# modelo_cox

November 5, 2025

[1]:
```
import pandas as pd
import numpy as np
import statsmodels.api as sm
from lifelines import ExponentialFitter, WeibullFitter, CoxPHFitter
```

[65]:
```
%store -r df_cox
```

[70]:
```
df_cox = df_cox[df_cox['duration']>0]
df_cox
```

[70]:

| | id | duration | event | GDP | Personal_Income | TasaDesempleo |
|---|---|---|---|---|---|---|
| 1 | Alabama | 18.266667 | 0 | 2.501586 | 2.481643 | 6.514286 |
| 2 | Alaska | 9.133333 | 1 | 2.384076 | 2.340522 | 6.914286 |
| 3 | Alaska | 6.066667 | 0 | 2.384076 | 2.340522 | 6.914286 |
| 4 | Arizona | 18.266667 | 0 | 2.533618 | 2.509739 | 6.414286 |
| 6 | Arkansas | 9.133333 | 0 | 2.454395 | 2.436157 | 6.033333 |
| .. | … | … | … | … | … | … |
| 65 | Wisconsin | 3.033333 | 1 | 2.530079 | 2.508573 | 5.952381 |
| 67 | Wisconsin | 6.066667 | 0 | 2.530079 | 2.508573 | 5.952381 |
| 68 | Wyoming | 3.033333 | 1 | 2.364291 | 2.320092 | 3.723810 |
| 69 | Wyoming | 3.066667 | 1 | 2.364291 | 2.320092 | 3.723810 |
| 70 | Wyoming | 6.066667 | 0 | 2.364291 | 2.320092 | 3.723810 |

[64 rows x 6 columns]

[92]:
```
#Modelo parametrico

exp_model = ExponentialFitter()
exp_model.fit(df_cox['duration'], event_observed=df_cox['event'])
summary = exp_model.summary
print(summary)
```

```
              coef   se(coef)  coef lower 95%  coef upper 95%  cmp to  \
lambda_  50.826172  13.583861       24.202294        77.45005     0.0

                z         p  -log2(p)
lambda_  3.741659  0.000183  12.41737
```

[90]:
```
# Weibull
weibull_model = WeibullFitter()
weibull_model.fit(df_cox['duration'], event_observed=df_cox['event'])
summary = weibull_model.summary
print(summary)
```

```
             coef   se(coef)  coef lower 95%  coef upper 95%  cmp to  \
lambda_  73.92983  41.315599       -7.047255      154.906915     1.0
rho_      0.78817   0.194980        0.406016        1.170324     1.0

                z         p  -log2(p)
lambda_  1.765189  0.077532  3.689063
rho_    -1.086419  0.277294  1.850514
```

[89]:
```
cox = CoxPHFitter()
cox.fit(df_cox, duration_col='duration', event_col='event', formula="GDP")
summary = cox.summary
print(summary)
```

```
               coef  exp(coef)  se(coef)  coef lower 95%  coef upper 95%  \
covariate
GDP       -8.301693   0.000248  3.488477      -15.138982       -1.464404

           exp(coef) lower 95%  exp(coef) upper 95%  cmp to         z  \
covariate
GDP               2.662097e-07             0.231216     0.0 -2.379747

                 p  -log2(p)
covariate
GDP        0.017325  5.851041
```

[88]:
```
cox = CoxPHFitter()
cox.fit(df_cox, duration_col='duration', event_col='event',␣
 ↪formula="GDP+Personal_Income")
summary = cox.summary
print(summary)
```

```
                     coef   exp(coef)   se(coef)  coef lower 95%  \
covariate
GDP                5.514219  248.196183  26.856241      -47.123045
Personal_Income -13.300833    0.000002  25.514435      -63.308207

                coef upper 95%  exp(coef) lower 95%  exp(coef) upper 95%  \
covariate
GDP                  58.151484         3.425481e-21         1.798327e+25
Personal_Income      36.706541         3.203282e-28         8.738729e+15

                cmp to         z         p  -log2(p)
covariate
```

```
GDP                0.0  0.205324  0.837319  0.256150
Personal_Income    0.0 -0.521306  0.602153  0.731797
```

[87]:
```
cox = CoxPHFitter()
cox.fit(df_cox, duration_col='duration', event_col='event',␣
 ↪formula="GDP+Personal_Income+TasaDesempleo")
summary = cox.summary
print(summary)
```

```
                      coef    exp(coef)   se(coef)  coef lower 95%  \
covariate
GDP                6.770542  871.784659  27.801397      -47.719194
Personal_Income -12.367026    0.000004  26.393222      -64.096792
TasaDesempleo    -0.250742    0.778223   0.235428       -0.712172

                coef upper 95%  exp(coef) lower 95%  exp(coef) upper 95%  \
covariate
GDP                  61.260278         1.887198e-21         4.027178e+26
Personal_Income      39.362739         1.455851e-28         1.244573e+17
TasaDesempleo         0.210688         4.905774e-01         1.234527e+00

                cmp to         z         p  -log2(p)
covariate
GDP                0.0  0.243532  0.807593  0.308300
Personal_Income    0.0 -0.468568  0.639378  0.645258
TasaDesempleo      0.0 -1.065049  0.286854  1.801612
```

[86]:
```
cox = CoxPHFitter()
cox.fit(df_cox, duration_col='duration', event_col='event',␣
 ↪formula="GDP+TasaDesempleo")
summary = cox.summary
print(summary)
```

```
                   coef  exp(coef)  se(coef)  coef lower 95%  coef upper 95%  \
covariate
GDP           -6.055163   0.002346  4.016530      -13.927417        1.817091
TasaDesempleo -0.256406   0.773828  0.236113       -0.719180        0.206368

               exp(coef) lower 95%  exp(coef) upper 95%  cmp to         z  \
covariate
GDP                  8.941282e-07             6.153931     0.0 -1.507561
TasaDesempleo        4.871517e-01             1.229205     0.0 -1.085944

                     p  -log2(p)
covariate
GDP           0.131667  2.925035
TasaDesempleo 0.277504  1.849420
```

[ ]: