# Tutorial 6

You are evaluating a new pizza oven and have been given the corresponding temperature (K) and pressure (kPa) data. Given the following OLS output, covariance matrix and ANOVA table, answer the following questions.

## OLS Output

Results: Ordinary least squares

| | | | |
|---|---|---|---|
| Model: | OLS | Adj. R-squared: | 0.996 |
| Dependent Variable: | Pressure | AIC: | 68.0642 |
| Date: | 2023-10-23 14:27 | BIC: | 69.8449 |
| No. Observations: | 18 | Log-Likelihood: | -32.032 |
| Df Model: | 1 | F-statistic: | 3776. |
| Df Residuals: | 16 | Prob (F-statistic): | 1.98e-20 |
| R-squared: | 0.996 | Scale: | 2.3141 |

| | Coef. | Std.Err. | t | P>\|t\| | [0.025 | 0.975] |
|---|---|---|---|---|---|---|
| | | | | | | |

| | | | |
|---|---|---|---|
| Omnibus: | 3.010 | Durbin-Watson: | 1.582 |
| Prob(Omnibus): | 0.222 | Jarque-Bera (JB): | 1.453 |
| Skew: | 0.348 | Prob(JB): | 0.484 |
| Kurtosis: | 1.794 | Condition No.: | 1153 |

## ANOVA Table

| | df | sum_sq | mean_sq | F | PR(>F) |
|---|---|---|---|---|---|
| Temperature | 1.0 | 8737.4742 | 8737.474200 | 3775.734433 | 1.977749e-20 |
| Residual | 16.0 | 37.0258 | 2.314112 | NaN | NaN |

## Covariance Matrix

$$\begin{bmatrix} cov(temperature, temperature) & cov(temperature, pressure) \\ cov(pressure, temperature) & cov(pressure, pressure) \end{bmatrix} = \begin{bmatrix} 11400 & 2420.588 \\ 2420.588 & 516.15 \end{bmatrix}$$

## Data Summary

| | Temperature | Pressure |
|---|---|---|
| count | 18.000000 | 18.00000 |
| mean | 330.000000 | 67.50000 |
| std | 106.770783 | 22.71887 |
| min | 160.000000 | 30.00000 |
| 25% | 245.000000 | 48.25000 |
| 50% | 330.000000 | 69.00000 |
| 75% | 415.000000 | 84.25000 |
| max | 500.000000 | 105.00000 |

i. Compute the least-squares regression line. Show the work by hand.

ii. Interpret the estimated slope of the line; what does it mean in words? Include units in your discussion.

iii. At the 0.05 level of significance, test the null hypothesis that the true population slope is equal to zero. You have been given that $SS_x$ = 193800.What do you conclude?

iv. Provide a supporting 95% confidence interval (2-sided) and show the formula. Show this work by hand. What do you conclude?

v. What is the estimated mean pressure for the population of ovens whose temperature is 230K? Show your work.