Econometrics-Damodar N. Gujarati / Chapter 5

Furkan Zengin

16 08 2021

$$H_o: \ \beta_1 = 0$$

$$t_{\text{stat}} = \frac{\hat{\beta}_1 - c}{\hat{\text{SE}}\left(\hat{\beta}_1\right)}$$

$$\text{SSE} = \sum_{i=1}^{n} e_i^2$$

$$\begin{aligned} e_i^2 &= (y_i - \hat{y}_i)^2 = \left(y_i - \hat{\beta}_0 - \hat{\beta}_1 x_i\right)^2 \\ &= y_i^2 - 2y_i\hat{\beta}_0 - 2y_i\hat{\beta}_1 x_i + \hat{\beta}_0^2 + 2\hat{\beta}_0\hat{\beta}_1 x_i + \hat{\beta}_1^2 x_i^2 \end{aligned}$$

$$\begin{aligned} \frac{\partial \text{SSE}}{\partial \hat{\beta}_0} &= \sum_i \left(2\hat{\beta}_0 + 2\hat{\beta}_1 x_i - 2y_i\right) = 2n\hat{\beta}_0 + 2\hat{\beta}_1 \sum_i x_i - 2\sum_i y_i \\ &= 2n\hat{\beta}_0 + 2n\hat{\beta}_1 \overline{x} - 2n\overline{y} \end{aligned}$$

$$\text{t} = \frac{(\hat{\beta}_2 - \beta_2)\sqrt{\sum_{i=1}^{n} x_i}}{\hat{\sigma}}$$

````
$$Empirical Exercises$$

$$5.9$$

```{r}



options(scipen = 999)
fix(Table5_5)
par(mfrow=c(2,2))

MODEL2 = lm(Table5_5$SALARY ~ Table5_5$SPENDING)

summary(MODEL2)


plot(Table5_5$SPENDING, Table5_5$SALARY,xlab = "SPENDING",
     ylab = "SALARY")
abline(MODEL2)
predict1=predict(MODEL2,interval = "confidence")
predict1 # shows that fitted values and lower and upper intervals
fitted.values(MODEL2) # shows the same
````
````

$$\underset{(1197.3508)}{SALARY = 12129.3710} + \underset{(0.3117)}{3.3076}SPENDING$$

Using:

$$https://www.econometrics-with-r.org/index.html$$

```
t <- seq(-15, 15, 0.01)

plot(x = t,
     y = dnorm(t, 0, 1),
     type = "l",
     col = "steelblue",
     lwd = 2,
     yaxs = "i",
     axes = F,
     ylab = "",
     main = expression("Calculating the p-value of a Two-sided Test when" ~ t^act ~ "=10.61"),
     cex.lab = 0.7,
     cex.main = 1)

tact <- 10.61

axis(1, at = c(0, -1.96, 1.96, -tact, tact), cex.axis = 0.7)

# Shade the critical regions using polygon():

# critical region in left tail
polygon(x = c(-6, seq(-6, -1.96, 0.01), -1.96),
        y = c(0, dnorm(seq(-6, -1.96, 0.01)), 0),
        col = 'orange')

# critical region in right tail

polygon(x = c(1.96, seq(1.96, 6, 0.01), 6),
        y = c(0, dnorm(seq(1.96, 6, 0.01)), 0),
        col = 'orange')

# Add arrows and texts indicating critical regions and the p-value
arrows(-3.5, 0.2, -2.5, 0.02, length = 0.1)
arrows(3.5, 0.2, 2.5, 0.02, length = 0.1)

arrows(-5, 0.16, 10.61, 0, length = 0.1)
```

```
arrows(5, 0.16, -10.61, 0, length = 0.1)

text(-3.5, 0.22,
     labels = expression("0.025"~"="~over(alpha, 2)),
     cex = 0.7)
text(3.5, 0.22,
     labels = expression("0.025"~"="~over(alpha, 2)),
     cex = 0.7)

text(-5, 0.18,
     labels = expression(paste("-|",t[act],"|")),
     cex = 0.7)
text(5, 0.18,
     labels = expression(paste("|",t[act],"|")),
     cex = 0.7)

# Add ticks indicating critical values at the 0.05-level, t^act and -t^act
rug(c(-1.96, 1.96), ticksize  = 0.145, lwd = 2, col = "darkred")
rug(c(-tact, tact), ticksize  = -0.0451, lwd = 2, col = "darkgreen")
```

5.15

```
options(scipen = 999)
fix(Table5_6)


MODEL3 = lm(Table5_6$GNP ~ Table5_6$M1)
MODEL3_1 = lm(Table5_6$GNP ~ Table5_6$M2)
MODEL3_2 = lm(Table5_6$GNP ~ Table5_6$M3)
MODEL3_3 = lm(Table5_6$GNP ~ Table5_6$L)

library(stargazer)
s1 = stargazer(list(MODEL3, MODEL3_1, MODEL3_2,MODEL3_3), type = "text")
```

5.16

```
options(scipen = 999)
fix(Table5_9)


MODEL4 = lm(Table5_9$`Actual Exchange Rate` ~ Table5_9$`Implied PPP`)
a = summary(MODEL4)

plot(log(Table5_9$`Implied PPP`),log(Table5_9$`Actual Exchange Rate`)
     ,xlab = "Implied PPP",
     ylab = "Actual Exchange Rate")
```

$$ActualExchangeRate = \underset{(26.98784)}{-33.09170} + \underset{(0.02744)}{1.81472}ImpliedPPP$$