
plt.plot(x_real, lin.predict(p.fit_transform(datos.reshape(-1, 1))), color='green', label='Prediccion')
plt.xlabel('DIAS' ,family='serif',
           color='r',
           weight='normal',
           size = 12,
           labelpad = 6)
plt.ylabel('CASOS',family='serif',
           color='r',
           weight='normal',
           size = 12,
           labelpad = 6)
plt.legend()
plt.show()
```


1e6
Prediccion
CASOS
DIAS