

Stat 5309 Lab 4b

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1.

The yield of a chemical process is being studied. The two most important variables are thought to be the pressure and the temperature. Three levels of each factor are selected and a factorial experiment with two replicates is performed. The yield data follows.

a

Set up the dataframe.

```
temperatures <- c("150", "160", "170")
pressures <- c("200", "215", "230")
process <- expand.grid(pressure = rep(pressures, 2),
                      temperature = temperatures)

process <- cbind(process, yield = c(90.4, 90.7, 90.2,
                                   90.2, 90.6, 90.4,
                                   90.1, 90.5, 89.9,
                                   90.3, 90.6, 90.1,
                                   90.5, 90.8, 90.4,
                                   90.7, 90.9, 90.1))

process %>% kable()
```

pressure	temperature	yield
200	150	90.4
215	150	90.7
230	150	90.2
200	150	90.2
215	150	90.6
230	150	90.4
200	160	90.1
215	160	90.5
230	160	89.9
200	160	90.3
215	160	90.6
230	160	90.1
200	170	90.5
215	170	90.8
230	170	90.4
200	170	90.7
215	170	90.9
230	170	90.1

b

Build a linear model using `aov()`. Are the pressure means significant? Are the temp means significant? Is the interaction significant?

c

Create a boxplot of yield vs temp yield vs pressure yield vs temp and pressure

d

Perform a residuals assumption check

2

Johnson and Leone describe an experiment to investigate warping of copper plates. The two factors studied were the temperature and the copper content of the plates. The response variable was a measure of the amount of warping. The data were as follows.

a

Set up the dataframe

b

build a response model surface (RSM) with warpage as response, use `rsm()`.